

Construction and Validation of a Physician Career Development Inventory

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The development and psychometric characteristics of the Medical Career Development Inventory (MCDI) are described. The MCDI represents the initial construction of a career maturity measure for a homogeneous population of adults who encounter a common set of vocational development tasks. The inventory is intended to measure both degree of vocational development and readiness to cope with the developmental tasks encountered in a physician's career. The MCDI includes 35 items that address coping behaviors germane to dealing with the vocational tasks constituting the career development continuum of physicians. Initial evaluation of the MCDI's psychometric properties with a sample of 160 student-physicians supported the content validity of the items, construct validity of the scales, and criterion validity of the inventory.

In a seminal paper on adult career maturity, Super and Kidd (1979) considered the problem of extrapolating to adults from models and measures constructed for adolescents. They concluded that adult career maturity inventories should assess "only those aspects of vocational maturity which are common to most adults, or be designed for special target populations which have certain experiences and certain career development problems in common" (p. 262). Super, Zerkowitz, and Thompson (1975) used the former approach in constructing a career development inventory for heterogeneous groups of adults. The present study used the latter approach to construct a career development inventory for physicians which is described in the first half of this report. The results of an initial study of the inventory's internal and external validity are then presented.

Medical students and physicians constitute a homogeneous group of adults to whom the construct of career maturity pertains. While sharing with all adults the need for a vocational adjustment repertoire, physicians also must cope with a series of vocational choice possibilities and problems

The inventory was constructed in 1980 by the author in collaboration with Donald E. Super and Albert S. Thompson of Teachers College, Columbia University. Requests for reprints should be sent to Dr. Mark L. Savickas, Behavioral Sciences Program, Northeastern Ohio Universities College of Medicine, Rootstown, OH 44272.

that extend well into middle adulthood. Young adults committed to a medical career still must choose a specialty, consider a subspecialty, select a practice type, and decide on a practice locale. For physicians, degree of vocational development may mediate choice satisfaction and career adjustment. The salience of this construct to physician careers, however, awaits empirical investigation. Such investigations would be facilitated by the availability of measures of vocational development. The next section describes the construction of an inventory designed to measure vocational development during the exploration and early establishment stages of a physician's career.

INVENTORY CONSTRUCTION

The Career Development Inventory-Adult Form (CDI-A) constructed by Super et al. (1975) served as the model for the Medical Career Development Inventory. The CDI-A measures a person's responses to the vocational development tasks of the exploration, establishment, maintenance, and decline stages of a career. A total score indicates the person's degree of vocational development, that is, "the place reached on the continuum of vocational development from exploration to decline" (Super, 1955, p. 153). Scale scores point out the focus of vocational development by indicating which tasks the person has completed, is facing, and is anticipating.

Using the CDI-A in counseling with medical students and physicians revealed two problems. First, subjects had differing interpretations of the same item, for example, some understood "occupation" to mean physician while others interpreted it as specialty role (e.g., surgeon, internist). Less career mature individuals interpreted items with regard to a career in the general field of medicine but more mature subjects interpreted the same items to relate to specific specialty roles. In this way, career immature individuals appeared more mature because they were responding to "easier" items. The second problem was that the CDI-A was not intended to measure a vocational development task continuum as complex as that of a physician. Constructing a Medical Career Development Inventory (MCDI) modeled after the CDI-A required that both these problems be resolved.

The problem of differing interpretation of items was addressed by using a standard vocabulary in the items. "Career" referred to the field of medicine, "specialty" referred to an occupation within the field of medicine, and "position" referred to a specific role enacted by a practicing physician. The complexity issue was addressed by constructing two forms of the MCDI: Form I focused on the exploration stage and Form II focused on the establishment and maintenance stages. Only Form I is discussed below. Splitting the vocational development task continuum into two parts and assigning each half to separate forms allowed more thorough

coverage of the tasks. Form I of the MCDI provided expanded assessment of the exploration stage tasks by presenting the tasks separately for career and occupational choice. Two cycles of tasks were conceptualized as constituting the exploration stage of physician vocational development: the career cycle (crystallize and specify a career preference, and implement a career choice) and the occupational cycle (crystallize and specify an occupational preference, and implement an occupational choice). The first task of the establishment stage, stabilizing in a practice position, was also included in Form I to ensure adequate "ceiling" for samples of exploration stage student-physicians and residents.

The next step in constructing the MCDI was to formulate item-writing rules. The physician vocational development continuum was divided into periods. A single vocational development task constituted each period. The periods and tasks shown in Table 1 served as the content outline for the inventory. Ten items were written for each period/task. The items consist of coping behaviors that deal with tasks.

Special attention was given to clearly delineating the tasks. For example, Super and Kidd (1977, p. 263) asserted that crystallization and specification tasks may be "logical distinctions which cannot well be made in practice." Super (1963, p. 88) earlier had proposed "confidence in a specific preference" as the distinguishing characteristic of specification. Although essentially cognitive, coping with the specification tasks is slightly more affective than is coping with the crystallization tasks. Therefore, coping behavior items for the specification task scale in the MCDI focus on evaluation, commitment, and assurance.

Five items for each task were selected from the item pool for inclusion in the preliminary version of the MCDI. Expert judges, three vocational psychologists, chose those items which they deemed germane to effective coping with each task. If more than five items were judged to be pertinent to effective task coping, the judges were instructed to identify the five most critical coping behaviors. The 35 items included in the MCDI appear in Table 2.

The coping behavior items were grouped by task so the subjects responded to seven homogeneous clusters of five items. The seven groups of items were presented in the following sequence: career crystallization (CC), career specification (CS), occupational crystallization (OC), career implementation (CI), occupational specification (OS), occupational implementation (OI), stabilization (S). Rather than presenting the three career cycle scales followed by the three occupational cycle scales in the preliminary version, the OC scale was presented before the CI scale to reflect the idea that students should crystallize an occupational preference before implementing the career choice of medicine by attending medical school. The results did not support this idea. The final scale arrangement presented in Table 2 is based upon the analyses to be reported. The

TABLE 1
MCDI Content Outline and Scale Specifications

Periods	Tasks	Coping behavior
Crystallize a career preference (CC)	Formulate a general preference, but not choice, for a medical career. Sample item: Finding a career that will allow for expression of my interests and abilities.	Behaviors that contribute to forming a vocational identity and that enable the emergence of a tentative preference for a medical career along with the corresponding academic achievement motivation.
Specify physician as career preference (CS)	Convert generalized preference for a medical career into a specific preference for a physician's career characterized by an attitude of commitment and dedication to the necessary training. Sample item: Deciding if my interests really are compatible with a career in medicine.	Behaviors that fill in the details of the generalized preference for a medical career and evaluate the suitability and viability of a commitment to a physician's career. The critical coping behavior is self-evaluation leading to self-assurance and commitment.
Implement physician as career choice (CI)	Convert career specification into a fact by implementing the preference and demonstrating commitment through action. Sample item: Making sacrifices to reach my career goals.	Behaviors that are goal-directed and pertain to the "trials" of a physician's career.
Crystallize a specialty preference (OC)	Formulate a generalized preference for an occupational role or small group of consistent occupational roles from those available as physician specialties. Sample item: Determining what skills each specialty requires.	Self-exploration of attitudes and inclinations relative to the major specialties and advanced occupational exploration which results in detailed information about physician specialties.
Specify a specialty preference (OS)	Convert generalized occupational preference into a specific preference for a specialty role to which one feels committed. Sample item: Finding a residency that will give me the kind of special training and experience that I need.	Behaviors that fill in the details of the crystallized preference and eventuate in selection of an occupational role to which one feels committed with some assurance and for which one actually looks for a residency position.

TABLE 1—*Continued*

Periods	Tasks	Coping behavior
Implement specialty choice (OI)	Convert specialty preference into a fact by occupying a residency position and eventually qualifying in the specified physician specialty role. Sample item: Getting started as a resident.	Behaviors facilitating beginning residency and executing plans for qualifying in a specialty and securing a position in which to practice that specialty.
Stabilize in a practice position (S)	Settle down in a practice position by keeping that position for a period of time. Sample item: Settling down into my regular practice.	Behaviors that establish and secure a practice position in which one is successful, satisfied, and stable.

order of the OC and CI scales is reversed so that the career cycle scales precede the occupational cycle scales. Items 11 through 15 were numbered 16 through 20 and vice versa when they were presented to the subjects and analyzed in the preliminary version. The following section reports the results of a study of the psychometric properties of the preliminary version of the MCDI.

VALIDATION OF THE MCDI

This study of the MCDI provided an initial evaluation of the content validity of the items, construct validity of the scales, and criterion validity of the inventory. If the inventory is internally consistent and valid, then certain relationships should exist among the items and scales and with external criteria. Specifically, the study investigated six hypotheses.

1. *The inventory is homogeneous.* The inventory purports to be a global measure of degree and focus of vocational development. Therefore, the items should sample a single domain. If this is true, then the items should attain very high domain reliability and constitute a general factor.

2. *The scales are moderately related to the composite total score and are low to moderately interrelated.* Each scale should be unique enough to measure the coping behaviors germane to a particular task. So, in addition to contributing common variance to a general factor, each scale should contribute sufficient unique variance to constitute a distinct group factor. If the scales conform to this factor structure, then they should relate both to the composite total and to each other. The scale intercorrelations should be greater for scales measuring adjacent tasks (e.g., career crystallization and career specification) but lower for scales mea-

TABLE 2
Medical Career Development Inventory^a

This inventory consists of 35 statements of career concerns. How much thinking or planning have you done in these areas? Rate each statement according to the following scale:

- 5 = I have already done this
- 4 = I am now doing what needs to be done
- 3 = I know what to do about it
- 2 = I have thought about it, but do not yet know what to do about it
- 1 = I have not yet thought much about it

1. Finding out where my talents lie. _____
2. Deciding what I really want to do for a living. _____
3. Learning more about various kinds of opportunities. _____
4. Clarifying my ideas about the type of work I would like to do. _____
5. Finding a career that will allow for expression of my interests and abilities. _____
6. Getting to know myself better while in the BS/MD program. _____
7. Finding out if I have the talents to perform well as a physician. _____
8. Deciding if my interests really are compatible with a career in medicine. _____
9. Determining what my major strengths and weaknesses are for a career in medicine. _____
10. Reassuring myself that medicine will be a suitable career for me. _____
11. Clarifying my ideas about the specialty I would like. _____
12. Implementing specific plans to achieve my career goals. _____
13. Making sacrifices to reach my career goals. _____
14. Choosing action steps that will help me achieve my ambitions. _____
15. Meeting physicians who may serve as role models. _____
16. Finding out what physicians do in the various medical specialties. _____
17. Determining what skills each specialty requires. _____
18. Learning what training is required for the various medical specialties. _____
19. Getting a part-time or summer job that will help me decide which specialty is for me. _____
20. Talking about my specialty interests with a faculty member who knows me. _____
21. Narrowing the number of medical specialties that appeal to me. _____
22. Choosing the specialty I see as best for me. _____
23. Deciding what type of residency training to seek. _____
24. Finding a residency that will give me the kind of special training and experience that I need. _____
25. Applying for residencies that will provide interest and challenge. _____
26. Getting started as a resident. _____
27. Arranging for the unique training and experience I need. _____
28. Obtaining a position when I finish my training. _____
29. Meeting people who can help me get started in a practice. _____
30. Qualifying in my specialty. _____
31. Establishing my practice. _____
32. Settling down into my regular practice. _____
33. Finding my own niche in the local medical community. _____
34. Making my practice secure. _____
35. Developing a reputation for myself. _____

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asuring nonadjacent tasks (e.g., career crystallization and occupational implementation) if they are assessing a continuum as intended.

3. *Items keyed to a scale are more highly related to it than to other scales or to the total.* Items assessing a task should relate more to items measuring the same task than to items measuring different tasks or the composite total.

4. *Items are moderately related to their scale and the scale items are homogeneous.* Although the items should be from a single domain, they should sample this unitary domain broadly. The MCDI limits its scope to physician vocational development but the items measure different tasks in this developmental continuum. If the items span the broad scope specified in the inventory's content outline, then those items measuring the same task should moderately interrelate, attain moderate to high internal consistency, and define a distinct group factor because they sample a single portion of the continuum. Hypothesis 4 deals with magnitude of the relationship within each scale, whereas Hypothesis 3 deals with comparative relationships of items across scales.

5. *Ordering the scales by their means produces an arrangement consistent with the temporal sequence underlying the vocational development continuum.* If the inventory measures a developmental function that increases with time, then scale mean scores should consistently decrease from scale 1 through scale 7. Moreover, there should be a positive monotonic relationship between degree of vocational development and chronological age for groups of subjects.

6. *Scales and their composite total positively and significantly relate to career planfulness.* If the MCDI measures vocational development, then it should be related to career maturity measures. Subjects who report more planful attitudes toward vocational development tasks should also report greater degree of vocational development.

METHOD

Measurement of Variables

Career planfulness, a dimension of career maturity, was the single external variable assessed in this study of the MCDI's validity. Planfulness was measured with Career Planning Scale (CP) of the Career Development Inventory—College and University Form (Super, Thompson, Lindeman, Jordaan, & Myers, 1982). The items assess how involved subjects are in thinking about and planning activities that facilitate vocational development. The User's Manual reports a coefficient α reliability of .91 for the scale.

Subjects

A sample of 160 student-physicians (114 males and 46 females) was selected for this study. These subjects constituted a sample of convenience

that offered an opportunity to refine the inventory before administering it to a large and systematically selected sample. All subjects were students enrolled in a 6-year BS/MD program (Dabney, Wagner, & Rogers, 1981) at a midwestern medical school. The sample included three subgroups. Subgroup 3 ($N = 80$) represented the entire Year 3 class. This group was equivalent to 1st-year medical students in a program that requires completion of the baccalaureate degree before entering medical school. Subgroups 2 ($N = 57$) and 1 ($N = 27$) included students enrolled in Years 2 and 1, respectively, of the 6-year curriculum. Using three groups in the sample enabled a cross-sectional test of Hypothesis 5.

Procedure

The data were collected late in the spring quarter of the academic year. Subgroup 3 responded to the MCDI and CP during a regularly scheduled behavioral science class. While participation in the study was voluntary all these students agreed to participate. Subgroups 2 and 1 participated at the conclusion of an optional basic science colloquium attended by 45% of all Year 1 and 2 students. Again, all colloquium participants agreed to participate. Because of time constraints, they were given only the MCDI. Seventy-six of the student-physicians in subgroup 3 took the MCDI again 20 months later as part of a required workshop on specialty selection. This second data set allowed a longitudinal test of Hypothesis 5.

Subjects took the inventories under standard conditions. They read and followed the directions printed on the CP. There were no questions or discussion and all subjects produced usable data. CP answer sheets were scored by a commercial service. Instructions printed on the MCDI directed subjects to respond to each item with one of five alternatives on a likert-type format. The response alternatives are shown in Table 2.

Data Analyses

Both scale scores and a total score were computed from the MCDI items. Scale scores consist of the arithmetic sum of responses to the five items in each scale. The scale scores, which could range from 5 to 25, indicate the focus of vocational development. A score of 20 or more suggests that a subject has coped with the task represented by that scale. A score from 15 to 19 suggests that the task is the focus of coping whereas a score from 10 to 14 suggests that the task is the subject of concern and reflection. A score below 10 suggests that the task has not been encountered. The total score consists of the sum of the seven scale scores and indicates "absolute" degree of vocational development, that is, the place reached on the continuum of vocational development tasks of early adulthood. Comparing the total score with that of others in the same age group shows whether the subject is more or less mature than

peers. This comparison indicates the subject's "relative" degree or rate of vocational development (Crites, 1961). To sum up, three scores from the MCDI (scale raw scores, total raw score, and total percentile score) indicate focus, degree, and rate of vocational development.

To test the hypotheses several statistical analyses were conducted. Item and scale means and standard deviations were computed. Cronbach alpha coefficients were calculated for each scale and for the total inventory. Pearson product-moment correlation coefficients were computed between and among the items, scales, and total. An alpha factor analysis was performed on the item intercorrelation matrix. Scale and total scores were computed for each of the subgroups. Product-moment correlation coefficients were obtained between the external criterion variable, planfulness, and the seven scales and their composite total.

Gender differences could moderate the statistical relationships, therefore, item, scale, and total scores on the MCDI were correlated with sex.

TABLE 3
MCDI Item Intercorrelations Matrix

Item	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
01	1.00															
02	.39	1.00														
03	.48	.43	1.00													
04	.46	.52	.61	1.00												
05	.45	.65	.63	.68	1.00											
06	.43	.23	.38	.36	.38	1.00										
07	.35	.27	.41	.36	.46	.36	1.00									
08	.20	.27	.24	.16	.29	.19	.44	1.00								
09	.60	.42	.49	.49	.52	.38	.51	.44	1.00							
10	.12	.34	.13	.19	.23	.15	.23	.49	.28	1.00						
11	.23	.28	.39	.35	.29	.19	.32	.24	.26	.25	1.00					
12	.31	.33	.49	.37	.34	.17	.31	.22	.34	.16	.75	1.00				
13	.28	.26	.45	.32	.31	.20	.41	.22	.31	.12	.58	.70	1.00			
14	.29	.33	.35	.31	.35	.18	.30	.19	.39	.10	.26	.32	.31	1.00		
15	.28	.20	.33	.35	.32	.18	.21	.02	.34	.14	.31	.38	.34	.42	1.00	
16	.26	.38	.33	.42	.47	.20	.33	.28	.38	.20	.40	.46	.56	.29	.41	1.00
17	.19	.40	.26	.27	.33	.04	.29	.11	.32	.27	.25	.36	.33	.29	.38	.45
18	.09	.36	.15	.36	.36	.08	.22	.13	.30	.20	.03	.17	.13	.19	.14	.32
19	.24	.32	.35	.41	.41	.18	.41	.09	.36	.26	.25	.31	.31	.21	.31	.36
20	.20	.33	.27	.38	.37	.11	.30	.14	.32	.12	.37	.37	.35	.41	.43	.39
21	.12	.24	.20	.23	.27	.18	.16	.16	.29	.11	.18	.16	.21	.24	.15	.29
22	.16	.26	.17	.20	.25	.06	.20	.16	.30	.12	.18	.25	.36	.17	.26	.54
23	.17	.30	.23	.28	.28	.06	.19	.19	.29	.22	.25	.33	.32	.17	.31	.41
24	.13	.22	.18	.25	.27	-.05	.15	.13	.26	.11	.26	.30	.24	.13	.25	.37
25	.07	.12	.25	.22	.23	-.05	.14	.04	.18	-.08	.24	.26	.21	.10	.30	.29
26	.16	.11	.33	.27	.22	.06	.25	.11	.22	-.02	.21	.30	.25	.14	.33	.25
27	.09	.14	.15	.24	.19	.05	.15	.02	.18	-.03	.20	.24	.17	.11	.29	.27
28	.16	.14	.22	.20	.20	-.01	.29	.14	.19	.05	.22	.26	.17	.18	.26	.21
29	.08	.23	.14	.14	.20	.04	.20	.19	.20	.17	.26	.24	.16	.09	.26	.28
30	.17	.23	.12	.16	.17	.08	.17	.17	.21	.12	.21	.28	.17	.02	.27	.26
31	.26	.23	.11	.28	.26	.10	.13	.05	.20	.05	.09	.16	.06	.03	.23	.34
32	.26	.21	.12	.26	.22	.16	.13	.02	.18	.06	.05	.16	.00	.01	.27	.25
33	.26	.20	.09	.24	.26	.14	.17	.03	.19	.06	.07	.16	.01	.08	.27	.19
34	.25	.18	.15	.26	.23	.12	.15	.08	.24	-.01	.14	.24	.08	.07	.29	.26
35	.19	.16	.07	.16	.18	.05	.17	.03	.17	.13	.09	.13	.05	.04	.20	.10

When significant correlations appeared, separate tests of the hypotheses were required.

RESULTS AND DISCUSSION

All hypotheses were accepted. Correlation coefficients between gender and the MCDI variables ranged from $\geq .14$ to $+.13$, with none reaching significance at the .05 level of probability. Therefore, separate tests of the hypotheses were not necessary.

Alpha factor analysis of the item intercorrelation matrix shown in Table 3 extracted eight factors with eigenroots exceeding one. The first factor had a generalizability coefficient of .93 and accounted for 30% of the total variance. All 35 items loaded positively on this factor. The mean correlation between the items and the first factor was .53. Only two items loaded below .30 (viz., No. 6 = .28; No. 10 = .26). Combined with an average item intercorrelation of .28, the high first-factor concentration

TABLE 3—Continued

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1.00																		
.50	1.00																	
.65	.43	1.00																
.36	.24	.35	1.00															
.20	.07	.19	.25	1.00														
.39	.20	.26	.25	.64	1.00													
.41	.24	.34	.38	.43	.68	1.00												
.52	.26	.41	.41	.27	.45	.64	1.00											
.41	.18	.36	.37	.14	.29	.38	.75	1.00										
.37	.15	.33	.37	.00	.18	.26	.50	.70	1.00									
.44	.22	.37	.30	-.05	.14	.20	.47	.62	.75	1.00								
.37	.14	.29	.28	.05	.19	.19	.33	.50	.66	.64	1.00							
.31	.09	.29	.38	.16	.25	.27	.45	.54	.48	.52	.56	1.00						
.44	.23	.28	.32	.07	.24	.31	.50	.56	.61	.57	.62	.64	1.00					
.25	.13	.26	.27	.08	.22	.27	.37	.40	.52	.53	.55	.50	.59	1.00				
.25	.12	.23	.23	.02	.19	.25	.32	.36	.48	.50	.50	.48	.60	.92	1.00			
.24	.13	.26	.22	.03	.15	.20	.31	.33	.47	.52	.51	.49	.52	.80	.83	1.00		
.23	.08	.22	.36	.01	.16	.23	.37	.44	.55	.52	.44	.54	.56	.76	.80	.77	1.00	
.14	.08	.20	.31	-.04	.02	.04	.19	.26	.32	.38	.32	.44	.35	.44	.46	.59	.59	1.00

and substantial item loadings form a strong case (Comrey, 1973, p. 105) for the presence of a general factor in the MCDI (Hypothesis 1).

Consistent with the saturation of item variance in a general factor, the items attained a Cronbach coefficient α of .93. This index of homogeneity reflected a high degree of internal consistency among the items and justified reporting a total score for the MCDI. It also indicated that the inventory exceeded the minimum level of reliability needed to evaluate individual scores (Kelley, 1927).

Sufficient residual correlations remained after removal of the general factor to produce seven group factors with positive generalizability. The presence of seven group factors was consistent with the MCDI's intent to measure seven vocational development tasks (Hypothesis 2). The extracted factors were rotated in order to interpret the underlying factor constructs and compare these constructs to the MCDI scales. An equamax rotation served to break apart the general factor and spread the extracted variance evenly across the group factors. Varimax rotation could not be used for this purpose because of the MCDI's high internal consistency (Gorsuch, 1974, p. 192). All eight extracted factors with eigenroots greater than one were rotated so eight derived factors resulted. Six factors each corresponded to a single MCDI scale. Two other factors both corresponded to the occupational crystallization scale. It appeared that the "extra" group factor was created by separating the self-exploration (Factor 7) and the information gathering (Factor 6) aspects of crystallizing an occupational preference. It was concluded from the alpha factor analysis that a single general factor corresponding to global career development and seven group factors corresponding to specific vocational tasks were present in the MCDI. Table 4 shows the substantive correlations (.40 or greater) between the items and rotated factors. Three items correlated with two factors; the lower correlation of each pair is bracketed in Table 4.

The second consideration in determining how adequately the MCDI measured physician vocational development addressed the item variable level. The factor analytic results suggested that seven items did not correspond to the expected scale. To assess the appropriateness of item assignments to scales, Pearson product-moment correlation coefficients for items with scales and with the total are reported in Table 5. The correlations were corrected for the spurious element introduced by including the item itself in the scale and total scores. The correction for spuriousness was marked for the scales because they each contained only five items. When corrected, five of the items (Nos. 9, 11, 15, 20, 25) related more to the total than to their respective scale. Four of these five plus two others (item Nos. 6, 9, 11, 15, 19, 25) correlated higher with a scale other than its own when corrected for spuriousness. Based on the corrected correlations, seven items need further study to determine if they should

TABLE 4
Correlation of Items with Rotated Factors

Item	Factor 1 S	Factor 2 OI	Factor 3 CC	Factor 4 CI	Factor 5 OS	Factor 6 OC-Info	Factor 7 OC-Self	Factor 8 CS
1			.62					
2						.41		
3			.65					
4			.58					
5			.60					
6			.54					
7			(.40)					.41
8								.78
9			.55					
10								.60
11				.74				
12				.83				
13				.70				
14							.61	
15							.49	
16				.40				
17						.67		
18						.66		
19						.55		
20							.55	
21					.63			
22					.87			
23					.68			
24		(.48)			.49			
25		.74						
26		.79						
27		.68						
28		.61						
29		.45						
30	(.47)	.55						
31	.81							
32	.86							
33	.83							
34	.79							
35	.56							

be refined or reassigned. These results indicated that 80% of the item were keyed to the correct scale (Hypothesis 3).

The MCDI's high domain generalizability and reliability (.93) supported the conclusion that the inventory measured a narrow scope of human behavior. Whether or not this single domain was extensively covered was a separate question (Hypothesis 4). The primary information concerning how thoroughly the inventory represented the domain was the content outline shown in Table 1. It indicated that the measured portions of the

TABLE 5
Item Means, Standard Deviations, and Correlations with Scale and Total

Scale item	Mean	Standard deviation	Corrected correlation with total	Corrected correlation with scale
1 CC				
1	3.74	1.07	.43	.54
2	3.92	1.03	.56	.62
3	3.37	1.09	.51	.67
4	3.59	.99	.59	.72
5	3.79	1.14	.62	.79
2 CS				
6	4.01	.82	.26	.37
7	3.78	1.04	.49	.55
8	4.31	.93	.32	.56
9	3.57	1.01	.59	.58
10	4.33	.84	.29	.39
3 CI				
11	3.11	1.04	.63	.51
12	3.18	1.21	.61	.68
13	3.73	1.21	.37	.49
14	3.45	1.12	.57	.62
15	3.08	1.34	.59	.44
4 OC				
16	3.20	.92	.48	.61
17	2.86	.96	.58	.70
18	3.03	.98	.51	.62
19	2.76	1.31	.38	.41
20	2.28	1.24	.53	.48
5 OS				
21	3.38	1.20	.30	.49
22	2.93	1.14	.47	.70
23	2.45	1.02	.52	.71
24	2.25	.96	.60	.68
25	2.09	.90	.57	.47
6 OI				
26	1.90	.87	.59	.74
27	1.95	.85	.56	.76
28	2.03	.97	.53	.76
29	2.06	.98	.54	.65
30	1.94	.84	.59	.73
7 S				
31	1.84	.79	.56	.83
32	1.83	.79	.54	.86
33	1.83	.81	.53	.86
34	1.72	.77	.56	.84
35	2.00	.96	.39	.56

vocational continuum broadly spanned and adequately differentiated the domain. Further evidence relevant to the question of representativeness came from consideration of the scales. As shown in Table 6, Cronbach α coefficients for the scales ranged from .73 to .91. This indicated that each scale focused on a single task in the sequence, presumably the task specified for that period in the content outline (Hypothesis 4). The average interitem correlation for the scales (.50) was higher than the average interitem correlation for the inventory (.28). The scales displayed a moderate correlation (mean $r = .69$; $S.D. = .10$) with the composite total score. The average intercorrelation among adjacent scales was moderate (.55) and the average interscale correlations among nonadjacent scales was lower (.34). Each scale assessed a portion of the continuum most similar to its adjacent portions and progressively less similar to successively more remote portions (Hypothesis 2). Taken together, the results suggested that the scales generalize to a vocational development continuum and that they extensively span this continuum.

It may be concluded from the item, scale, and factor analyses that each scale contributed both unique and common variance to the measurement of the domain. Each scale assessed a specific vocational development task (group factor) yet the scales interrelated to constitute a continuum reflecting a construct of career development (general factor).

The mean scores reported in Table 7 largely coincided with the temporal sequence underlying the vocational development continuum (Hypothesis 5). Mean scores on the inventory consistently increased from subgroup 1 to subgroup 3B. In addition, the mean scale scores for the total group decreased from scale 1 through scale 7 with but one exception. The career specification scale mean (19.90) was greater than the career crystallization scale mean (18.41). This inversion suggested that the subjects were committed to becoming physicians although they had not adequately established a personal identity or thoroughly explored alternative careers. A post hoc analysis tentatively supported this interpretation. Subgroup 3 contained 24 student-physicians who entered the BS/MD program during Year 3 after they had earned a bachelor's degree elsewhere. This group was both older and had more years of education than the other 56 subjects in subgroup 3. The 24 subjects' mean score was higher on crystallization than on specification while the means for the remaining 56 subjects still revealed the anomalous inversion. The possibility of "pseudocrystallization" is a recognized risk inherent to accelerated induction into a profession. A competing interpretation of these results attributes the inversion in scale mean order to inadequacies in the career specification scale. The factor analysis of MCDI items indicated that career specification was the weakest factor, only three items from the career specification scale loaded on it and one of these (No. 7) loaded almost as highly on the career crystallization factor. Both the factor

TABLE 6
Scale and Inventory Intercorrelations, α Coefficients, and Correlations with Planfulness

Scale	α	Planfulness	1 (CC)	2 (CS)	3 (CI)	4 (OC)	5 (OS)	6 (OI)	7 (S)	Total
(CC) 1	.85	.47***	1.00							
(CS) 2	.73	.15	.58***	1.00						
(CI) 3	.77	.42***	.55***	.41***	1.00					
(OC) 4	.77	.30**	.56***	.46***	.57***	1.00				
(OS) 5	.81	.21	.35***	.27***	.39***	.60***	1.00			
(OI) 6	.89	.24*	.26**	.21**	.35***	.48***	.49***	1.00		
(S) 7	.91	.16	.27***	.17*	.14	.30***	.28***	.63***	1.00	
Total	.93	.41***	.73***	.62***	.73***	.81***	.71***	.69***	.55***	1.00

* $p < .05$. ** $p < .01$. *** $p < .001$.

TABLE 7
MCDI Means and Standard Deviations for Subgroups

Scale	Total ($N = 160$)		1 ($N = 53$)		2 ($N = 27$)		3 ($N = 80$)		3B ($N = 76$)	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
(CC) 1	18.41	4.05	16.89	4.09	16.19	4.62	20.16	3.35	18.72	3.53
(CS) 2	19.90	3.37	19.02	3.55	19.44	3.26	20.64	3.11	20.26	2.85
(CI) 3	16.49	4.12	14.68	4.54	15.44	3.64	18.04	3.62	17.62	3.34
(OC) 4	14.17	3.99	12.38	3.40	12.15	3.61	16.03	3.57	17.41	3.50
(OS) 5	13.13	3.99	12.10	3.98	12.00	2.95	14.20	4.02	17.05	3.34
(OI) 6	10.02	3.91	8.75	2.90	9.37	3.25	11.08	4.38	11.29	3.04
(S) 7	9.36	3.66	9.19	3.67	9.15	2.69	9.54	3.91	8.70	3.30
Total	101.27	20.29	92.5	18.83	93.8	17.39	109.6	18.65	110.79	15.67

analysis and the item-scale correlations indicated that two career specification scale items (Nos. 6, 9) should be keyed to the career crystallization scale. Yet these findings do not completely explain the inversion in scale mean order because the best two specification scale items (Nos. 8, 10) had the highest means of any items in the inventory. Further research is required to determine if the inversion is a function of the inventory or BS/MD programs, but the present results do indicate that the career specification scale needs additional work.

More data pertinent to Hypothesis 5 were available in the pattern of means for the four subgroups. The order of scale means *within* each subgroup was the same as the order of scale means within the total group with one minor deviation: in subgroup 1 the mean for scale 7 (9.19) was higher than the mean for scale 6 (8.75). The pattern of scale means *across* subgroups was markedly different from the pattern of inventory means across subgroups. The inventory mean scores consistently increased from subgroup 1 through subgroup 3B but only one of the seven scales (No. 6) showed this pattern. Although a monotonic increase of scale mean scores across subgroups was predicted, examination of the means between rows in Table 7 revealed that 13 increased but 9 decreased. The most striking example of unexpected decreases occurred between subgroups 3 and 3B.

Comparison of subgroups 3 and 3B provided the best test of the developmental hypothesis as it pertained to scale means. The mean scores for subgroups 3 and 3B allowed a longitudinal comparison whereas the mean scores for subgroups 1, 2, and 3 allowed only a cross-sectional comparison. Furthermore, subgroup 3 included more subjects than did subgroups 1 or 2. Comparison of scale means for subgroup 3 at two points in time indicated that the means for the three occupational task scales each increased as expected, but the means for the three career task scales each decreased. Although this may reflect a deficiency in the MCDI, a competing hypothesis is that the pattern of scale scores reflected a "crisis" point in the subjects' vocational development. The scores indicated that as the subjects progressed from Year 3 to Year 5, they focused on the task of specifying an occupational choice. The mean on this scale increased from 14.2 to 17.05. This 2.85 increase was greater than the increase on the other two occupational task scales: 1.38 on scale 4 and .21 on scale 6. Instead of increasing, all three career task scales decreased. The decrease on the career crystallization scale (-1.44) was much greater than the decrease on the career specification scale ($-.38$) and the career implementation scale ($-.42$). This comparison suggested that the focus of career task "recycling" was crystallizing a career preference. A single interpretation integrated all this data: The subjects in subgroup 3B had specified a medical career and implemented this preference by attending medical school without adequately crystallizing

a personal identity (inversion of scales 1 and 2). In Year 5, they focused on specifying an occupational preference but choosing a medical specialty was particularly difficult because they had not yet formed an identity to use as the criterion for specialty choice. Consequently, they revisited the career crystallization task in order to develop an adequate foundation for dealing with the occupational specification task.

Ordering the scales by their means also indicated that the task of implementing a career choice preceded the task of crystallizing a specialty preference. Although the occupational crystallization scale was presented in the inventory booklet before the career implementation scale, the career implementation scale attained a higher mean (14.68) than did the occupational crystallization scale (12.38). Apparently when the subjects began medical school, they had not yet considered which medical specialty to choose. Accordingly, the three scales in the career cycle should be placed in the inventory before the three scales in the occupational cycle. The item arrangement in Table 2 does this. In sum, the data concerning mean and patterns largely supported Hypothesis 5 but some inconsistencies must be clarified by further research.

Table 6 shows the correlation coefficients obtained between career planfulness and the MCDI total and scale scores (Hypothesis 6). Planfulness significantly correlated with the total score ($r = .41, p < .001$), thereby supporting the MCDI's criterion validity. The criterion variable differentially correlated with the MCDI's scales. Planfulness was linked to career crystallization ($r = .47, p < .001$) and implementation ($r = .42, p < .001$), and to occupational crystallization ($r = .30, p < .01$) and implementation ($r = .24, p < .05$). Planfulness did not significantly correlate with the two specification scales. This finding offered preliminary evidence that the crystallization and specification scales measure different constructs. Furthermore, it was cogent that planfulness did not correlate with specification because the specification scales purported to focus more on evaluation of and confidence in a plan than on making a plan.

SUMMARY

The results of this evaluation of the MCDI indicated that it is possible to construct a measure of vocational development for a population of adults encountering a common set of vocational development tasks. The MCDI appeared to assess a general factor of vocational development. The items constituted a highly homogeneous measure, with the total score representing this common variance. Most of the items were keyed to the correct scale but seven items need additional work. MCDI scales appeared to assess focus of vocational development. Scales were internally consistent and formed clusters of similar coping behaviors germane to dealing with distinct vocational development tasks. Each scale contributed both common and unique variance to the measurement of vocational

development. The scales interrelated highly enough so that their common variance constituted a construct of vocational development, as also evidenced by each scale's correlation with the composite total score and by the factor analysis.

The task/time sequence of the scales conformed to vocational development theory in that older student-physicians attained higher total scores and, when the career implementation and occupational crystallization tasks were reordered, the scale means produced a monotonic decreasing pattern. This finding supported the validity of the inventory as a measure of degree of vocational development. Finally, the MCDI exhibited a certain external validity because the total score related to a dimension of career maturity as theory predicted.

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