DEVELOPMENT AND VALIDATION OF THE CAREER DECISION MAKING INDICATOR (CDMI) USING EXPLORATORY AND CONFIRMATORY FACTOR ANALYSIS

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ABSTRACT

Using data from 1880z high school students, a series of five studies developed and validated a measure of the career decision-making tailored to adolescents, the Career Decision Making Indicator (CDMI). The CDMI measure the individual along eight dimensions: Decidedness, Comfort, Career Choice Anxiety, External Barrier, Need for Information, Readiness, Career Salience, and Inconsistent Information. The instrument has been validated through a scientific method to ensure its reliability and validity. Two advanced statistical methods were used, namely: Exploratory factor analysis (EFA) and Confirmatory factors analysis (CFA). EFA was used to identify the underlying dimensions of each construct of the instrument. CFA is used to confirm the dimensions and to analyze the fitness of the data collected in the hypothesized model. The results provide evidence that the developed instrument achieved sound psychometric properties. The overall reliability value of Cronbach's Alpha was .935. The result of EFA showed that, the CDMI constructs produced eight significant factors. The CFA results showed that the goodness-of-fit indices for the model were as follows: χ^2=1674.711, df= 674, CMIN/df= 2.485, CFI=.917, GFI= .930, AGFI= .919, PCOLOSE =1.00 and RMSEA =.036; each of the indices was above the threshold values. Results are discussed in terms of implications for future research and career development efforts.

INTRODUCTION

Career indecision is a multidimensional, client problem that is applicable to a differential diagnostic approach and is influenced by cultural factors (Gati, krausz, & Osipow 1996b; Tak & Lee 2002). It is faced by many school students, college students, and adult. Career counseling psychologists should clearly understand the causes and types of problems clients face when choosing a career to assist them. Career counselors can classify students, who are clear or unclear on their future careers, establish differentiated interventional strategies based on individual needs, and differentiate students with chronic problems, through the course of vocational assessment (Tak & lee 2002). A career counselor should also differentiate the types and causes of problems the client has in order to achieve the above objectives. Several measures of career indecision have been developed for differentiating among persons who are undecided about their career choice, thus that career interventions can be better adapted to meet their needs such as: the Career Decision Scale and the Career Decision Scale (CDS; Osipow, Carney, Winer, Yanico & Koschier, 1976).

Many researchers in career decision-making conclude that Career decision making can be attributed by cultural factors (Fouad 1993; Gati, Garty & Fassa 1996a). An individualôs decision is a by-product of the relationships between individualôs psychological traits, his or her sense of value of an occupation, and alternatives which is often large and affected by the length of training, the degree of dependence, and the type of relationships with people (Gati, Osipow, & Givon, 1995). Thus, the career decision-making is directly affected by oneôs own cultural and social specificity. This study attempt to contribute to the literature by construction of a reliable and valid instrument to assess career decision-making construct.

PURPOSE

The purpose of this study was to develop a scale that evaluates factors affect the career decision applicable to Omani high school students.

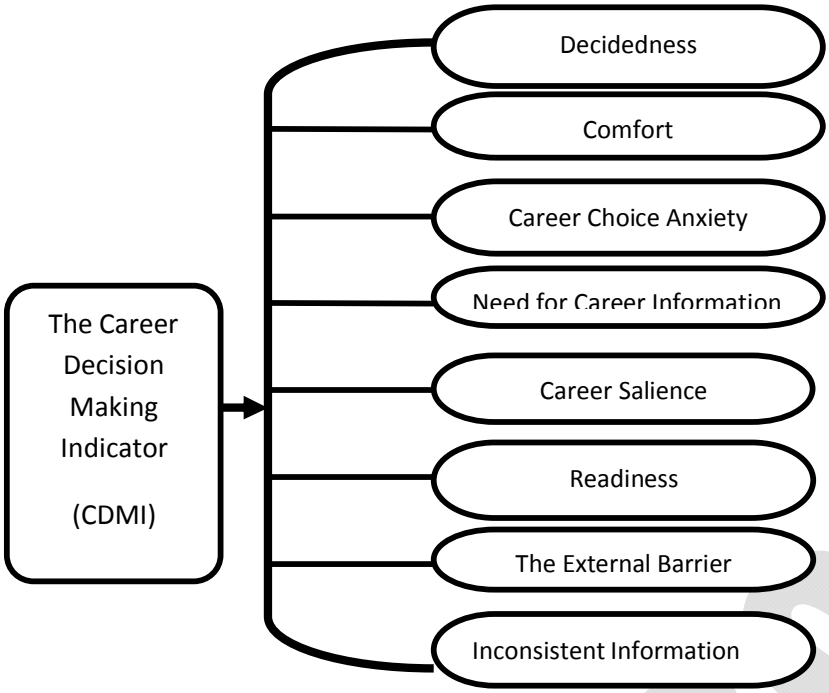
METHOD

Population and Participants

The populations for this study were from high school students in the Sultanate of Oman. The participants constituted 1880 students from the 10th, 11th, and 12th grade, who were randomly selected from the graduating class of 2008 in the Sultanate of Oman. Stratified Random Sampling methods were used to select the participants. Five different samples were used in this study, which were randomly selected from the graduating class of 2008 from three regions. Students were aged of 14 - 18 years old, with an average age of 16.5, S.D = 1.13. They were all Muslims having Arabic as their mother tongue.

The development of the Career Decision Making Indicator

The new instrument (The Career Decision Making Indicators) attempts to measure the individual along three dimensions: Decidedness, Comfort, and Reasons for Indecision. The last dimension attempt to cover several dimensions based on the review of the career decision-making literature. The Taxonomy of Difficulties in Career Decision Making proposed by Gati, krausz and Osipow (1996b) was based on decision theory. It is including three major categories of difficulties, namely Lack of Readiness, Lack of Information, and Inconsistent Information, which are further divided into 10 specific difficulty areas. These categories were derived also from the cause dimensions of the Missouri Diagnostic Plan (Callis 1965). Moreover, a review of the career decision making literature indicates that informational and personal- emotional dimensions can be subdivided into two information factors (Need for Career Information and Need for Self-Knowledge) and three personal-emotional factors (Self-Esteem, Career Choice Anxiety, and Generalized Indecisiveness) (Chartrand, Robbins, Morrill, & Boggs, 1990). Seven dimensions from this review will be included in the new instrument beside it include a dimension of External Barrier. The External Barrier includes items of financial difficulty, family consideration, religious constraints, and the tendency for academy cliques to dominate, and representing factors specific to the culture of Oman. The summarized contents of the instrument and its dimensions are presented below.



STUDY 1

Overview

The purpose of this study was initial scale construction and reliability analysis. A preliminary pool of items was generated from the literature on career decision-making, interviews with adolescents, and interviews with professionals who were providing psychological services to adolescents. This pool supplements items from previously published career decision-making questionnaires besides the professional recommendations. Moreover, students participate in this study were asked an open-ended question, ñDescribe ten reasons why you have difficulty in deciding on a future careerò. A total of 97 items selected for the first version of the CDMI, were those agreed upon by a majority of judges as being content-valid.

Participants

Two hundred and fifty four students (123 males and 131 females) from the 10th, 11th, and 12th grade participated in the study, aged 14-19 years old, with an average age of 16.66, S.D =1.025.

Measures

The Career Decision Making Indicator (CDMI) measures the individual along eight dimensions: Decidedness, Comfort, Career Choice Anxiety, External Barrier, Need for Information, Readiness, Career Salience, and Inconsistent Information. The first version of the CDMI consists of 97 items with Decidedness measured by 12 items, Comfort by 8 items, Career Choice Anxiety by 10 items, External Barrier by 10 items, Need for Information by 16 items,

Readiness by 13 items, Career Salience by 16 items, and Inconsistent Information by 12 items. The items follow a Likert-type format consisting of statements with which respondents are asked to express agreement or disagreement by selecting one of five labeled choices (strongly disagree, disagree, neutral/undecided, agree, strongly agree).

Procedures

Data was collected through distribution of questionnaires among the selected sample. The distribution of questionnaires was assisted by several Vocational guidance specialists from schools. Prior to that, the researcher gave a short explanation to the Vocational guidance specialists regarding the scales which are used in this study, its purpose and the instructions needed to be given to the respondents. The data collection process was completed within a period of two weeks.

Results and discussion

Internal consistency reliability for each of the CDMI dimensions was assessed by Cronbahôs alpha. Eleven items were deleted from the total scale, in an effort to increase the scale reliability. Coefficient alphas for the CDMI were .75 for Decidedness, .67 for Comfort, .73 for Career Choice Anxiety, .65 for External Barrier, .81 for Need for Information, .70 for Readiness .79 for Career Salience and .79 for Inconsistent Information. The internal consistency reliabilities were regarded as an acceptable to good level of reliability.

STUDY 2

Overview

The purpose of this study was to conduct an exploratory factor analysis of the CDMI. Exploratory factor analysis (EFA) is a primarily data-driven technique for discovering what underlying structure the sample data could process (Bollen 1989). It can be used for two main purposes in scale development: (a) to reduce the number of items in a scale so that the remaining items maximize the explained variance in the scale and maximize the scaleôs reliability and (b) to identify potential underling dimensions in a scale (Netemeyer et al 2003).

Participants

A total of 457 students (230 males and 227 females) from the 10th, 11th, and 12th grade participated in the study, aged 12-20 years old, with an average age of 16.24, S.D =1.127.

Measures

The CDMI was used for this study, after making minor wording changes in three items. Coefficient Alpha for the CDMI were .75 for Decidedness, .67 for Comfort, .73 for Career Choice Anxiety, .65 for External Barrier, .81 for Need for Information, .70 for Readiness .79 for Career Salience and .79 for Inconsistent Information.

Procedures

Data was collected through distribution of questionnaires among the selected sample.

Results and discussion

Exploratory Factor Analysis using Varimax rotation with Kaiser Normalization was selected due to the goal of the researcher to reduce a larger number of variables to a smaller set of uncorrelated variables (Hair et al. 2006). The data indicated that the measure for sampling adequacy (MSA) for all variables fulfill over the acceptable level of .60.

As shown in table 1, the analysis of the CDMI instrument produced eight significant factors, which accounted for 51.245% of total variance explained. The first factor was labeled ñReadinessò, a total of 10 items loaded in this factor, which accounted for 26.4 % of the scale variance. Second factor explained 6.8% of variance and included 8 items. This factor was labeled ñNeed for Informationò. The third identified factor was ñCareer Salienceò, which accounted for 5.8% of scale variance and 4 items with above .40 loaded on it. The fourth factor was labeled ñcomfortò, a total of 6 items loaded in this factor, which accounted for 2.8% of variance explained. Fifth factor was labeled ñExternal Barrierò and explained 2.7% of variance. It included 7 items with loading above .40. The sixth identified factor was ñInconsistent Informationò, which accounted for 2.4 % of scale variance and 6 items with above .40 loaded on it. The seventh identified factor was ñDecidednessò, which accounted for 2.3 % of scale variance and 4 items with a load above .40 on it. The final factor was labeled ñCareer Choice Anxietyò, which accounted for 2.2% of variance, and only three items loaded on it. A total of 28 items was lost due to low loadings with their a priori assigned scales and only 48 items remained and used in the next analysis.

Table 1: Rotated Component Matrix for the CDMI instrument

Item	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8
CR4	**.641** **.623** **.562** **.529** **.523** **.522** **.506** **.485** **.450** **.432**	.168	.152	.102	.127	.153 53.092	.150	.061
CR5	**.623**	.308	.085	.124	.125	.092	.043	.207
CR3	**.562**	.148	-.033	.144	.151	.168	.024	-.069
CR6	**.529**	.352	.119	.019	.107	.145	.062	.102
CR1	**.523**	.229	.182	.141	.361	.063	.058	-.005

CH5	**.522**	.190	.180	.093	.026	.333	.080	.120
CH6	**.506**	.206	.150	.055	.200	.053	.121	.276
CD6	**.485**	.228	.257	.223	.211	.145	.091	.060
CR2	**.450**	.324	.130	.048	.078	.174	.068	.378
CD5	**.432**	.184	.191	.287	.230	.278	.073	-.169
CN14	.239	**.662**	.116	-.026	.083	.116	.138	.041
CN12	.275	**.617**	.217	.104	-.141	082	-.001	.081
CN15	.192	**.573**	.179	.042	.162	.194	.140	.004
CN10	.317	**.564**	.156	.130	.060	.167	.009	.194
CN7	.268	**.547**	.104	.213	.092	.002	-.085	-.018
CN2	.013	**.524**	-.086	-153	.232	.369	.224	-.088
CI9	.135	**.523**	.009	.154	.233	.116	-.101	.227
CN8	.255	**.496**	-.021	.060	.173	.347	.058	.017
CS8	.156	.109	**.758**	.038	.248	.079	.073	-.023
CS9	.163	.151	**.741**	.061	.190	.132	.089	.020
CS12	.132	.098	**.631**	.090	.348	.097	.073	-.018
CN16	.169	.328	**.552**	.169	.211	.160	.035	.056
CO4	.167	.170	.074	**.659**	.004	.092	.263	.006
CO3	.109	.049	.089	**.652**	-.027	.163	.092	.152
CO1	.125	-.053	.101	**.643**	.044	.255	.104	.071
CO2	.108	.130	.071	**.637**	.013	.054	.288	-.060
CD10	.075	.009	-.094	**.452**	.093	.020	.228	.440
CD4	.039	.160	-.021	**.424**	-.032	.043	.418	.204
CE6	.084	.211	.053	.090	**.654**	043.056 .056	-.196	.130
CE5	.299	-.013	.235	.059	**.632**	.025	.025	-.021
CE7	.242	.015	.148	-.114	**.580**	.077	.020	-.152
CE3	.043	.138	.345	.012	**.542**	.208	.167	.044

CD2	.071	.073	.402	-.034	**.522**	.079	.107	.014
CI11	.083	.346	.244	.041	**.442**	.151	.097	.156
CH9	.258	.270	.284	-.006	**.400**	.038	.174	.188
CI5	.091	.110	.240	.241	.166	**.600**	-.026	.025
CI1	.187	.115	.175	.201	.150	**.592**	.112	.106
C112	.199	.249	.066	.193	.097	**.569**	123	.087
CI6	.350	.252	.177	.123	-.072	**.475**	-.078	.181
CI4	.339	.355	.029	.047	.079	**.457**	.102	.098
CI3	.340	.361	.007	.163	.074	**.403**	-.034	.070
CD7	.119	.043	-.051	.241	.103	.036	**.648**	.086
CD11	.046	.039	.147	.149	.020	.060	**.639**	.094
CD9	.123	.129	.121	.351	-.046	.080	**.624**	.107
CD4	.059	-.130	.413	.140	.042	.011	**.509**	-.083
CH2	-.039	.147	.035	.351	-.027	-.039	203	**.650**
CH1	.321	.028	-.021	.010	.017	.321	.030	**.602**
CH3	.362	.198	-.017	-.090	.020	.388	.056	**.472**
Eigen value	**12.69**	**3.27**	**2.77**	**1.32**	**1.28**	**1.14**	**1.09**	**1.05**
Percentage of variance	**26.4**	**6.8**	**5.8**	**2.8**	**2.7**	**2.4**	**2.3**	**2.2**

STUDY 3

Overview

The purpose of this study was to conduct a confirmatory factor analysis of the CDMI. The CFA was used to confirm the exploratory model. CFA is a structural equation modeling technique used to determine the goodness of fit between a hypothesized model and the sample data (Kline 2005).

The following goodness-of-fit indices were used to assess the degree of fit between the model and the sample: The Minimum Fit Function Chi-Square χ^2, the minimum value of discrepancy between the observed data and the hypothesized model divided by the degrees of freedom (CMIN/df), the Comparative Fit Index (CFI), Root Mean Square error of approximation

(RMSEA), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI) and P-values (PCLOSE). Thus, in this case, the value for the CIMN/df with a value of between 2 and 5 is considered acceptable. The possible values of GFI, CFI and AGFI range from zero to one, with values close to one showing a good fit. The value of RMSEA of .08 or less shows a reasonable error of estimation (Kline, 2005; Byrne, 2001).

Participants

A total of 959 students (400 males and 559 females) from the 10th, 11th, and 12th grade participated in the study, aged 12-21 years old, with an average age of 16.52, S.D =1.135.

Procedures

Data was collected through distribution of the CDMI among the selected.

Results and Discussion

The eight-factor solution derived from the EFA was cross-validated on 959 participants retained from the overall sample on which EFA was conducted. The initial model was run and resulted in a poor fit. Nine items were removed from the instrument because it cross-loaded on more than one factor and this resulted in an improved for the model. Figure 2 shows the final CFA for the sample.

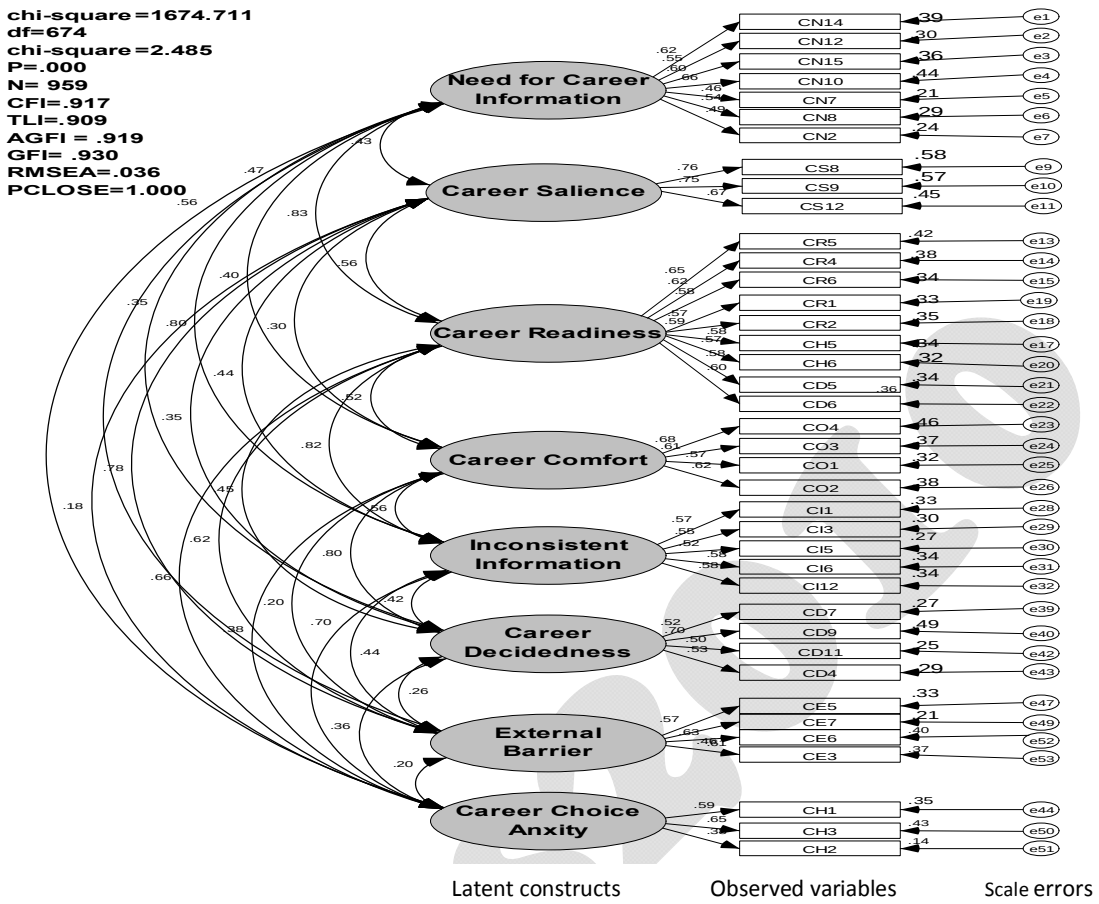


Figure 2: The Measurement Model for CDMI

The CFA results showed an adequate fit to study data, except the ɑ2 value is significant that is due to the large sample size, other indices are all fulfilled to the suggesting requirements for an adequate model (Bentler 1990; Bollen 1989). The goodness-of-fit indices for the hypothesized model were as follows: ɑ2 =1802.559, df= 712, CMIN/df= 2.485, CFI=.913, GFI= .927, AGFI= .916, PCOLOSE =1.00 and RMSEA =.036; each of the indices was above the threshold values.

STUDY 4

Overview

The purpose of this study was to examine the convergent validity of the CDMI by correlating measures of each the career decision-making constructs from the CDMI with measures of corresponding constructs assessed by the Career Decision Scale (CDS: Osipow, Carney, Winer, Yanico & Koschier, 1976), and with the Career Decision Difficulties Questionnaire (CDDQ: Gati, krausz, & Osipow, 1996a).

Participants

A total of 160 students (60 males and 100 females) from the 10th, 11th, and 12th grade participated in the study, aged 15-20 years old, with an average age of 17.13, S.D =.762.

Measures

The CDMI measures the individual along eight dimensions: Decidedness, Comfort, Career Choice Anxiety, External Barrier, Need for Information, Readiness, Career Salience, and Inconsistent Information. It consists of 39 items with Decidedness measured by 4 items, Comfort by 4 items, Career Choice Anxiety by 3 items, External Barrier by 4 items, Need for Information by 7 items, Readiness by 9 items, Career Salience by 3 items, and Inconsistent Information by 5 items. The items follow a Likert-type format consisting of statements with which respondents are asked to express agreement or disagreement by selecting one of five labeled choices (strongly disagree, disagree, neutral/undecided, agree, strongly agree).

The Career Decision Scale (Osipow, Carney, Winer, Yanico & Koschier, 1976), measures the extent of certainty regarding a career and the antecedents of career indecision. It consists of 18 items, with Items 1 and 2 reflecting career choice certainty. Items 3 through 18 represent antecedents of career indecision. The items follow a Likert-type format and scores range from 1 ñNot at all like meò to 4 ñExactly like meò. High scores on the first two items reflect certainty, whereas high scores on the remaining items are indicative of indecision. A factor analysis of the 16 antecedent items revealed four factors: (1) lack of structure and confidence, (2) perceived external barriers, (3) positive choice conflict, and (4) personal conflict (Osipow, Carney, Winer, Yanico & Koschier, 1976).

The Career Decision Difficulties Questionnaire (CDDQ; Gati, krausz, & Osipow, 1996b), measures three main categories of career decision making difficulty: Lack of Readiness (R), Lack of Information (L), and Inconsistent Information. These three categories are further subdivided into a number of sub-scales. Lack of Readiness incorporates Lack of Motivation (3 items), Indecisiveness (4 items), and Dysfunctional Myths (3 items). The second category, Lack of Information, is subdivided into Lack of Knowledge about the Process (3 items), Lack of Knowledge about the Self (8 items), Lack of Knowledge about Occupations (4 items), and Lack of Knowledge about How to Access Additional Sources of Information (2 items). The third category, Inconsistent Information, consists of Unreliable Information (6 items), Internal Conflicts (7 items), and External Conflicts (4 items). The scale also yields a total score which is an indication of the severity of difficulties being faced by an individual respondent.

Procedures

The CDMI and CDS were administrated to a random sample of 120 students. While, the CDMI and the CDDQ were administrated to a random sample of 40 students. They were asked to answer both of these instruments and return it to the researcher one week later.

Results and Discussion

Table 2 displays the correlations for common constructs from the CDMI and the CDS. As can be seen in table 2, the results provided support for the convergent validity of the CDMI. It was expected that since both the CDS and CDMI are measures of reasons of indecision, there would be a positive relationship between five scales from the CDMI namely: Need for Career Information (CN), Readiness (CR) Inconsistent Information (CI), Career Choice Anxiety (CH) and Career Salience (CS), with the Indecision scale from the CDS. It was also expected that Decidedness and Comfort Scales would be positively correlated with the certainty scale from the CDS. The results confirm this expectation.

Table 2: Correlations between Scales from the CDMI and the CDS main scale

CDS Scale / **CDMI Scales**	**Certainty scale**	**Indecision scale**
Career Decidedness (CD)	**.439****	-261**
Career Comfort (CO)	**.382****	-.386**
Career Choice Anxiety (CH)	-.241**	**.354****
Need for Career Information (CN)	-.211*	**.390****
Career Salience (CS)	-.222*	**.520****
Readiness (CR)	-.048	**.385****
Inconsistent Information(CI)	-.054	**.186***
External Barrier (CE)	-.038	**.471****

Table 3 displays the correlations for common constructs from the CDMI and the CDDQ. As can be seen in table 3, the results provided support for the convergent validity of the CDMI. It was expected that since both the CDDQ and CDMI are measures of problems in career decision-making, there would be a strong relationship between three scales from the CDMI namely: Need for Career Information (CN), Readiness (CR) Inconsistent Information (CI), with three scales from the CDDQ namely: Lack of Readiness (R), Lack of Information (L), and Inconsistent Information from the CDDQ. Indeed, most of the CDMI scales revealed statistically significant positive correlations with the CDDQ, with the expectation of the Decidedness (r=-.033) and the Comfort (r=-.069) scales. The Readiness (r=.703), Need for Career Information (r= .565), and the Inconsistent Information (r=.400) scales tied for the highest correlation with the CDDQ as was expected.

Table 3: Correlations between Scales from the CDMI and the CDDQ main scale

CDDQ scales / CDMI Scales	Lack of Readiness	Inconsistent Information	Lack of Information
Decidedness	-.033	-.069	-.128
Comfort	-.121	.005	.043
Career Choice Anxiety	.130	.223	.272
Need for Career	.030	.360	**.565****
Career Salience	.444*	.029	.016
Readiness	**.703****	.251	.498**

Inconsistent Information	.091	**.400***	.394*
External Barrier	.270	.275	.467**

STUDY 5

Overview

The purpose of this study was to examine the test-retest reliability of the CDMI.

Participants

A total of 50 students (16 males and 34 females) from the 10th, 11th, and 12th grade participated in the study, aged 14-16 years old, with an average age of 15.28, S.D =.536.

Procedures

Students were asked to complete the final draft of the CDMI a second time after 6 weeks from the initial response.

Results And Discussion

The overall Alpha for the CDMI is equal to .943, which can be considered ‘excellent’. Subscale test-retest reliability estimates for the CDMI sub-scales were as follows: Decidedness .80, Comfort .77, Career Choice Anxiety .78, External Barrier .75, Need for Information .86, Readiness .79, Career Salience .81, and Inconsistent Information .81. These results represent a moderate level of reliability.

General Discussion

The present series of studies, which involved a total of 1880 students at different schools and grade level, was successful in developing a reliable and valid measure of adolescent career decision-making constructs. The CDMI Total demonstrated high reliability (Ŭ = .94) compared with other instruments with similar intent. For example, the Career Decision Scale (CDS) consistently showed internal consistency in the .80s and test-retest coefficients from .82 to .90 for the Indecision Scale (Osipow, Carney, Winer, Yanico & Koschier, 1976). Career Decision making Difficulties Questionnaire (CDDQ) received an alpha coefficient of .94 for the total test and a range of .63 to .95 for the three sub-scales (Gati, krausz, & Osipow, 1996b). Moreover, the Career Decision Profile (CDP) consistently showed internal consistency in the .70s, ranging from .66 to .80 for the six sub-scales (Jones 1989). The internal consistency reliability ranged from .65 to .81 for the eight CDMI sub-scales, scales with reliabilities ranging from .65 to .73 are in need of further development.

The results of the exploratory factor analysis and confirmatory factor confirmed the eight-factor structure of the CDMI. The findings of study 4 demonstrate evidence for the convergent validity of the CDMI has been demonstrated through its significant positive correlation with the Career Decision Scale (CDS: Osipow, Carney, Winer, Yanico & Koschier,

1976) beside The Career Decision Difficulties Questionnaire (CDDQ; Gati, krausz, & Osipow, 1996b).

In conclusion, this series of five studies provides multiple forms of evidence for the psychometric integrity of the Career Decision Making Indicator (CDMI), a measure of the career decision-making constructs designed specifically for adolescents. Hopefully, future studies in the CDMI can extend its validation as well as inform adolescent theory and research.

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