

## A STRUCTURAL AND DISCRIMINANT ANALYSIS OF THE WORK ADDICTION RISK TEST

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The Work Addiction Risk Test (WART) was designed to measure "workaholism." The present study examines the underlying dimensions of the WART and investigated the accuracy of the WART scores to discriminate between workaholics and a control group. The results suggest that workaholism, as measured by the WART, includes five dimensions: (a) Compulsive Tendencies, (b) Control, (c) Impaired Communication/Self-Absorption, (d) Inability to Delegate, and (e) Self-Worth were developed from the factor analysis. A discriminant analysis that used the subscale scores as the independent variables and group membership (workaholic or control group) as the dependent variable indicated that the first three subscales provided the greatest distinction between the groups, with a 88.5% correct classification rate. A discriminant analysis that used the total WART score as the independent variable and group membership as the dependent variable had an 86.4% correct classification rate.

Since the late 1980s, workaholism has been identified as a serious and legitimate compulsive disorder (Fassel, 1990; Pietropinto, 1986; Robinson, 1998; Spruell, 1987). Social scientists have begun to study work addiction in terms of career development (Naughton, 1987) and family functioning (Robinson & Post, 1995). Although it has become a common word, *workaholism* has not been accepted into the official psychiatric and psychological nomenclature. This has led to many definitions with no formal method of assessment as a construct (Naughton, 1987; Seybold & Salomone, 1994; Spence & Robbins, 1992).

Robinson (1999) defined workaholism as the overindulgence in and preoccupation with work, often to the exclusion and detriment of the workaholic's health, intimate relationships, and participation in child rearing. Workaholics are frequently perfectionists and obtain their self-worth from their jobs. Work addiction grew out of the literature in which the construct of

addiction is conceptualized as symptomatic of a family system. The main perspective is that addictions are transmitted through the breakdown of the family system, rendering the family dysfunctional. Using this definition of workaholism, Robinson (1999) developed the Work Addiction Risk Test (WART) for measuring workaholism.

### WART

The WART is a 25-item self-report inventory. Respondents are instructed to rate each item according to how well the item describes their work habits. Responses are scored on a 4-point Likert-type scale: 1 = *never true*, 2 = *sometimes true*, 3 = *often true*, and 4 = *always true*. Summing the item responses across all items creates a total score ranging from 25 to 100. A listing of the items on the WART is contained in Table 1.

Previous studies on the WART have examined the reliability, content validity, and concurrent validity of the scores from the WART. Based on data from 151 respondents, Robinson, Post, and Khakee (1992) reported a test-retest correlation coefficient of .83 after a 2-week interval and a coefficient  $\alpha$  of .85. Robinson and Post (1995) reported a Spearman-Brown split-half reliability coefficient of .85 based on 442 respondents, and Robinson (1999) reported a coefficient  $\alpha$  of .88 based on 371 respondents.

Content validity was estimated by having 50 working adults match each item to the major symptoms of work addiction (overdoing, self-worth, control-perfectionism, intimacy, and mental preoccupation-future reference) with acceptable matching reported (Robinson & Post, 1994). Robinson and Phillips (1995) selected 20 psychotherapists to critically examine test items as they related to work addiction. The psychotherapists were instructed to identify the 25 items out of 35; 10 items unrelated to work addiction were nested in the original 25 items, which were related to work addiction. The mean percentage of correctly identified symptoms was 89%.

Robinson (1999) correlated scores from the WART with measures of "Type A" behaviors and state-trait anxiety. Correlation coefficients ranged from .20 to .50. The relationships between the constructs were in the hypothesized direction and expected magnitude.

### Purpose

The previous studies have examined the reliability, as well as the content and concurrent validity of scores on the WART, but there are no extant studies that examine the underlying dimensionality or the accuracy in discrimination of the WART scores. Hence, the purpose of the present study was to provide additional and essential information on the validity of the scores on the WART. Specifically, the present study sought to examine the construct valid-

Table 1  
*Means, Standard Deviations, and Discrimination Indices for the Work Addiction Risk Test (WART) Items*

Item	<i>M</i>	<i>SD</i>	<i>d</i>
1 I prefer to do most things myself rather than ask for help.	3.05	.56	.33
2 I get impatient when I have to wait for someone else or when something takes too long.	3.02	.74	.42
3 I seem to be in a hurry and racing against the clock.	2.82	.69	.64
4 I get irritated when I am interrupted while I am in the middle of something.	2.73	.70	.43
5 I stay busy and keep many irons in the fire.	3.09	.73	.50
6 I find myself doing two or three things at one time such as eating lunch and writing memos while talking on the phone.	2.65	.83	.58
7 I overly commit myself by biting off more than I can chew.	2.54	.74	.60
8 I feel guilty when I am not working on something.	2.64	.83	.58
9 It is important that I see the concrete results of what I do.	3.04	.67	.36
10 I am more interested in the final results of my work than in the process.	2.70	.76	.39
11 Things do not seem to move fast enough or get done fast enough for me.	2.46	.67	.62
12 I lose my temper when things don't go my way or work out to suit me.	2.24	.69	.44
13 I ask the same question over again, without realizing it, after I've already been given the answer once.	1.97	.65	.49
14 I spend a lot of time mentally planning and thinking about future events while tuning out the here and now.	2.70	.75	.52
15 I find myself continuing to work after my coworkers have called it quits.	2.50	.79	.55
16 I get angry when people don't meet my standards of perfection.	2.38	.75	.60
17 I get upset when I am in situations where I cannot be in control.	2.42	.75	.57
18 I put myself under pressure with self-imposed deadlines when I work.	2.73	.82	.65
19 It is hard for me to relax when I'm not working.	2.13	.93	.71
20 I spend more time working than on socializing with friends, on hobbies, or on leisure activities.	2.57	.95	.67
21 I dive into projects to get a head start before all phases have been finalized.	2.27	.70	.54
22 I get upset with myself for making even the smallest mistake.	2.45	.81	.59
23 I put more thought, time, and energy into my work than I do into my relationships with friends and loved ones.	2.23	.90	.63
24 I forget, ignore, or minimize birthdays, reunions, anniversaries, or holidays.	1.86	.91	.49
25 I make important decisions before I have all the facts and have a chance to think them through thoroughly.	2.08	.72	.44

*Note.* The item discrimination index (*d*) is the correlation of the item to the total WART score.

ity of the scores from the WART. Structural (factor-analytic) and discriminant analyses were used to provide evidence of construct validity.

## Method

### *Participants*

Two different samples from previous studies (i.e., Robinson, 1999; Robinson & Post, 1997) were used for this study. One of the samples (Robinson & Post, 1997) recruited participants from Workaholics Anonymous, a 12-step support group for work addiction, and conference registrants from national self-help conferences who had signed their names and addresses on a mailing list for participation in the study. Of 140 potential volunteers, 107 returned their questionnaires, resulting in a response rate of 76%. Two additional respondents did not complete all items on the questionnaire and were excluded from this study. The 105 respondents represented five regions of the United States and Canada. The mean age of respondents was 44 years, with a range of 28 to 65 years. Sixty percent of the respondents were women. For the purposes of the present study, this sample will be referred to as the “workaholic” group.

The second sample (Robinson, 1999) of participants was a convenience sample of students attending graduate and undergraduate classes at a large university in the southeastern United States. A sample of 371 students between 17 and 53 years of age (mean age 22 years) participated. A total of 2% (or 8 respondents) did not complete all the forms, yielding 363 in the final sample, 29% of whom were male ( $n = 107$ ) and 71% of whom were female ( $n = 256$ ). Participants were asked to complete the questionnaire during class time. For purposes of the present study, this sample will be referred to as the “control” group.

### *Data Analyses/Results*

Two procedures were used to evaluate the underlying dimensions of scores from the WART and the discriminating ability of WART scores, a factor analysis, and a series of discriminant analyses. The means, standard deviations, and item discrimination indices ( $d$ ) are presented in Table 1. None of the items was highly skewed or had extremely unbalanced distributions, and the item discrimination for all items ranged from small ( $d = 0.33$ ) to moderately high ( $d = 0.71$ ).

The average total WART score for the workaholic group ( $n = 105$ ) was 73.91 ( $SD = 10.35$ ), and for the control group ( $n = 371$ ), it was 59.92 ( $SD = 7.77$ ). There was a statistically significant difference between the means ( $t = 12.88$ ,  $df = 474$ ,  $p < .001$ ) with a large effect size ( $g = 1.67$ ). Interitem correla-

Table 2  
*Pattern Coefficients, Structure Coefficients, and Communalities for the Work Addiction Risk Test (WART) Items*

Item	Factor					Communality
	I	II	III	IV	V	
1	-.07 (15)	.11 (20)	.09 (17)	<b>-.74 (-74)</b>	.14 (16)	.59
2	-.06 (14)	<b>.65 (63)</b>	.02 (20)	.13 (11)	.03 (23)	.42
3	<b>.54 (63)</b>	.36 (50)	.04 (30)	.17 (16)	-.06 (16)	.54
4	-.04 (17)	<b>.67 (64)</b>	-.07 (14)	-.01 (21)	.02 (21)	.41
5	<b>.75 (70)</b>	-.15 (09)	-.03 (16)	-.06 (08)	< .01 (08)	.52
6	<b>.74 (72)</b>	.04 (28)	-.02 (21)	.18 (04)	.03 (18)	.56
7	<b>.67 (69)</b>	< .01 (27)	.16 (36)	.24 (11)	.06 (21)	.55
8	<b>.62 (66)</b>	.02 (25)	-.12 (19)	-.20 (-30)	.16 (26)	.50
9	.16 (25)	-.02 (21)	-.24 (03)	-.15 (-14)	<b>.80 (78)</b>	.68
10	-.14 (07)	.02 (29)	.23 (33)	-.02 (02)	<b>.76 (79)</b>	.67
11	.24 (43)	<b>.43 (61)</b>	.11 (35)	.12 (06)	.20 (40)	.48
12	-.20 (07)	<b>.61 (64)</b>	.18 (33)	.06 (05)	.14 (33)	.48
13	.07 (27)	.12 (35)	<b>.47 (56)</b>	.14 (10)	.21 (35)	.41
14	.21 (36)	.20 (41)	.24 (41)	.21 (16)	.25 (40)	.39
15	<b>.49 (57)</b>	.02 (25)	.20 (35)	-.09 (-18)	< .01 (13)	.37
16	.09 (36)	<b>.66 (70)</b>	.05 (29)	-.23 (-28)	-.06 (17)	.56
17	.14 (37)	<b>.63 (65)</b>	-.02 (22)	-.21 (-27)	-.10 (27)	.50
18	<b>.50 (62)</b>	.38 (52)	-.03 (25)	-.01 (-12)	< .01 (20)	.50
19	<b>.61 (73)</b>	.07 (35)	.14 (38)	-.23 (-35)	.01 (21)	.62
20	<b>.53 (66)</b>	.13 (36)	.23 (42)	-.22 (-34)	-.10 (07)	.56
21	.24 (40)	.05 (31)	<b>.45 (57)</b>	.06 (01)	.12 (26)	.39
22	.20 (41)	<b>.42 (55)</b>	-.01 (25)	-.27 (-32)	.12 (28)	.44
23	.32 (52)	.03 (28)	<b>.46 (57)</b>	-.35 (-40)	-.07 (07)	.58
24	.12 (32)	-.13 (12)	<b>.75 (73)</b>	-.20 (-27)	-.12 (-01)	.62
25	-.15 (12)	.09 (29)	<b>.76 (75)</b>	.02 (01)	.02 (16)	.58

*Note.* Decimals have been omitted. Structure coefficients are in parentheses, and coefficients for salient items are in bold.

tion coefficients ranged from .06 to .54; coefficient  $\alpha$  for scores across all 25 items was .90.

A principal component analysis was used to evaluate the structure of the 25 items on the WART. The decrease in eigenvalues (i.e., scree test) leveled off at five factors, each with an eigenvalue greater than 1.0. An oblique rotation (direct oblimin with delta equal to zero) was performed and retained for interpretation. The structure coefficients, pattern coefficients, and communalities for this analysis are presented in Table 2.

The total variance accounted for by the five factors was 52%. Items with structure/pattern coefficients greater than .40 were used to determine saliency of items with the factors. Using the major symptoms of work addiction developed by Robinson and Post (1994) and a review of the factors by two psychologists with expertise in the area of workaholism, each factor was

Table 3  
*The Five Factors and Corresponding Items From the Work Addiction Risk Test*

Factor	Items
1. Compulsive Tendencies	3, 5, 6, 7, 8, 15, 18, 19, and 20
2. Control	2, 4, 11, 12, 16, 17, and 22
3. Impaired Communication/Self-Absorption	13, 21, 23, 24, and 25
4. Inability to Delegate	1
5. Self-Worth	9 and 10

inspected for possible common themes among the items that identified with the factor. The first factor had nine items with coefficients greater than .40 (Items 3, 5, 6, 7, 8, 15, 18, 19, and 20). These items appear to represent the symptom of Compulsive Tendencies. The second factor had seven items with coefficients greater than .40 (Items 2, 4, 11, 12, 16, 17, and 22). All the items in this factor appeared to represent the symptom of Control. The third factor consisted of five items (Items 13, 21, 23, 24, and 25) and corresponded to the symptoms of Impaired Communication and Self-Absorption. The fourth factor had only one item (Item 1), which appeared to represent Inability to Delegate. The final factor had two items (Items 9 and 10) and seemed to represent Self-Worth. Item 14 did not have a coefficient greater than .40 on any factor. The factors and corresponding items are presented in Table 3.

Four discriminant analyses were conducted to examine the correct classification rate of scores on the WART and explore which of the subscales and items accounted for the differences in the average score profiles of the workaholic and control groups. In all the analyses, prior probabilities proportional to group sample sizes were used. In the first discriminant analysis, the total WART score was used as the independent variable. This analysis provided information concerning how well the WART total score separated the two groups and the percentage of correct classifications using just the WART score. In the second analysis, the subscales that were developed from the factor analysis were used as the independent variables. The third analysis used the individual items as the independent variables, which allowed for examining the importance of individual items on discriminating between the two groups. The final analysis used information about the subscales and items and developed a revised WART by eliminating subscales and items that did not contribute to the separation of the workaholic and control group.

As previously noted, the first discriminant analysis used the total WART score as the independent variable and the group membership (workaholic and control) as the dependent variable. A statistically significant function was calculated (Wilks's lambda = 0.65,  $\chi^2 = 187.42$ ,  $p < .001$ ) with a canonical correlation of .59. In the workaholic group, 57.3% were classified as workaholics, and in the control group, 95.3% were classified as nonworkaholics, which resulted in 86.4% of the cases correctly classified.

Table 4  
*The Canonical Discriminant Function Coefficients and Structure Matrix of the Work  
 Addiction Risk Test Subscales*

Factor	Canonical	Structure
Compulsive Tendencies	.68	.90
Control	.26	.60
Impaired Communication/Self-Absorption	.34	.68
Inability to Delegate	-.21	.28
Self-Worth	.12	.14

The second discriminant analysis used the subscales, based on the factor analysis (i.e., Compulsive Tendencies, Control, Impaired Communication/Self-Absorption, Inability to Delegate, and Self-Worth), as the independent variables and group membership as the dependent variable. A statistically significant function was calculated (Wilks's lambda = .61,  $\chi^2 = 220.28$ ,  $p < .001$ ) with a canonical correlation of .63. The standardized canonical discriminant function and structure matrices are reported in Table 4. The most important subscales for separating the groups as indicated by a structure coefficient greater than .30 were Compulsive Tendencies, Control, and Impaired Communication/Self-Absorption. The workaholic group was correctly classified as workaholics in 63.5% of the cases, and 95.0% of the control group was correctly classified as nonworkaholics, resulting in an 88.5% correct classification rate.

For the next discriminant analysis, the individual items on the WART were the independent variables, and group membership was the dependent variable. A statistically significant function was calculated (Wilks's lambda = .55,  $\chi^2 = 255.87$ ,  $p < .001$ ) with a canonical correlation of .67. The standardized canonical discriminant function and structure matrices are reported in Table 5. Fifteen of the original items had structure coefficients greater than .30. Seventy percent of the workaholic group and 93.8% of the control group were correctly classified, resulting in an 89.2% correct classification rate.

Using results of the previous discriminant analyses, the first three factors were modified to include only those items that had individually served to separate the workaholic and control groups. The revised subscales of Compulsive Tendencies (Items 3, 5, 6, 7, 8, 15, 18, 19, and 20), Control (Items 11, 16, 17, and 22), and Impaired Communication/Self-Absorption (Items 23 and 24) were used as the independent variables, and group membership was the dependent variable. A statistically significant function was calculated (Wilks's lambda = .62,  $\chi^2 = 214.70$ ,  $p < .001$ ) with a canonical correlation of .62. The standardized canonical discriminant function and structure matrices are reported in Table 6. The workaholic group members were correctly classified as workaholics in 65.7% of the cases, and the control group members were correctly classified as nonworkaholics in 95.0% of the cases, resulting in an 88.1% correct classification rate.

Table 5  
*The Canonical Discriminant Function Coefficients and Structure Matrix of the Work Addiction Risk Test Items*

Item	Canonical	Structure	Item	Canonical	Structure
19	.36	.68	4	.23	.29
20	.20	.62	25	.09	.28
23	.10	.54	21	-.15	.28
7	.17	.50	13	.00	.27
24	.30	.50	1	.07	.25
6	.21	.48	14	-.10	.24
15	.18	.46	12	-.04	.22
18	.06	.44	2	.01	.20
11	.16	.42	10	-.06	.11
5	.08	.41	9	-.13	.09
17	.12	.40			
3	-.13	.38			
16	.02	.38			
8	-.04	.38			
22	.04	.37			

*Note.* Items are in descending order by value of structure matrix.

Table 6  
*The Canonical Discriminant Function Coefficients and Structure Matrix of the Work Addiction Risk Test Modified Subscales*

Factor	Canonical	Structure
Compulsive Tendencies	.65	.89
Control	.17	.71
Impaired Communication/Self-Absorption	.44	.56

The percentage correct classification rate for each of the discriminant analyses is presented in Table 7. The correct classification rate for the control group remained consistent for all of the analyses, ranging from 93.8 to 95.3. The correct classification rate for the workaholic group was consistently lower than for the control group and varied up to 12.7% between analyses.

## Discussion

The data indicate that workaholism, as measured by the WART, is not a unidimensional construct. The factor analytic findings suggested that the WART has five underlying dimensions; however, the discriminant analysis results suggest that workaholism, as defined by Robinson (1999), has only three dimensions: (a) Compulsive Tendencies, (b) Control, and (c) Impaired Communication/Self-Absorption. These subscales had the greatest impact on separating the workaholic group from the control group. The remaining



Table 7  
*Percentage Correct Classification Rates for the Discriminant Analyses*

Independent Variable	Workaholic Group	Control Group	Total
Total Work Addiction Risk Test (WART) Score	57.3	95.3	86.4
Five WART subscales	63.5	95.0	88.5
25 WART items	70.0	93.8	89.8
Three modified WART subscales	65.7	95.0	88.1

two factors—Inability to Delegate and Self-Worth—were ill defined, consisting of few items with minimal impact on separating the two groups.

When the WART total score was used to classify individuals, more misclassifications were made for the workaholic group: 43% of the workaholics were not classified as workaholics, whereas very few (5%) of the control group were misclassified. For practitioners, this suggests that the use of the total WART score will misclassify workaholics as nonworkaholics resulting in false negatives. These results are based on the assumption that those who were in the workaholic group continued to demonstrate symptoms of workaholism. Recall that the workaholic participants were recruited from Workaholics Anonymous and a national self-help conference. It is possible that some of the participants had received help for their workaholism and were no longer displaying the symptoms of workaholism. If this were the case, the classification rate for the total WART score was underestimated.

The classification rate of workaholics increased by 6% when the subscale scores were used in the discriminant analysis. In addition, examining the subscales provided information concerning the construct of workaholism. The subscale of Compulsive Tendencies and the items within this subscale are the most important variables for discriminating between workaholics and the control group. Other important variables were the Control and Impaired Communication/Self-Absorption subscales. Focusing on these dimensions of workaholism would allow practitioners and their clients to examine the symptoms of workaholism instead of the global construct of workaholism.

Examining the discriminant analyses of the subscales and all the items suggests that the WART could be reduced in the number of items. The first three subscales were important variables for discriminating between the workaholic and control groups. Fifteen individual items, which were all in the first three subscales, were important variables for discriminating between workaholic and control groups. The discriminant analysis using the three modified subscales as independent variables improved the classification rate of workaholics by 8% when compared to the classification rate of the total WART score, and a 2% increase was noted in classification rate when compared to the original five subscales of the WART. Of course, the modifications were based on results from the same sample that this discriminant anal-

ysis was conducted, so inflated classification rates would be expected. Further research using only the 15 items and a different sample is needed to examine the effectiveness of the modified subscales.

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