Measuring the Psychological Construct of Control

Discriminant, Divergent, and Incremental Validity of the Shapiro Control Inventory and Rotter's and Wallston's Locus of Control Scales

Deane H. Shapiro, Jr., Ph.D, Steven G. Potkin, M.D., Yi Jin, M.D.,
Bo Brown, M.D. Daniel Carreon, M.D., and Jack Wu

The psychological construct of control is increasingly thought to be an important variable in psychosomatic medicine, but there are limitations with how it has been measured by previous instruments. The current study details four limitations of previous instruments as a rationale for developing a new multi-faceted, multi-dimensional instrument to measure control, the Shapiro Control Inventory (SCI). Discriminant, divergent, and incremental validity of the SCI is compared with the Rotter's Internal/External Locus of Control Scale and Wallston's Multidimensional Health Locus of Control Scales on five groups, one normal and four clinical groups (depression, generalized anxiety disorder, borderline personality, and panic disorder). Analysis of variance showed significant differences among populations on each of the nine SCI scales. The majority of these results were highly significant, whereas for Rotter's scale the results were barely significant, and for Wallston's three scales, not at all significant. Correlations of the SCI scales with Rotter's and Wallston's scales were small to moderate, but in no case explained more than 15% of the variance. The SCI also provided incremental validity over Rotter's and Wallston's scales both for sensitivity (clinical versus normal) and specificity (between clinical groups). The discussion section provides suggestions for future research.

MEASURING THE PSYCHOLOGICAL
CONSTRUCT OF CONTROL

The psychological construct of control has been shown to be an important variable in both physical and mental health (1). As such, control may serve as one of the more important links between "mind-body" health. The task with which clinicians and researchers are faced is to ensure that the way we assess and measure the construct of control is as accurate as possible. Over the past decades, the locus of control scales developed by Rotter (2) and the Wallston (3,4) have yielded important contributions to our understanding of the construct of control. However, research during the past two decades has revealed that control is a molar, multi-faceted construct, of which locus of control is only one aspect. To reflect changes and developments in our understanding of control, a multi-faceted, multi-domain instrument, the Shapiro Control Inventory (SCI) has been developed over the past decade to address four areas not measured by Rotter's and Wallston's scales.

First, neither Rotter's nor Wallston's scales gave an indication about whether or not the person felt a "sense of control" in their life. A distinction has now been made between generalized control expectancies (internal/external locus of control) as first identified by Rotter (1,5) and individual control beliefs as detailed by Bandura's self-efficacy theory (6-8). Control is defined as "the ability to cause an effect in the intended direction" (1) and sense of control, as used in this inventory, is a measure of a person's view that they have
control, as well as the belief that they can gain control if they wished. The SCI measures general domain sense of control through three scales: a positive sense of control scale; a negative sense of control scale; and an overall general domain sense of control scale formed from combining the two.

Second, research has shown the importance and higher validity of domain specific data (9, 10). Rotter's scale is only general domain, and Wallstons' scales are only domain specific in one area: health. The current inventory, in addition to assessing sense of control through the above general domain scales, also has a scale assessing sense of control on twenty-five parameters. This domain specific sense of control scale assesses control in the areas of body (parameters such as eating behavior, physical exercise); mind (thoughts, attention, as well as sadness, stress); interpersonal relations (friends, significant other, family of origin); career (employment situation, work habits); self; environment; and other (alcohol consumption; drug usage; gambling; violent behavior).

Third, research suggests that there are two basic modes by which individuals gain a sense of control. One mode involves active, instrumental efforts to influence or change a situation (or oneself). This has been referred to by various researchers as mastery model (11) problem-focused instrumental coping (12), situational reconstruction (13), primary control (14). A second mode involves learning to accept the situation (or oneself) as is. This has been referred to by various researchers as a coping model (15,16), secondary control, (14) palliative coping, (12) compensatory self-improvement (13). Rotter's and Wallstons' tests have an implicit cultural bias in understanding control, and assume that if one does not have active control, one is either resigned or helpless. Even the terms used above suggest an implicit, if not explicit cultural bias (e.g., mastery versus coping; instrumental versus palliative; primary versus secondary. As previously noted (1 5p. 260), equating control with active efforts to alter or change, or to use restraint to refrain from altering or interfering may reflect a limiting, culture-bound definition. Other cultures conceptualize control in terms of yielding, accepting, and letting go of active control. More of a sense of control may be gained from letting go of control (acceptance) than continuing efforts to try to change that over which we do not have active control.

Therefore, the SCI has scales to measure both an active assertive mode of control and a yielding, accepting mode of control, as well as scales to measure overcontrol (negative assertive mode) and too little control (negative yielding mode), thereby providing four different modes of control quadrants (scales 5 to 8). Fourth, neither Rotter's nor Wallstons' scales involve a motivational variable of desire or effort for control. Desire for control has been distinguished from locus of control (17). The SCI contains a desire for control scale, scale nine, which like Burger's, includes desire for control over the environment, but also includes desire for control over the self, i.e., self-control.

### Goals and Rationale for the Current Study

The current study attempted to extend programmatic research on the SCI in three ways: discriminant validity, divergent validity, and incremental validity.

**Objective One**, discriminant validity, sought to determine whether the SCI's, Rotter's, and Wallstons' scales could significantly discriminate among five groups (a normal and four clinical populations). Previous research has indicated that there are several clinical areas in which an impairment of control may be one of the central features: depression (18-19); stress and anxiety related disorders (20-21). Research has shown that a sense of control is associated with positive psychological health (7, 22) and positive physical health (7); and fear, loss, and lack of control is associated with psychopathology (23).

Based on the above findings about the relationship of control to positive health and psychopathology, it was hypothesized that the three measures used here would be able to discriminate differences among groups overall, and in particular between normals and different clinical groups. Objective one is an essential and critical step, for unless we can find a way to assess and discriminate control between normals and clinical populations, there is no need to further proceed with the study's objectives.

The main hypotheses for objective one state that on all nine SCI scales, as well as Rotter's Internal/External Locus of Control Scales and Wallstons' Multidimensional Health Locus of Control Scales, there will be significant differences among groups.

**Objective Two**, divergent validity, involved correlating the SCI scales with Rotter's and Wallstons' scales to determine whether, and to what extent, there were differences and overlap between instruments. If objec-

<table>
<thead>
<tr>
<th>Table 1. Four Quadrant Mode Of Control</th>
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<tbody>
<tr>
<td><strong>Quadrant One</strong></td>
</tr>
<tr>
<td>Active Control</td>
</tr>
<tr>
<td>Positive Assertive</td>
</tr>
<tr>
<td><strong>Quadrant Two</strong></td>
</tr>
<tr>
<td>Letting-go Control</td>
</tr>
<tr>
<td>Positive Yielding</td>
</tr>
<tr>
<td>Accepting</td>
</tr>
<tr>
<td><strong>Quadrant Three</strong></td>
</tr>
<tr>
<td>Over-Control</td>
</tr>
<tr>
<td>Negative assertive</td>
</tr>
<tr>
<td><strong>Quadrant Four</strong></td>
</tr>
<tr>
<td>Too Little control</td>
</tr>
<tr>
<td>Negative Yielding</td>
</tr>
</tbody>
</table>

(From Shapiro, 1982)
tive one is met, and all instruments can successfully discriminate among groups, it is necessary to show that the SCI is different from the other two measures of control. If the SCI is exactly the same, then there is no rationale for the development of a new instrument.

The main hypothesis for objective two is based on the belief that the SCI measures aspects of control that neither the Rotter nor Wallston are measuring. Since with a large N (100), even a small correlation, such as .25 is significant at the p=.01 level, it was decided not to use statistical significance as the criterion, but rather to use the .60 figure cited by Cronbach (24) as the clinically significant correlational criterion between tests. Therefore, this hypothesis states that no scale of the SCI will be correlated with either the Rotter or Wallston Scales at .60 or above.

Objective Three, incremental validity, involves asking what advantage there is to the SCI over and above base rate predictions provided by Rotter's and Wallston's scales. This is also a critical objective, for even if all the tests can discriminate among groups (discriminant validity), and even if the SCI scales are different from Rotter's and Wallston's scales (divergent validity), the question must be asked, why is that important. This incremental validity involved comparing the sensitivity and specificity of the three control assessment instruments in distinguishing normals from clinical disorders (sensitivity) and in distinguishing between clinical groups (specificity).

Note. It should be noted that additional specific comparisons of between group clinical profiles go beyond the scope of this paper and have been detailed elsewhere (25). Those comparisons will, however, be briefly highlighted in the discussion section.

METHOD

Setting

Subjects were individuals recruited as part of the second author's ongoing research programs at the University of California Irvine Medical Center with clinical populations of depression (N=50); generalized anxiety disorder (N=16); panic disorder (N=48); and borderline personality (N=39). Clinical subjects were recruited in three ways: 1) referrals from the outpatient clinic at UCIMC; 2) referrals from the Orange County Mental Health Facility; and 3) ads on TV and in the newspaper The Orange County Register. Normal subjects (N=14) were recruited from a variety of sources, including a previously established list of normal control volunteers who had participated in past research; as well as medical center employees who agreed to participate. The sex ratio of 35.7% male and 64.3% female as well as the mean age, 39.1, were selected to approximate the averages of the sex ratio and ages of the other four groups. There were no significant differences among the five groups on age, marital status, number of children, and religion; and the normal group was not significantly different from the other four clinical groups on the variables of sex and ethnicity.

Subject Criteria for Inclusion.

The following were the criteria established for inclusion of the respective subject populations. DSM III-R diagnostic determinations were made using two criteria. One criteria was a complete psychiatric history, including information on previous episodes of psychiatric illness, family psychiatric history, and past patient psychiatric history conducted by a psychiatrist. Based on structured psychiatric interview, the results of the psychiatric history and mental status examination were used to formulate the diagnosis in accordance with DSM III-R criteria. A second criterion, to ensure reliability of diagnosis, was the use of established psychometric tests with each population, as detailed below.

MAJOR DEPRESSION

There were 50 subjects in this group, mean age 34.3, 40% male and 60% female. Subjects were males and post menopausal females age 18-65, non-hospitalized, meeting a) DSM III-R major depression criteria (single moderate; 296.22; single severe without psychotic features 296.23; recurrent moderate, 296.32; recurrent severe without psychotic features 296.33); b) a total score of nine or greater on the Raskin Depression Scale and seven or less on the Covi Anxiety Scale; and c) a minimum total score of 18 or greater on the Hamilton Depression Rating Scale. These additional tests were utilized in order to determine that the depressed patients did not also suffer from anxiety disorders, and thereby directly addresses the issue of co-morbidity.

BORDERLINE PERSONALITY

There were thirty-nine subjects in this group, mean age 34.5, 20.5% male, 79.5% female. Subjects were outpatients, age 18 to 65, without active suicidal ideation, with no history of epilepsy or seizures; who had not experienced a schizophrenic, bipolar, or obsessive compulsive disorder; and who, based on individual structured interviews, met five of the eight DSM III-R criteria for BPD. In addition, all borderline subjects were given the Schedule for Interviewing Borderlines (26).

Those individuals with a prior history of major depression were excluded from the study. However, because of the high fluctuation of mood of borderline patients, subjects who were admitted to the study were given the Hamilton Anxiety and Depression Scales as a way to assess the extent of co-morbidity.
PANIC DISORDER

There were 48 subjects in this group, mean age 35.8, 16.7% male, 83.3% female. Individuals were outpatients, age 18 to 65, with a severity of panic disorder that did not prevent them from attending the clinic, even if accompanied. Subjects were required to meet DSM III-R diagnostic criteria for frequency, unexpectedness, and four of the thirteen symptoms. Determination was made by structured interview, and the keeping of a Daily Panic Attack Inventory. Subjects with any history of other psychiatric illness were excluded. A final criteria for subjects in this group was that it could not be established that an organic factor initiated and maintained the disturbance.

GENERALIZED ANXIETY DISORDER

There were sixteen subjects in this group, mean age 38.9 years, 62.5% male, 37.5% female. Subjects were males or post menopausal females, 18-64 years old, with no alcohol or drug abuse or any medically unstable illness, or suicide attempts in the past year. Subjects were required to meet DSM III-R diagnostic criteria, and in addition, needed a Hamilton Anxiety Scale total of 18 or more; a Covi Anxiety Scale of 9 or more; a Covi Anxiety scale score greater than the Raskin Depression Scale score; and with fewer than one per week episodes of anxiety associated with panic attacks. The latter criteria ensured the subjects had GAD and not depression or panic attack.

NORMALS

As noted, there were fourteen normals, mean age 39.1, 35.7% male and 64.3% female. Normals were screened by a fifteen question Normal Screening Assessment. This assessment addressed whether the individual or his/her family had or currently has any evidence of psychiatric symptomatology: major mental or physical illness in the past year; as well as whether the individuals or "your parents or siblings have ever had any major illnesses in the past or recently." It also assessed whether the individual has or had any problem with alcohol; prescribed or non-prescribed drug usage; or whether the person either now or in the past had heard things; had problems thinking clearly; felt there were "people following you;" had a "fear of hurting yourself;" or any symptoms of obsessive compulsive disorder. Finally there was a screening for past episodes of depression, manic-depression, and/or anxiety.

Test Instruments

Wallston's Multidimensional Health Locus of Control Scales. Wallston's first version of a Health Locus of Control Scale was constructed similarly to Rotter's (forced choice, yielding one score for internal-external). There were two differences: questions were asked in a personal rather than a general manner; and the scale was domain-specific (health) rather than general domain, like Rotter's.

However, based on the work of Levinson and others (27-28), it was shown that internal and external were not one dimension; but rather that the two dimensions may be thought of as orthogonal, showing a zero correlation with each other. Because of this, the Wallston and colleagues (4) developed a "second generation" test, the Multidimensional Health Locus of Control Scales. This instrument provided for both an internal and an external score. Further, external locus of control was divided into chance (randomness, luck) and powerful other (and the inventory was changed from forced choice to a Likert scale). These three control factors (internal, external powerful other, external chance) are each measured by six items with a six point Likert-like format.

Because the Rotter's Internal External Locus of Control and Wallston's Multidimensional Health Locus of Control Scales are common and standard tests in the psychological literature, they will not be further discussed here.

The Shapiro Control Inventory, a nine-scale, 187 item paper-and-pencil questionnaire, is designed to provide a multifaceted general domain and domain specific control profile of an individual.

There are four sense of control scales: 1) an overall 7 point Likert format general domain sense of control scale which is formed from a 2) positive sense of control scale; and a 3) negative sense of control scale. The positive sense of control scale consists of 11 items measuring perceived self-efficacy; ability to set meaningful goals; skills to carry out the goals; appropriate level of self-control. The negative sense of control scale consists of 5 items measuring loss of control, lack of control, feeling others control you too much. The fourth sense of control scale is the 4) specific domain sense of control scale. This scale is based on a six point Likert-type rating from very out of control to very in control for twenty-five parameters, grouped into seven areas.

There are also four mode of control scales. The mode of control inventory consists of 49 words reflecting four different quadrants: positive assertive, positive yielding, negative assertive, negative yielding. Positive psychological health is defined as having high scores on quadrants one and two, and low scores on quadrants three and four (22,29-30). Subjects describe themselves on a four point Likert-type scale (describes me not well at all to describes me exceedingly well). 5)
Quadrant one (positive assertive) mode of control scale measures an individual's self-description in terms of ability to alter the environment, others, and oneself, and includes words like "decisive," of "communicating needs," "leading." 6) Quadrant two (positive yielding) mode of control scale involves knowing when a sense of control needs to come from letting go, trusting, and accepting, and words include "patient," "trusting," "accepting." 7) Quadrant three (negative assertive) mode of control scale involves too much active control and words include "manipulating," "overcontrolling," "dogmatic." 8) Quadrant four (negative yielding) involves too little control, and words include "indecisive," "manipulated," "timid."

The final scale (9) is a desire for control scale. The desire for control scale contains eleven items including desire to control self, desire to control other; the importance of the appearance of being in control; the fear of losing control.

Reliability Studies

As can be seen from Table Two, previous research with the inventory shows quite adequate internal scale consistency and scale stability. The items for the sense of control and desire for control scales were both theoretically and clinically derived (31), and then empirically verified. For the mode of control scales, a pool of several hundred words were generated by mental health professionals reflective of the four quadrants. Only words which had a minimum of 83.3% agreement among six experts were included. These experts included one man and one woman in each of the three fields of health psychology/Type A behavior; sex role psychology; and East/West psychology (32). Factor analytic studies with these words, were then undertaken (33) which gave additional psychometric support for the discreteness of the four quadrants.

Validity Studies

The first pilot tests of the nine-scale SCI were done with two populations for whom control was hypothesized to be an important variable. One was an at risk population, adult children of alcoholics (34); and the other study was with a DSM III-R population, eating disorder patients (anorexia nervosa and bulimia nervosa) (35). Both studies showed discriminant validity; that the scales of the SCI significantly differentiated the populations from age and sex matched normal comparison groups.

Two further studies have also been undertaken using a content analysis version of the SCI. The first study was an effort to help determine construct validity. In this study, verbal samples of initial outpatient psychiatric patient interviews were coded based on the above scales. Patients included affective disorders (major depression, bipolar disorder; dysthymic disorder); anxiety disorders (generalized anxiety disorder and adjustment reactions); psychosexual disorder (exhibitionism); and substance abuse disorder. Results showed, as expected, significantly more statements reflecting loss and lack of control than positive sense of control and belief one could gain a sense of control. Further, the sense of control and mode of control 36-37 constructs were correlated with Gottschalk and Glezer's anger and hostility content analysis scales. Sense of control was significantly correlated inversely with hostility inward and anxiety; loss of control was correlated with perceiving hostility from others; a combined positive assertive mode and positive yielding mode of control was inversely correlated with anxiety and with overt hostility (23,38).

A second study sought to begin to determine neurobiological correlates of the psychological construct of control by noting specific areas of the brain that increase or decrease cerebral glucose metabolism depending upon the subject's mentionation. Normal male subjects were injected with 18 F-D-deoxyglucose during REM sleep, and awakened approximately one-half hour later to report their dreams. The control content analysis coding was used to code verbal reports of these dreams which were then correlated with localized cerebral glucose metabolic rates obtained from PET (Positron Emission Tomography) scores. Data showed that having a sense of control was positively correlated with brain regions of the medial cortex, basal ganglia, and right thalamus; and negatively correlated with the limbic system, especially the right amygdala. Conversely, losing control was positively correlated with

**Table 2: Reliability**

<table>
<thead>
<tr>
<th></th>
<th>Alpha</th>
<th>Test-Retest (Five Week)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sense Of Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Domain</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Overall Sense Of Control</td>
<td>.89</td>
<td>R=.83</td>
</tr>
<tr>
<td>2. Positive Sense Of Control</td>
<td>.89</td>
<td>R=.81</td>
</tr>
<tr>
<td>3. Negative Sense Of Control</td>
<td>.70</td>
<td>R=.70</td>
</tr>
<tr>
<td><strong>Specific Domain</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Overall Domain Specific</td>
<td>.75</td>
<td>R=.93</td>
</tr>
<tr>
<td><strong>Four Quadrant Mode Of Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Quadrant One; Positive Assertive</td>
<td>.88</td>
<td>R=.80</td>
</tr>
<tr>
<td>6. Quadrant Two; Positive Yielding</td>
<td>.77</td>
<td>R=.67</td>
</tr>
<tr>
<td>7. Quadrant Three; Negative Assertive</td>
<td>.82</td>
<td>R=.78</td>
</tr>
<tr>
<td>8. Quadrant Four; Negative Yielding</td>
<td>.70</td>
<td>R=.84</td>
</tr>
<tr>
<td><strong>Desire For Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Overall Desire For Control</td>
<td>.76</td>
<td>R=.82</td>
</tr>
</tbody>
</table>

(From Shapiro, 1993)
the limbic system overall and the cingulate. These scores showed internal consistency with each other (39).

The mode of control aspect of the inventory, after initial rater reliability studies (32) was given to over two thousand individuals in eleven U.S. cities, and its relationship with psychological health and social desirability was examined (30). Further, in preliminary clinical case studies, the four modes were shown to differentiate different types of stress and anxiety patients on entering treatment, and to show differential and appropriate movement at post test on the four modes in the direction of psychological health; increases in quadrants one and two, and decreases in quadrants three and four (21). The four quadrant modes of the SCI were also given to individuals in two contrast groups to establish discriminant group validity: Type A individuals with one myocardial infarction (40); and long term meditators (41). As expected, the Type A group was significantly higher on quadrant three, overcontrol, and the meditation group significantly higher on quadrant two, positive yielding. The Type A study also had a cognitive behavioral intervention component which showed that after two years, as a result of counseling, individuals can increase their scores on both positive assertive and positive yielding modes of control.

SCI Scale Intercorrelations

Table Three presents an intercorrelation of the nine SCI scales, taken from a normal comparison group of college students used in a previous study (35). As can be seen from Table Three, correlations between the overall sense of control scale, and the two scales from which it is constructed, the positive and negative sense of control scales, is, as would be expected, quite high. Other than that obvious high correlation, the SCI scales show a small to moderate intercorrelation with each other. Because of the relative independence of the scales, analyses in this study are run for all nine scales.

RESULTS

Objective One: Discriminant Validity

As can be seen from Table Four, analysis of variance revealed that all nine of the SCI scales were able to significantly differentiate among groups. For the 1) overall control scale F(4,152)=11.07; p<.0001; 2) for the positive sense of control scale, F(4,152)= 8.72; p<.0001; for the 3) negative sense of control scale, F(4,152)=8.35; P<.0001; 4) for the domain specific overall scale F(4,119)=7.14; P<.0001; 5) for the positive assertive, (quadrant one) mode of control F(4,165)=8.27; p<.0001;6) for positive yielding (quadrant two) F(4,165)=4.72; p<.0001; 7) negative assertive/overcontrol (quadrant three) F(4,165)=6.81; p<.0001; 8) negative yielding/too little control (quadrant four) F(4,165)=5.41; P=.0004; and 9) desire for control, F(4,152)=3.78; p=.06.

Rotter's Internal/External Locus of Control scale
### Table Four
Control Scales: Sci, Rotter, Wallstons

<table>
<thead>
<tr>
<th>Groups:</th>
<th>Normal</th>
<th>Border Line</th>
<th>Depression</th>
<th>Panic Attack</th>
<th>Generalized Anxiety</th>
<th>Overall p</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCI General Domain Sense of Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Overall Sense Of Control</td>
<td>5.59 (SD: 0.44)</td>
<td>3.92 (SD: 0.69)</td>
<td>3.98 (SD: 0.98)</td>
<td>4.22 (SD: 0.83)</td>
<td>4.43 (SD: 0.92)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>2) Positive Scale</td>
<td>5.68 (SD: 0.45)</td>
<td>4.00 (SD: 0.81)</td>
<td>3.98 (SD: 1.17)</td>
<td>4.17 (SD: 0.96)</td>
<td>4.47 (SD: 1.03)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>3) Negative Scale</td>
<td>2.60 (SD: 0.57)</td>
<td>4.27 (SD: 1.02)</td>
<td>4.04 (SD: 0.88)</td>
<td>3.73 (SD: 0.94)</td>
<td>3.61 (SD: 1.09)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sci Specific Domain Sense of Control</td>
<td>5.15 (SD: 0.46)</td>
<td>3.79 (SD: 0.58)</td>
<td>3.69 (SD: 0.76)</td>
<td>3.90 (SD: 0.88)</td>
<td>4.10 (SD: 0.87)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>SCI Mode Of Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Quadrant One: Positive Assertive</td>
<td>2.90 (SD: 0.55)</td>
<td>2.32 (SD: 0.41)</td>
<td>2.06 (SD: 0.54)</td>
<td>2.16 (SD: 0.59)</td>
<td>2.42 (SD: 0.65)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>6) Quadrant Two: Positive Yielding</td>
<td>2.67 (SD: 0.54)</td>
<td>2.07 (SD: 0.42)</td>
<td>2.16 (SD: 0.46)</td>
<td>2.24 (SD: 0.48)</td>
<td>2.22 (SD: 0.55)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>7) Quadrant Three: Negative Assertive</td>
<td>1.79 (SD: 0.48)</td>
<td>2.43 (SD: 0.63)</td>
<td>2.02 (SD: 0.41)</td>
<td>2.06 (SD: 0.48)</td>
<td>2.64 (SD: 0.58)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>8) Quadrant Four: Negative Yielding</td>
<td>1.50 (SD: 0.42)</td>
<td>2.19 (SD: 0.53)</td>
<td>2.20 (SD: 0.62)</td>
<td>2.23 (SD: 0.60)</td>
<td>2.13 (SD: 0.59)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>9) SCI Desire For Control</td>
<td>4.66 (SD: 0.74)</td>
<td>5.37 (SD: 0.62)</td>
<td>4.97 (SD: 0.75)</td>
<td>4.94 (SD: 0.62)</td>
<td>5.19 (SD: 0.78)</td>
<td>&lt;.01</td>
</tr>
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</table>

Rotter’s Internal/External Locus Of Control Scale

<table>
<thead>
<tr>
<th>Means</th>
<th>SD (95% Confidence Interval)</th>
<th>NS (95% Confidence Interval)</th>
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<tbody>
<tr>
<td>8.09</td>
<td>(3.90)</td>
<td>(3.97)</td>
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Wallstons’ Multidimensional Health Locus Of Control Scales

<table>
<thead>
<tr>
<th>Internal</th>
<th>External</th>
<th>Chance</th>
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<tbody>
<tr>
<td>29.09</td>
<td>21.82</td>
<td>17.09</td>
</tr>
<tr>
<td>(3.42)</td>
<td>(12.87)</td>
<td>(4.76)</td>
</tr>
</tbody>
</table>

Clinical Versus Normal: +p<.05; ++p<.01; +++p<.001; ++++ P<.0001
also differentiated among groups F(4,178)=2.50; p=.0445. Wallstons' scales did not differentiate among groups: internal F(4,178)=1.21; p=.308; external powerful F(4,178)=1.35; p=.2550; external chance F(4,178)=.40; p=.8096.

Further, based on planned comparisons and post-hoc analysis, it can be seen from Table Four that the SCI was also able to significantly differentiate between the healthy normals and each of the four clinical groups on all four of the general and specific domain scales at least at the p.<.01 level; and the SCI significantly differentiated between normals and each of the four clinical groups on three of the four modes (one, two, four) at least at the p.<.05 level. Rotter's scale discriminated between normals and two clinical populations at the p.<.05 level, but was unable to discriminate between normals and two other clinical populations.

Therefore objective one, discriminant validity, is clearly met for seven, and partially met for two of the SCI scales in this study, partially met for Rotter's scale, and not at all met for Wallstons' three scales.

**Objective Two: Correlations Of Wallstons’ Rotter’s And Shapiro’s Control Scales:**

**Divergent Validity**

The SCI scales had moderate correlations with Rotter's scale, and these were in the expected direction. For example, as can be seen from Table Four, Rotter's scale was negatively correlated with general domain positive sense of control, specific domain sense of control, and the positive assertive and positive yielding modes of control; and was positively correlated with the negative sense of control scale (a low score on Rotter's scale means a higher internal locus of control). Wallstons' internal scale had a positive correlation with the SCI positive sense of control scale; and, as expected, showed one of the highest correlations with the SCI on the body domain (.29).

However, as can further be seen from inspection of Table Four, the highest correlation among any of the nine SCI scales and Rotter's or Wallstons' scales was between the SCI general domain negative sense of control and Rotter's scale (r=.38). This correlation accounts for less than 15% of the variance, is below the .60 correlation stated in Hypothesis II, and is well outside confidence limits (.27-.45) for the population correlation coefficients given the sample coefficients (42, p. 392). Therefore, the alternative hypothesis for objective two is supported, and objective two is met.

**Objective Three: Sensitivity And Specificity; Incremental Validity**

Because Wallstons' scales failed to differentiate among groups, discriminant functional analysis with jackknifed classification results are reported below.

| Table 5. Correlations Between the Shapiro Control Inventory (SCI) Scales and the Rotter and Wallstons Scales
<p>| Co-pairs N=164 |</p>
<table>
<thead>
<tr>
<th>SCI scales</th>
<th>Rotter’s internal</th>
<th>Wallstons’ powerful other chance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) positive</td>
<td>-.31</td>
<td>.25</td>
</tr>
<tr>
<td>2) negative</td>
<td>.38</td>
<td>-.19</td>
</tr>
<tr>
<td>3) overall</td>
<td>-.37</td>
<td>-.26</td>
</tr>
<tr>
<td><strong>4) Domain specific</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>-.37</td>
<td>.18</td>
</tr>
<tr>
<td>Mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) positive assertive (Q1)</td>
<td>-.23</td>
<td>.14</td>
</tr>
<tr>
<td>6) positive yielding (Q2)</td>
<td>-.25</td>
<td>.07</td>
</tr>
<tr>
<td>7) negative assertive (Q3)</td>
<td>.12</td>
<td>-.02</td>
</tr>
<tr>
<td>8) negative yielding (Q4)</td>
<td>.23</td>
<td>-.07</td>
</tr>
<tr>
<td>9) desire</td>
<td>.15</td>
<td>.05</td>
</tr>
</tbody>
</table>

*On the Rotter, the lower the number, the more internal the locus of control.
For N=100, a correlation of .196 is significant at p=.05
For N=100, a correlation of .254 is significant at p=.01

Only for the SCI scales and Rotter’s scale. Depending upon sample size, two-tailed Fisher Exact and Yates corrected chi square were run in order to determine whether differences among scales were significant.

In terms of sensitivity, the highest accuracy was 90%, achieved by the SCI scales of Positive Sense of Control and Negative Sense of Control. An additional three SCI scales had 80% or better accuracy; the SCI general domain Overall Sense of Control Scale; the SCI domain specific Overall Sense of Control; and the negative yielding Mode of Control Scale. Two scales had 70% accuracy; the Rotter and the SCI Desire for Control scale. The other three SCI Mode of Control Scales had accuracies higher than 60%. Although the statistical comparison between the SCI scales and Rotter Scales revealed no significant differences, it can be seen that the SCI had two scales which reduced Rotter’s error by two-thirds; and three scales that reduced Rotter’s error by one-third.

For specificity, all nine scales of the SCI were more accurate than Rotter’s 2.6% accuracy for borderline, with Negative Sense of Control being most accurate (56.4%) and four SCI scales being significantly more
accurate than Rotter’s at the $P<.0001$ level. For GAD, eight of the SCI’s nine scales were more accurate than Rotter’s 0.0% accuracy, with the SCI positive and negative sense of control, and desire for control scales being most accurate (25%), significant at $P<.05$ level. For depression, the SCI scales of positive sense of control (53.1%) and positive assertive (50.0%) were the most accurate, followed by a tie between Rotter and the SCI overall sense of control (46.9%). The Rotter was significantly more accurate ($P<.001$) than five of the other SCI scales (negative, desire, and quadrants 2,3,4). For panic disorders, the most accurate scale was the SCI positive yielding (14.6%), the SCI desire for control (14.3%), followed by a tie between Rotter and the SCI domain specific sense of control scale with 6.1% accuracy. There were no significant differences among scales on panic attack.

**DISCUSSION**

This paper compared three generations of control assessment scales, the first generation Rotter’s Internal/External Locus of Control Scale (2); the second generation Wallstons’ Multidimensional Health Locus of Control Scale (4) and the third generation Shapiro Control Inventory (43). Strong support was provided for the three SCI related objectives of the study; discriminant, divergent, and incremental validity. These three objectives were foundational and essential cornerstones for the further psychometric development of the SCI.

In terms of objective one, the study clearly demonstrated that all nine scales of the SCI are able to differentiate overall among the five different groups studied. Of the nine SCI scales four scales differentiated among groups at $P<.0001$; three scales at $P<.001$; and two scales at $P<.01$, with F values ranging from 3.78 to 11.07. The Wallstons’ three scales were unable to discriminate among groups, and Rotter’s scale barely achieved significance among groups at $P=.0445$, and an F value of 2.5. Further, on seven of the SCI scales, there was significant discrimination between the normal and each of the four clinical groups. Rotter’s scale, however, only significantly differentiated between the normal and two of the four clinical groups. Therefore, the discriminant validity objective is met for the SCI, partially met for Rotter’s scale, and not met for Wallstons’ scales.

In terms of objective two, discriminant validity, the correlations between the SCI scales and Rotter’s and Wallstons’ scales suggest that the SCI is measuring something different from the other tests. The highest correlation, .38, between Rotter and the SCI Negative Sense of Control Scale, accounts for less than 15% of the variance. This low correlation across scales was as expected. Rotter and Wallstons assess if a contingent statement regarding control is true (in the abstract), but not whether it is true for that particular person, as do the SCI sense of control scales. Further, whereas the Rotter and Wallstons appear to reflect at least a generalized expectancy along a quadrant one-quadrant four continuum (positive assertive-negative yielding), neither of them even attempt to measure quadrant two (positive yielding) or quadrant three (negative assertive) mode of control scales.

By meeting the first two objectives of the study, that the SCI significantly discriminates overall among groups, and that the SCI measures something different than Rotter’s and Wallstons’ control tests, the third objective, that of incremental validity over the other tests, was able to be more fully explored.

In terms of sensitivity, five of the SCI scales were more accurate than Rotter in predicting normals, reducing between one third to two thirds of the Rotter error. In terms of specificity, the SCI was more accurate than Rotter in correct diagnoses of borderline patients on all nine scales; GAD patients on eight scales; depressed patients on two scales; and panic attack patients on two scales.

**Future Directions**

There are three next steps which are necessary to help further determine the relationship of control to psychological health and pathology: determination of between clinical group differences; determination of the role of the construct sense of control as antecedent and consequence of pathology; and development of a control-based psychotherapy and health care intervention which can follow from and be based on the psychometric assessment of control.

Having met the three objectives of this current study, it is now possible to theoretically and empirically justify between group clinical comparisons using the SCI. The borderline group was significantly more negative than the generalized anxiety disorder and panic attack groups on the negative sense of control scale, and significantly higher than the depressed and panic attack groups on desire for control. The generalized anxiety group had the highest negative assertive mode of control, significantly higher than the depressed and panic attack groups. The depressed group had the lowest positive assertive mode of control, significantly lower than borderline and generalized anxiety groups. Further research, based on predictive scale-based hypotheses is now needed.

Second, further research can examine the sense of control construct both as independent and dependent variable. Research suggests that sense of control as independent variable may be a protective buffer against severity of subsequent health related concerns. For example, Rodin has focused on the relationship of control to diseases such as cancer and diabetes. In a seminal article summarizing the literature on “sense of
control," studies were reviewed showing that "self-terminating options" could have good and sometimes markable effects on morbidity and mortality; that control, as an independent variable, caused decreased corticosteroid and cortisol levels in humans and animals; and that at least in animal studies, the psychoendocrine effects of variations of control appeared to have a significant influence on the immune system (1,9). Current work (44) is examining the relationship between sense of control and morbidity and mortality with breast cancer.

Sense of control can also be assessed as a dependent variable, an effect of psychotherapy treatment (21,40). The SCI can be used to assess therapeutic progress across treatment: pre, during, and post. Since this study clearly indicates that sense of control is related to normalcy and psychological health, and lack of control is related to psychopathology, it should be possible to assess progress in therapeutic treatment, regardless of approach, e.g., psychodynamic, cognitive/behavioral, humanistic/existential (45).

Finally, the SCI, as noted, was both theoretically and clinically derived. Scale items were determined in such a way that item level analysis could provide the clinician with important information regarding the nature and type of control based intervention needed. For example, the four quadrant modes of control provided a clinical map which can help determine where the therapeutic intervention should be directed regarding mode of control deficits. The domain specific scale provides parameter level information both in terms of where the patient feels out of control, and by which mode the individual wants to address the area of concern. Items within the positive mode of control scale assess six refinements related to control: awareness, skill, goal, responsibility, choice, effort (31). This information can be useful clinically in helping the therapist determine where the specific control deficits exist that need to be focused upon, and more clearly tailor control-related strategies to those specific areas (46-49). More precise measurement of control, such as that offered by the SCI, can help lay the groundwork for helping future research determine more accurately the control-related profile of different forms of pathology, as well as distinct expressions of positive psychological well-being. That more precise psychometric assessment can, in turn, help provide more sophistication in the development and refinement of the use of non-pharmacological "self-control" strategies to provide patients increased control over their behavior and cognitions (48,50-51).

At the very least, this study should suggest that control is a complex, multi-faceted, molar construct. Its measurement, therefore, seems to require an equally multi-faceted psychometric inventory.

REFERENCES

14. Weisz, J. R., Rothbaum, F.M and Blackburn, T. C. Standing out and standing in: The psychology of control in America and
Measurement of Control


Index Terms

control, Shapiro control inventory, locus of control scale, multidimensional health locus of control scale

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