Abstract

Findings on neuropsychological associates of the negative syndrome of schizophrenia have been inconsistent. The “deficit syndrome,” a reconceptualization of the negative syndrome, was developed in part to address this inconsistency. The purpose of this study was (1) to replicate previous findings relating the deficit syndrome to impairment of certain kinds of attentional abilities, and (2) to compare the negative and deficit syndromes in their associations with performance on tests of attention. Data from 40 individuals with schizophrenia were analyzed. Results provide evidence to suggest that impairment of certain attentional processes is associated with severity of deficit symptomatology, while impairment of other attentional processes is not. Moreover, the negative and deficit syndromes differed in their respective associations with attentional task performance at a trend level or above for five of seven tasks, suggesting that the negative and deficit syndromes do indeed have different underlying neuropsychological correlates.

Keywords: Schizophrenia, deficit, negative, syndrome, attention.


The heterogeneity of symptoms in people with schizophrenia may reflect differences among subjects in the underlying pathophysiological process. However, organization of these symptoms into clinically valid syndromes has proven to be challenging. The negative syndrome, identified as early as 1858 (Reynolds; see Berrios 1985), is the product of one such organizational attempt. This construct has been central to Kraepelin’s “loss of volition” (1919), Andreasen’s negative schizophrenia (Andreasen and Olsen 1982), and Crow’s type II schizophrenia (Crow 1985). However, negative syndrome definitions have lacked specificity in that they have not differentiated between negative symptoms that are idiopathic or primary, and those that are secondary (e.g., a result of depression or medication, or a method of coping with positive symptoms). Carpenter et al.’s (1988) definition of a “deficit syndrome” addresses this problem by focusing solely on specific, enduring negative symptoms. Those patients who exhibit chronic, primary negative symptomatology are included in the deficit syndrome group, and all others are in a nondeficit group. The present study examined differences in neuropsychological correlates of the negative versus deficit syndromes.

Previous studies have suggested that the negative syndrome is related to attentional impairment, independent of generalized deficit effects (see Earnst and Kring 1997 for a review). However, attempts to identify a consistent and recognizable pattern of attentional impairment that is characteristic of the negative syndrome have been largely unsuccessful. For example, studies using the Wisconsin Card Sorting Test (WCST), a measure of frontal lobe functions, including the ability to form abstract concepts and to shift and maintain attentional set (Lezak 1995), have yielded notably varied results. A relationship between WCST impairment and negative symptoms has been found in some studies (Chen et al. 1996; Schroder et al. 1996; Berman et al. 1997; Norman et al. 1997; Basso et al. 1998; Mahurin et al. 1998; Zaksanis 1998) but not in others (Morrison-Stewart et al. 1992; Van der Does et al. 1993; Himelhoch et al. 1996; Collins et al. 1997). Such marked inconsistency of findings may reflect heterogeneity within the negative syndrome resulting from various underlying factors.

1 There is debate as to whether the deficit syndrome reflects a dimensional or a categorical phenomenon (see Kirkpatrick et al. 2001). The present study primarily examined the deficit syndrome as a dimensional construct. However, participants were also categorically assigned to deficit and nondeficit groups, and the subsequent analyses are included as part of this study.

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from a lack of differentiation between primary and secondary negative symptoms.

Although subjects with the negative syndrome tend to show inconsistent neuropsychological correlates, subjects with the deficit syndrome tend to show more specific attentional impairments. Buchanan et al. have described these as "impairments in the ability to allocate and activate attention, or in the ability to discriminate meaningful from irrelevant information under conditions of information overload" (1997, p. 369). This is based on findings that (1) compared to nondeficit subjects, subjects with the deficit syndrome have performed more poorly on visual-motor tasks that involve focusing attention while simultaneously screening out distracting stimuli (see Mirsky et al. 1991 for elaboration on this "focus/execute" component of attention) (Buchanan et al. 1994); (2) compared to nondeficit subjects, subjects with the deficit syndrome have demonstrated poorer performance on the Degraded Stimulus Continuous Performance Task (DSCPT), a task requiring vigilant stimulus discrimination under conditions of relatively high processing load (Nuechterlein et al. 1986); and (3) subjects with the deficit syndrome have not significantly differed from subjects with nondeficit schizophrenia on other measures of neuropsychological functioning, such as the WCST (Buchanan et al. 1994) and the span of apprehension tasks (Buchanan et al. 1997). More broadly, these findings suggest that certain relatively distinct neuropsychological impairments may be characteristic of deficit schizophrenia. Furthermore, the deficit syndrome appears to be a more meaningful construct for understanding the negative symptoms of schizophrenia, given the aforementioned inconsistency associated with more traditional definitions of the "negative syndromes."

The purpose of the present study was twofold. First, we wished to replicate and extend previous findings on the relationship between the deficit syndrome and impairment on specific attentional tasks. Second, we wanted to determine whether the negative and deficit syndromes differed in their patterns of attentional impairment more generally. A significant disparity between neuropsychological correlates of the deficit versus negative syndromes could explain some of the inconsistencies in previous findings on negative syndrome processes from studies in which a distinction was not made between primary and secondary negative symptoms.

Methods

Participants. Subjects consisted of 28 male and 12 female stable outpatients with DSM-IV (American Psychiatric Association [APA] 1994) diagnosed schizophrenia, based on a DSM-IV-compatible Schedule for Affective Disorders and Schizophrenia—Lifetime Version (Endicott and Spitzer 1978). Participants were recruited from an urban community mental health center. Volunteers who were not fluent in English or who presented histories suggestive of neurologic impairment other than schizophrenia were excluded from this study, as were those who met DSM-IV criteria for substance abuse or dependence. In addition, volunteers who had Global Assessment of Functioning (GAF, DSM-IV [APA 1994]) scores below 35 were excluded. The participant sample was composed of 32 Caucasians and 8 African-Americans, with a mean age of 35.6 ± 7.5 years, mean education of 12.5 ± 1.5 years, mean GAF score of 50 ± 12 points, and average Shipley Institute of Living Scale estimated IQ score (Zachary 1986) of 103 ± 8.5 points.

Clinical Assessment

Symptom rating scales. The Brief Psychiatric Rating Scale (BPRS; Overall and Gorham 1962; Lukoff et al. 1986) was used to assess subject symptomatology. Interviews and ratings were done by graduate-level researchers who had attained acceptable levels of interrater reliability (all intraclass correlations > 0.69; most > 0.90).

Negative and deficit syndromes. The negative syndrome was represented by the factor 2 score described by Overall and Gorham (1962). This score is a summation of scores of three BPRS items: blunted affect, emotional withdrawal, and motor retardation. The factor 2 score was used because it was empirically derived in factor analytic studies and has been used as a measure of the negative syndrome in previous research (Kirkpatrick et al. 1993). In the present study, the negative syndrome was employed as a continuous variable. The deficit syndrome was assessed using the Proxy for Deficit Syndrome Scale (PDS), a cross-sectional measure that has demonstrated a high level of concurrent validity with the major longitudinal measure of the deficit syndrome, the Schedule for the Deficit Syndrome (Kirkpatrick et al. 1989). In essence, the PDS measures two primary negative symptoms: blunted affect (measured by the BPRS blunted affect score) and diminished emotional range (measured by the AFFSCALE score, which is a summation of BPRS items depression, anxiety, guilt, and hostility). The PDS is computed by subtracting the AFFSCALE score from the blunted affect score (Kirkpatrick et al. 1993).

While the PDS was originally intended to be used in distinguishing deficit from nondeficit forms of schizophrenia, recent research has suggested that it may lack temporal stability when used categorically (Subotnik et al. 1998). Therefore, the present study employed the PDS primarily as a continuous variable to avoid miscategorization. However, secondary analyses were also run using it.
as a categorical measure. For these analyses, following the method of Kirkpatrick (see Kirkpatrick et al. 1996 for elaboration on this method), the deficit syndrome group consisted of all cases in the top 15 percent of the range of PDS scores (PDS score > 0, n = 6), and the nondeficit syndrome group consisted of all cases in the lowest 50 percent of PDS scores (PDS score < –2, n = 21). The remaining 35 percent of cases were left out of these analyses. While previous reports suggest that 25 to 30 percent of chronic outpatients meet deficit syndrome criteria (Kirkpatrick et al. 2001), 18 percent (n = 7) of our sample had PDS scores of zero. Given that a zero PDS score could occur for several reasons (including the participant being asymptomatic with respect to both blunted affect and the AFFSCALE), all of the zero scores were included in the middle, excluded group.

**Psychosis severity.** Psychosis severity was measured using the psychosis score described by Kirkpatrick et al. (1993). This score is a summation of four BPRS items: conceptual disorganization, suspiciousness, hallucinatory behavior, and unusual thought content.

**Attentional Measures**

**Digit span and digit distraction.** An audiotaped digit span test with matched distraction and nondistraction conditions was administered (Oltmanns and Neale 1975). Each nondistraction digit span trial consisted of a female voice presenting six digits at the rate of one digit every 2 seconds. After each sequence, the tape was stopped and subjects responded. Subjects were instructed to recall as many digits as they could, in the same order as they had been spoken. For the digit distraction trials, the same female voice presented five digits, one every 2 seconds, while a male voice presented four “distraction” digits between each two target digits. Subjects were instructed to recall only the digits spoken by the female voice. Scores for each trial were calculated as the number of correct digits recalled minus the number of errors of order or omission. Digit span scores were computed as the total score for the nondistraction trials. Digit distraction scores were calculated as the difference between the scores in the nondistraction and distraction conditions (i.e., nondistraction trial scores minus distraction trial scores). The digit span score is considered to be a measure of concentration and short-term memory, whereas the digit distraction score measures distractibility and the ability to focus attention on target stimuli while simultaneously screening out competing stimuli (Oltmanns and Neale 1975).

**Trail making tests.** The trail making A and B tests (Reitan and Davidson 1974) were employed. The Trails A measures visual motor skills and simple concentration/attention abilities (Lezak 1995), while the Trails B also assesses the ability to shift attentional set (Lezak 1995) and to focus on target data while simultaneously screening out irrelevant stimuli (Mirsky et al. 1991). Scores from both tests were recorded as total time for correct completion of the task.

**DSCPT.** A computerized continuous performance task was administered. This version (DSCPT, version 7.03 [Nuechterlein and Asarnow 1994]; UCLA Clinical Research Center for the Study of Schizophrenia) employs an 8-minute series of degraded digits flashing on a computer screen at the rate of one per second. A measure of sensitivity (A’) was calculated that incorporated both hit rate and false alarm rate. This test is regarded as a measure of ability to discriminate signal from noise under conditions of heavy information processing load (Nuechterlein et al. 1986).

**Continuous Performance Task—auditory.** An auditory Continuous Performance Task (CPT-A; Strub and Black 1988) required subjects to listen to a 7-minute audiotape of a series of quasi-random letters read at 1-second intervals and respond verbally each time a target letter (A) was presented. Performance was measured by a count of the errors of omission. This test is regarded as a measure of attentional vigilance (Mirsky et al. 1991).

**WCST.** William Spaulding’s computerized version of the WCST (Coglab version) was administered. Performance was scored as the total number of trials to task completion. This test is regarded, among other things, as a measure of the ability to form abstract concepts and to shift and maintain attentional set (Lezak 1995).

**Analysis.** The analysis was performed in three parts. First, bivariate correlations were calculated between deficit syndrome scores and the seven attentional measures. We expected that deficit syndrome scores would be positively correlated with impairment on the digit distraction, Trails B, and DSCPT tasks and not with impairment on the digit span nondistraction task, Trails A, CPT–A, or WCST. These predictions were based on (1) prior research suggesting that Trails B (Buchanan et al. 1994) and DSCPT (Buchanan et al. 1997) performance was worse in a deficit syndrome group compared to a nondeficit group; (2) a hypothesized association between the deficit syndrome and impairment in the ability to focus attention while simultaneously screening out distracting stimuli (Buchanan et al. 1997), an ability that the digit distraction, Trails B, and DSCPT but not the WCST, digit span, Trails A, or CPT–A tasks appear to require; and (3) findings that deficit and nondeficit groups have not differed in their performance on the WCST or simple short-term memory tasks (Buchanan et al. 1994).

Next, bivariate correlations were calculated between the negative syndrome scores and performance on the attentional tasks. Correlations of the deficit and negative
syndrome severity scores with each of the seven attentional task scores were compared using Fisher r-to-z transformations. Finally, the deficit and negative syndrome scores were entered into a hierarchical regression on each of the seven attentional tasks, to examine the individual syndromes’ contributions to performance on each task. For each regression, the attentional task performance score was the dependent variable. The deficit syndrome score was entered in step one, followed by the negative syndrome score in the second step. Conceptually speaking, the second step of the regression tested for additional contributions of secondary negative symptoms on test performance.

Results

Levels of significance reported are 2-tailed for all comparisons. Means and standard deviations (SDs) were calculated for the deficit (mean = -2.41, SD = 3.24) and negative (mean = 2.33, SD = 1.91) syndromes, and the psychosis scores (mean = 5.74, SD = 4.00). To compensate for an overly platykurtic distribution (skurtosis value > 2.0), the Trails A and B scores were logarithmically transformed. Scores for the CPT-A test were trichotomized to compensate for a ceiling effect (skew > 2.0). The digit span and DSCPT scores were multiplied by a factor of -1 for purposes of presentation, so that increasing scores for all of the neuropsychological tests would represent worse performance.

Syndrome and Symptom Scores, Demographics, and Psychosocial Functioning. Deficit and negative syndrome scores were not significantly related to age, gender, ethnicity, level of education, or Shipley estimated IQ scores. Deficit scores were essentially unrelated to GAF scores (r[39] = -0.09, nonsignificant [ns]) but were significantly, inversely correlated with total BPRS symptom severity scores (r[39] = -0.55, p < 0.001) and psychosis scores (r[39] = -0.40, p < 0.05). Conversely, negative syndrome scores were not significantly related to psychosis scores (r[39] = 0.09, ns) but were positively correlated with total BPRS symptom severity scores (r[39] = 0.35, p < 0.05) and inversely related to GAF scores (r[39] = -0.49, p < 0.01). These results suggest that the deficit syndrome severity scores were associated with lower psychosis severity scores and a lower severity of total psychiatric symptomatology. Negative syndrome severity scores were associated with a lower level of global functioning and higher severity of total psychiatric symptomatology. While the deficit syndrome group did have significantly higher levels of negative symptom scores as compared to the nondeficit group (r[25] = 2.59, p < 0.05), the negative and deficit scores were not significantly correlated with each other (r[39] = 0.22, ns), supporting the idea that the two syndromes are substantially different.

Syndrome Scores and Test Performance. Bivariate correlations between syndrome scores and neuropsychological test performance are presented in table 1. Two of the seven attentional task scores demonstrated significant associations with the deficit syndrome scores. These were the digit distraction (p < 0.01) and the Trails B scores (p < 0.05). Contrary to expectation, scores on the DSCPT were not significantly related to deficit scores. As expected, the digit span, Trails A, WCST, and CPT-A scores were not significantly correlated with deficit syndrome scores. The negative syndrome scores were not significantly related to the digit distraction task, Trails A, DSCPT, or digit span scores but were related to the CPT-A (p < 0.05), Trails B (p < 0.10, trend), and WCST (p = 0.10, trend) scores.

The correlations between the deficit syndrome and attentional task performance and those between the negative syndrome and attentional task performance were then compared using the Fisher r-to-z test (table 1). It is worth noting that the present study was probably underpowered for such an analysis. Nonetheless, differences at the trend level were observed between the deficit and negative syndromes in their respective correlations to the digit distraction, Trails A, digit span, WCST, and CPT-A tasks. There were no appreciable differences between the deficit and negative syndromes in performance on the DSCPT or Trails B. Overall, the negative and deficit syndromes differed in their respective associations with attentional impairment at a trend level of significance on five of the seven tests.

When participants were divided into deficit and nondeficit groups, the deficit syndrome group performed significantly more poorly than the nondeficit group on the digit distraction (t[24] = 2.67, p = 0.01) and Trails B (t[23] = 3.18, p < 0.01) tasks, and at a trend level on the Trails A (t[24] = 1.72, p < 0.10) task. The deficit and nondeficit groups did not differ significantly with respect to the digit span, WCST, or CPT-A scores.

As previously noted, deficit scores were inversely correlated with severity of psychosis. To determine whether the psychosis scores were significantly influencing the correlations between deficit syndrome scores and performance on the neuropsychological tasks, partial correlations were computed. When severity of psychosis was controlled, the correlations of deficit syndrome scores with digit distraction (r[34] = 0.48, p < 0.01) and Trails B (r[34] = 0.56, p < 0.001) scores changed only slightly. The deficit syndrome scores still were not significantly related to the DSCPT, WCST, digit span, or CPT-A scores but were significantly related to Trails A (r[35] =
Table 1. Means and SDs for attentional measures, bivariate correlations of attentional impairment and syndrome scores, and comparison of deficit versus negative syndrome scores in their associations with attentional impairment

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean ± SD</th>
<th>n</th>
<th>Deficit</th>
<th>Negative</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCPT¹</td>
<td>-0.87 ± 0.12</td>
<td>38</td>
<td>0.03</td>
<td>-0.05</td>
<td>0.95</td>
</tr>
<tr>
<td>Digit distraction²</td>
<td>0.08 ±0.18</td>
<td>34</td>
<td>0.47**</td>
<td>0.14</td>
<td>0.09+</td>
</tr>
<tr>
<td>Trails A³</td>
<td>1.26 ± 0.27</td>
<td>38</td>
<td>0.23</td>
<td>-0.13</td>
<td>0.08+</td>
</tr>
<tr>
<td>Trails B³</td>
<td>1.99 ± 0.27</td>
<td>37</td>
<td>0.37*</td>
<td>0.29+</td>
<td>0.69</td>
</tr>
<tr>
<td>Digit span⁴</td>
<td>-0.83 ± 0.21</td>
<td>38</td>
<td>-0.12</td>
<td>0.26</td>
<td>0.07</td>
</tr>
<tr>
<td>WCST⁵</td>
<td>70 ± 23</td>
<td>37</td>
<td>-0.05</td>
<td>0.34+</td>
<td>0.05+</td>
</tr>
<tr>
<td>CPT-A⁶</td>
<td>1.81 ± 83</td>
<td>32</td>
<td>0.05</td>
<td>0.41*</td>
<td>0.07+</td>
</tr>
</tbody>
</table>

Note.—CPT-A = auditory Continuous Performance Test; DSCPT = Degraded Stimulus Continuous Performance Test; SD = standard deviation; WCST = Wisconsin Card Sorting Test.

¹ Sensitivity (A') (reversed).
² Percent correct in nondistraction condition minus percent correct in distraction condition.
³ Seconds to completion (scores were log transformed).
⁴ Percent correct (reversed).
⁵ Trails to completion.
⁶ Errors of omission (scores were trichotomized).

0.34, p < 0.05) scores. Partial correlations were also used to determine whether differences in global level of functioning were contributing to the correlations between the negative syndrome scores and performance on the neuropsychological tasks. When GAF was controlled, the negative syndrome scores were related to the Trails A (r[35] = -0.32, p < 0.10) and CPT–A (r[35] = 0.31, p < 0.10) task scores at the trend level and were not significantly related to the digit span, digit distraction, Trails B, or WCST task scores.

Partial correlations were also calculated between the deficit and negative syndrome severity scores and the attentional tasks, controlling for Shipley estimated IQ scores. The deficit syndrome severity scores still were significantly associated with impairment on the digit distraction (r[31] = 0.46, p < 0.01) task and at a trend level with Trails B (r[31] = 0.31, p < 0.10) scores. The negative syndrome scores still were associated with impairment on the CPT–A scores (r[31] = 0.38, p < 0.05) and at a trend level with WCST scores (r[28] = 0.33, p < 0.10). These findings suggest that differences in severity of psychosis, global impairment of functioning, and verbal IQ scores were not significant influences on the relationships between deficit syndrome scores and neuropsychological task performance.

Independent Contributions of Negative and Deficit Syndrome Scores to Test Impairment. Hierarchical regressions were performed to examine the individual contributions of the deficit and negative syndromes to test performance. For each attentional test score, the deficit scores were entered first, followed by the negative syndrome scores. Table 2 contains the results of the regressions.

As noted in the bivariate correlations, the deficit scores explained a significant portion of the variance on the digit distraction and Trails B tasks but not on the DSCPT or any of the other tests. In step 2, the negative syndrome scores did not contribute significantly to the variance of the DSCPT, digit distraction, Trails A, or Trails B tasks beyond the effects of the deficit syndrome. The digit span, WCST, and CPT–A scores did take significant contributions from the negative syndrome scores beyond any effects of the deficit scores.

Each of the seven regressions was then recomputed in reverse order, so that the negative syndrome severity scores were entered in the first step and the deficit syndrome scores in the second step. This analysis examined the issue of specificity—that is, whether attentional impairment was significantly associated with deficit syndrome severity scores beyond the contribution made by...
Table 2. Hierarchical regression of syndrome scores on attentional measures

<table>
<thead>
<tr>
<th>Attentional measures</th>
<th>Step 1: Deficit syndrome scores</th>
<th>Step 2: Negative syndrome scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DSCPT</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td>F change 0.03</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.00</td>
</tr>
<tr>
<td>(df = 2,30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Digit distraction</strong>&lt;sup&gt;2&lt;/sup&gt;</td>
<td>F change 9.70**</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.22</td>
</tr>
<tr>
<td>(df = 2,34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trails A</strong>&lt;sup&gt;3&lt;/sup&gt;</td>
<td>F change 1.97</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.05</td>
</tr>
<tr>
<td>(df = 2,34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trails B</strong>&lt;sup&gt;3&lt;/sup&gt;</td>
<td>F change 5.42*</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.13</td>
</tr>
<tr>
<td>(df = 2,34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Digit span</strong>&lt;sup&gt;4&lt;/sup&gt;</td>
<td>F change 0.55</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.02</td>
</tr>
<tr>
<td>(df = 2,34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WCST</strong>&lt;sup&gt;5&lt;/sup&gt;</td>
<td>F change 0.08</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.00</td>
</tr>
<tr>
<td>(df = 2,28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CPT–A</strong>&lt;sup&gt;6&lt;/sup&gt;</td>
<td>F change 0.08</td>
<td>R&lt;sup&gt;2&lt;/sup&gt; change 0.00</td>
</tr>
<tr>
<td>(df = 2,35)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. — CPT–A = auditory Continuous Performance Test; DSCPT = Degraded Stimulus Continuous Performance Test; SD = standard deviation; WCST = Wisconsin Card Sorting Test.

1 Sensitivity (A') (reversed).
2 Percent correct in nondistraction condition minus percent correct in distraction condition.
3 Seconds to completion (scores were log transformed).
4 Percent correct (reversed).
5 Trials to completion.
6 Errors of omission (scores were trichotomized).
+ p < 0.10; * p < 0.05; ** p < 0.01

the negative syndrome severity scores. The deficit syndrome scores contributed to the variance in the digit distraction scores (F change [1,34] = 8.7, p < 0.01) and showed a trend-level contribution to Trails B scores as well (F change [1,34] = 3.8, p < 0.10). Deficit scores did not contribute significant levels of additional variance to any of the other attentional task scores. Thus, deficit syndrome scores showed some level of specificity to digit distraction and the Trails B task impairment, inasmuch as deficit syndrome scores contributed at least a trend-level significance to impairment on the digit distraction and Trails B tasks beyond that of the negative syndrome scores. Moreover, these results support the idea that, although there does appear to be overlap between the deficit and negative constructs, there are differences between the two and the deficit syndrome is not simply a variant of the negative syndrome. In effect, there are facets of the deficit syndrome that are not included in the negative syndrome.

Discussion

In summary, deficit syndrome severity scores were related to impairment on the Trails B and digit distraction tasks and not to impairment on the DSCPT, CPT–A, Trails A, digit span, or WCST tasks. Similarly, when participants were classified into deficit and nondeficit syndrome groups, the deficit syndrome subjects performed significantly worse on the Trails B and digit distraction tasks but not on the other measures of attention. Conversely, negative syndrome scores were related, at a trend level or
higher, to impairment on the Trails B, WCST, and CPT-A tasks but not on the digit distraction, digit span, or DSCPT tasks.

Generally speaking, these results offer support for the idea that the deficit syndrome is characterized by impairments on certain kinds of attentional tests and not others. However, it is somewhat premature to attempt to operationalize what this impaired neuropsychological process might be based on the present findings, particularly because the Trails B and digit distraction tasks were only moderately correlated with each other ($r = 0.27$, $p = 0.11$). Buchanan et al. (1994, 1997) have suggested that these impairments may involve the ability to allocate and activate attention, and focus on target stimuli while simultaneously ignoring irrelevant information. However, more research will be required to fully characterize these attentional impairments and to elucidate their neuroanatomical correlates. More important, this is the first study to directly compare the negative and deficit syndromes in their relationships to performance on tests of attention.

Our findings support the idea that the negative and deficit syndromes are substantially different from each other. First, although subjects with the deficit syndrome had significantly higher levels of negative symptomatology compared to the nondeficit group, the correlation between the negative and deficit syndrome scores was surprisingly low. Second, we found that the negative and deficit syndromes were associated with different patterns of neuropsychological impairment. In the present study, the deficit and negative syndromes differed in their associations with attentional impairment on five of the seven tasks at a trend level. Moreover, these differences remained when differences in psychosis severity and IQ were controlled. More broadly stated, differences between the negative and deficit syndrome definitions may help to explain some of the inconsistency of findings from previous studies that have explored syndrome-specific neuropsychological impairment.

Contrary to our expectations, we found no relationship between DSCPT performance and either of the syndrome scores, despite the fact that previous investigations have related DSCPT impairment to both the negative (Nuechterlein et al. 1986) and the deficit (Buchanan et al. 1997) syndromes. There were no notable outliers in our sample and no obvious differences in testing format or sample characteristics between the previous examinations and our study. Therefore, the reasons for this inconsistency in findings are not clear.

Several limitations warrant mention. First, the subjects were medicated. There were no apparent substantive effects of medications on our results, but of course medications were not randomly assigned, so the present study was unable to effectively examine the possible effects of medications on neuropsychological performance. It is important to note that, in the present study, subjects who were taking anticholinergic medication tended to have more severe deficit symptomatology ($r = -2.069$, $p = 0.05$). However, subjects who were prescribed anticholinergics versus those not prescribed them did not differ in their performance on the digit distraction, Trails B, or DSCPT tasks. Second, it is not optimal to use cross-sectional data to measure enduring negative symptoms, even though the PDS has been shown to be highly correlated with a longitudinal measure of the deficit syndrome (Kirkpatrick et al. 1993). In addition, the PDS operationally defines diminished emotional range using only the negative emotions measured by the BPRS: anxiety, depression, guilt, and hostility. Nonetheless, despite the limitations of the PDS, we were able to replicate and extend previous findings on the deficit syndrome as measured longitudinally. Finally, some of the analyses in the present study were underpowered.

Like previous researchers, we found that the negative and positive syndrome severity scores were not significantly related to each other. However, there was a significant inverse correlation between the deficit and positive syndromes scores, suggesting that positive symptoms were less severe in people with the deficit syndrome. This has been found in some previous studies (Kirkpatrick et al. 1993; Buchanan et al. 1994) but not others (Buchanan et al. 1997). It is worth noting that the PDS, the deficit syndrome measure used in the present study, is based exclusively on two deficit symptoms, blunted affect and a diminished level of emotionality. Thus, the present findings suggest that subjects who appeared flat and were not evidencing or reporting anxiety, depression, guilt, or hostility tended to experience less severe psychosis as compared to other subjects. It is presently unclear why deficit and psychotic symptoms might be linked in this manner. Psychotic symptoms tend to be emotionally charged. One possibility is that a diminished capacity to experience emotions also reflects a diminished capacity to experience emotion-driven psychotic symptoms. Alternatively, certain deficit symptoms may reflect a dissociation from emotion, or a defense mechanism designed to decrease the impact of potentially distressing positive symptoms. However, it is important to note that the positive symptom severity scores used in the present study do not permit an investigation of the exact nature of the differences in deficit versus nondeficit subjects, because frequency, intensity, and preoccupation with symptoms are all taken into account when assigning positive symptom scores using the BPRS. This issue must be left for future research.
Conclusions

The present findings support the idea that the deficit syndrome is associated with certain kinds of attentional impairments but not others. These results also contribute to the construct validity of the deficit syndrome as a separate process or syndrome within schizophrenia and support the idea that the deficit syndrome has at least some significant differences in underlying neuropsychological processes from its historical precursor, the negative syndrome.

References


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