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# Psychometric Properties of the Career Clusters Interest Survey

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**Abstract**

The current study examined the psychometric support of the Career Clusters Interest Survey (CCIS) that provides subscales scores for the 16 Office of Vocational and Adult Education (OVAE) career clusters in a sample of 203 college students. Reliability of the subscales was supported with respect to internal consistency and 2-week stability estimates. A principal components analysis (PCA) of the subscale scores revealed that the CCIS yielded only two factors, a general one and one capturing People/Things. Correlation of these components with interest scores from the Personal Globe Inventory (PGI) revealed that the CCIS scales captured only the People/Things dimension while not covering the Data/Ideas dimension or prestige. So, the instrument represents a very restricted range of interests. In addition, the agreement of the cluster scores from the CCIS with those provided by the PGI was very low. So, reliability support was provided but questions about the validity of the CCIS with respect to its coverage of the interest domain were yielded. Using the CCIS to guide students could result in a very restricted examination of occupations.

**Keywords**

Career Clusters Interest Survey, career assessment, career clusters, vocational interests, Personal Globe Inventory

The Career Clusters Interest Survey (CCIS) is a unique career interest survey developed to provide interest information to users that corresponds with the 16 career clusters created by the U. S. Department of Education, Office of Vocational and Adult Education (OVAE). These 16 clusters are (a) Agriculture, food and natural resources, (b) Architecture and construction, (c) Arts, audio/video (A/V) technology, and communications, (d) Business, management, and administration, (e) Education and training, (f) Finance, (g) Government and public administration, (h) Health science, (i) Hospitality and tourism, (j) Human services, (k) Information technology, (l) Law, public safety, corrections, and security, (m) Manufacturing, (n) Marketing, sales, and service (o) Science, technology, engineering, and mathematics, and (p) Transportation, distribution, and logistics. In 2001, the OVAE required that states use career clusters as one way to report student enrollment for the Perkins accountability requirements (Ruffing, 2006). Perkins accountability requirements are federal requirements, which are tied to the Carl D. Perkins Vocational and Technical Education Act,

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initially passed in 1984. Under the most recent Perkins legislation, schools are required to demonstrate that they are offering vocational and technical curricula to students enrolled in high schools across the United States. The creators of the CCIS, the Career Clusters Institute, recognized the need for an assessment device that would allow students to explore their career interests according to the 16-cluster model; thus, the CCIS was rationally created to aid educators in (a) assessing students' career clusters scores and (b) matching students to the appropriate vocational and technical curricula required by the Perkins accountability requirements.

The Career Clusters Institute has been widely successful at marketing the CCIS. In fact, in some states, such as Oklahoma and Arkansas, the Career Clusters Institute has been so successful in their marketing that the CCIS is being administered as part of the state vocational curriculum. This success is partly due to the support that the Career Clusters Institute offers educators and school administrators using the CCIS. Through conferences and online support, the Career Clusters Institute offers instruction for test administrators and comprehensive curriculum ''plans of study'' created for the purpose of integrating the CCIS into the curricula at the state and local level.

Although favorable anecdotal evidence exists in support of the CCIS, it has not been the subject of scholarly review. Comprehensive literature reviews yielded no research either analyzing or pertaining to the CCIS or pertaining to the OVAE's 16 career clusters themselves. The Career Clusters Institute acknowledges the lack of research support for the CCIS with disclaimers found on the pencil and paper version of the survey. The first disclaimer found at the bottom of page one states, ''This survey does not make any claims of statistical reliability and has not been normed. It is intended for use as a guidance tool to generate discussion regarding careers and is valid for that purpose.'' Similarly, the second disclaimer found at the bottom of the fourth page reads,

> Your interests may change over time. These survey results are intended to assist you with informal career exploration. Consider more formal assessments and other resources or services to help you plan your career. This survey does not make any claims of statistical reliability.

This lack of psychometric evidence is problematic in several regards. First, as stated above, the CCIS is widely administered in schools across the United States, and, in some institutions the CCIS serves as the primary means of career exploration. Second, in its current state, the CCIS does not meet the minimum requirements for educational and psychological testing developed jointly by the American Educational Research Association (AERA, 1999), the American Psychological Association (APA, 1999), and the National Council on Measurement in Education (NCME, 1999) given its lack of psychometric support. Third, a wealth of scientifically validated alternatives to the CCIS exist, such as the Kuder General Interest Survey (Kuder, 1964), the Self-Directed Search (Holland, 1994), Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994), and the Personal Globe Inventory (PGI; Tracey, 2002). Each of these alternative tests has demonstrated strong psychometric support.

The CCIS aspires to use the person-environment fit paradigm within the framework of the 16 broad career clusters created by the OVAE. Specifically, the objective of the CCIS is to measure which of the OVAE's 16 career clusters matches an individual's vocational interests, which is meant to serve as a basis for more refined exploration in that area. However, without a scientific basis for measuring interests against the OVAE's 16 career clusters, it is unclear whether the CCIS is an appropriate measure to accomplish this goal.

The current study was designed to examine the psychometric support of the CCIS with regard to its reliability and validity. No instrument is appropriate if it does not at least have some reliability support. The extent to which the CCIS is internally consistent and stable over time was examined. Then, given that validity is in part dependent on having adequate reliability, we examined the structural validity of the CCIS. For the CCIS to be a good representation of the interest structure, it should

adequately represent the domain of interests. As such, we examined how well the CCIS represented interests relative to other measures that have demonstrated validity.

The reigning structural model of vocational interests is that of John Holland (1959, 1985, 1997) who proposed that interests are composed of combinations of six types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (collectively known as RIASEC). Prediger (1982; Prediger & Vansickle, 1992) demonstrated that these six types exist in two-dimensional space defined by the dimensions People/Things and Data/Ideas. In a series of structural meta-analyses, Tracey and Rounds (1993; Rounds & Tracey, 1993, 1996) demonstrated support for both the circular arrangement of the RIASEC types and for the presence of Prediger's two dimensions underlying them. Furthermore, Tracey (Tracey, 1997; Tracey & Rounds, 1996a, 1996b) found support for the presence of a third factor, that of prestige existing in interest data. Given these results, Tracey (2002) constructed the PGI from a broad, representative sample of occupations and work activities and it serves a valid representation of a general model that includes RIASEC types as well as Prediger's dimensions and the added dimension of prestige. The PGI is also one of the few instruments that provides interest-occupation match scores for the 16 OVAE career clusters. So given its validity support, breadth of interest content, and inclusion of career cluster scores, we used the PGI as a comparison with the CCIS. So, even though the CCIS may not be designed to measure the exact same variables as other interest measures, it still needs to adequately cover the domain of interests, otherwise it portrays a very limited and restricted image of an individual's interests.

The current study was thus designed to assess (a) whether obtained scores demonstrated any support for the reliability of the CCIS, (b) whether the structural validity of the CCIS demonstrated an adequate representation of the domain of interests and the scientifically supported interest space, and (c) whether the CCIS matched the PGI with respect to career cluster agreement. Regarding the structural validity of the CCIS, we argue that for it to be considered an adequate representation of the domain of interests, it would at a minimum need to demonstrate support for the two dimensions posited by Prediger (1982, Prediger & Vansickle, 1992) to underlie the RIASEC types. With regard to career cluster agreement, we specifically aimed to assess whether the CCIS provided similar rankings of the career clusters to that provided by the PGI.

## Method

### Participants

The sample consisted of 203 students enrolled in a large Southwestern State University. There were a total of 154 women and 49 men in the sample. The sample had a mean age of 20.7 (standard deviation [*SD*] = 3.5, ranging from 18 to 45) and was composed primarily of freshman (30%) and sophomores (39.9%), although there were also juniors (16.3%), seniors (13.3%), and one graduate student (.5%). The sample self-identified as 3.4% African Americans, 1% Native Americans, 2.5% Asian Americans, 71.9% Anglo Americans, 16.3% Latino Americans, 4.4% Other or not identified, and 0.5% foreign citizen.

A second sample of 31 participants was obtained to assess test–retest reliability. There were a total of 21 women and 10 men in the sample. Similar to the overall sample, this smaller test–retest sample had a mean age of 20.2 (*SD* = 1.3, ranging from 19 to 23) and was composed primarily of freshman (35.5%) and sophomores (41.9%), although there were also juniors (6.5%) and seniors (16.1%). The sample self-identified as 12.9% African Americans, 3.2% Native Americans, 77.4% Anglo Americans, and 6.5% Latino Americans.

### Procedures

Participants were administered a questionnaire that contained the CCIS and the PGI activity liking form. Data were collected over the span of approximately 1 month and informed consent was

obtained from all participants. Participants were recruited through five computer literacy, four teacher education, and two career development classes. The students completed the questionnaire packet anonymously in class and everyone in the classes participated. This procedure resulted in sample of 218 respondents but 15 individuals were dropped from the study because they did not complete the questionnaire.

Similar to the overall sample, test–retest participants were administered a questionnaire that contained the CCIS and the PGI activity liking form. However, this sample completed the questionnaire, twice, 2 weeks apart. These participants were recruited from two career development classes and the questionnaire packet was completed anonymously in class. Informed consent was obtained from all participants and everyone in the classes participated. This resulted in a sample of 35 individuals but 4 were dropped from the study because they did not complete the questionnaire in its entirety.

## Measures

The CCIS is a 16-scale career interest survey developed to match people's traits and interests with the 16 career clusters created by the U.S. Department of Education's, OVAE. The survey was developed rationally to represent the interest content associated with each of the 16 career clusters. Each of the 16 scales found on the CCIS contains 3 separate item sets, which can be summed to obtain individual scale scores. Item Set 1, which is titled *Activities that describe what I like to do*, asks participants to identify from a list of seven items those activities that appeal to them. Sample options for Item Set 1 include, *Learn how things grow or stay alive* and *Play a musical instrument*. Item Set 2, titled *Personal qualities that describe me*, asks participants to identify from a list of five items those personal qualities that describe them. Sample options for Item Set 2 include, *Self-reliant* and *Curious about new technology*. Item Set 3, which is titled *School subjects that I like*, asks participants to identify from a list of five items those school subjects that appeal to them. Sample options for item three include, *Mathematics* and *Language Arts*. So, there are a total of 272 items, 17 items per scale across 16 scales. Each of the 272 items is responded to in a dichotomous manner (yes/no). Scores are yielded on each of the 16 scales by summing the number of yes endorsements. These distinct scale scores (which the CCIS refers to as a *box score*) are meant to correspond directly with the 16 career clusters created by the U.S. Department of Education, OVAE. Upon completion, test takers are instructed to self-score each of the 16 scales and to identify their 3 highest box scores, which can then be matched with the corresponding career cluster (e.g., Box One is meant to correspond with Cluster One) and used for further career exploration. Example career clusters are *Agriculture, Food, and Natural Resources*, and *Business, Management, and Administration.*

The PGI (Tracey, 2002) is an interest inventory that measures vocational interests using a spherical model, which extends the work of John Holland (1973, 1985, 1997). Tracey (1997; Tracey & Rounds, 1996a) found support for a three-dimensional model of interests, which can be organized spherically using 18 scales. The sphere from which the PGI is built incorporates Holland's RIASEC model at the equator of the sphere and three summary dimensional scales (Prediger's People vs. Things, Data vs. Ideas, and Tracey's added dimension, Prestige). The PGI yields scores on the RIASEC scales, 18 PGI-specific scales, and the 3 dimensions of People/Things, Data/Ideas, and prestige. For our purposes, we were most interested in the dimensional scores as these represent the domain of interests.

In its original form, the PGI contains 113 occupational title preference items, 113 activity liking items, and 113 activity competence items. For the purposes of this study, only the 113 activity liking items were used. Each of these sets of scales can be used collectively or separately; there is similar psychometric support for all (Tracey, 2002). The 113 activity items represented a broad sampling of the occupational activities listed in the *Occupational outlook handbook* (U.S. Department of Labor,

**Table 1.** Reliability Estimates for the Career Clusters Interest Survey (CCIS) Cluster Scores

| Scale | $\alpha^a$ | Test–Retest $r^b$ |
|---|---|---|
| Agriculture, food, and natural resources | .66 | .73 |
| Architecture and construction | .72 | .79 |
| Arts, A/V technology, and communications | .82 | .87 |
| Business, management, and administration | .71 | .80 |
| Education and training | .74 | .79 |
| Finance | .79 | .58 |
| Government and public administration | .74 | .87 |
| Health science | .70 | .75 |
| Hospitality and tourism | .77 | .77 |
| Human services | .80 | .90 |
| Information technology | .83 | .80 |
| Law, public safety, corrections, and security | .74 | .78 |
| Manufacturing | .76 | .73 |
| Marketing, sales, and service | .78 | .70 |
| Science, technology, engineering, and mathematics | .84 | .70 |
| Transportation, distribution, and logistics | .73 | .71 |

Notes: A/V = audio/video
a. $N = 203$
b. $N = 31$

1996). Example activities include *Help others, Write computer programs for business*, and *Operate a woodworking machine*. Each activity is responded to using a 7-point Likert-type scale, with a score of "1" indicating *Strongly dislike* and a score of "7" indicating *Strongly like*. These items are averaged to yield scale scores using the equations provided in Appendix C of Tracey (2002). The activity liking items were selected as they most closely match the content of the CCIS in that they both ask respondents to endorse the extent of liking of different aspects and activities and thus provide the best comparison.

As reported in the monograph for the PGI, Tracey (2002) conducted a series of studies designed to examine the psychometric properties of the PGI. The reliability estimates of the PGI scales were found to be very strong, with the vast majority having internal consistency estimates of $r > .80$ and 2-week test–retest reliabilities of $r > .77$. Similarly, these studies demonstrated strong support for the structural validity of the PGI in any of its scoring methods (i.e., 6-type circular model, 8-scale model, and 18-scale spherical model) in general and across age, gender, and ethnicity. The PGI was also found to have high concurrent validity, correlating with the Strong Interest Inventory general Occupational Theme scales at values above $r = .75$. Since its introduction, the PGI has been used to assess the structure of interests in a number of countries outside of the United States, including Ireland, Serbia, China, Japan, and Croatia (Darcy, 2005; Hedrih, 2008; Long, Adams, & Tracey, 2005; Long, Watanabe, & Tracey, 2006; Šverko, 2008).

Besides providing scores on interest scales, the PGI also provides an index of interest-occupation match for all of the occupations listed in the *Occupational outlook handbook*. It also provides indices of the extent to which each individual's interest profile matches each of the 16 OVAE career clusters.

## Results

Coefficient alphas were computed to obtain internal consistency estimates for each of the CCIS scales and these are presented in Table 1. In support of the measure's internal consistency, the

**Table 2.** Component Loadings Among the Career Clusters Interest Survey (CCIS) Scales

| CCIS Scale | Component 1 | Component 2 |
|---|---|---|
| Agriculture, food, and natural resources | .67 | −.27 |
| Architecture and construction | .76 | −.39 |
| Finance | .76 | −.26 |
| Information technology | .74 | −.42 |
| Manufacturing | .78 | −.38 |
| Science, technology, engineering, and mathematics | .71 | −.54 |
| Transportation, distribution, and logistics | .80 | −.25 |
| Arts, A/V technology, and communications | .60 | .30 |
| Education and training | .73 | .40 |
| Government and public administration | .71 | .30 |
| Hospitality and tourism | .70 | .57 |
| Human services | .63 | .49 |
| Law, public safety, corrections, and security | .69 | .32 |
| Marketing, sales and service | .70 | .32 |
| Business, management, and administration | .75 | −.04 |
| Health science | .79 | .07 |

Notes: A/V = audio/video

observed reliability coefficients were acceptable with a median value of .76 and a range of .66–.84. The lowest reliability coefficient (.66) corresponded with the *Agriculture, food, and natural resources* scale and the highest reliability coefficient (.84) corresponded with the *Science, technology, engineering*, and *mathematics* scale. Two-week test–retest scores yielded similar acceptable estimates indicating that the measure is fairly stable over time for this sample. The median value of the test–retest coefficient was good ($r = .78$) and had a range of .58–.90. The lowest reliability coefficient (.58) corresponded with the *Finance* scale and the highest reliability coefficient (.90) corresponded with the *Human resources* scale. The results for the reliability analyses for the test–retest group are also provided in Table 1. Thus, both the stability and internal consistency estimates for the CISS scales appeared adequate.

Next, a principal components analysis (PCA) was conducted to determine the underlying structure of the CCIS scale scores. PCA was used because it was used in similar examinations of the structure of interests (e.g., Prediger, 1982; Prediger & Vansickle, 1992; Tracey & Rounds, 1996). As operationalized in most statistical packages, all factor analysis (e.g., Statistical Package for the Social Sciences [SPSS]) typically involves conducting an initial PCA, after which the number of factors is determined and then rotated as a factor analysis is being conducted. So, PCA and factor techniques, although different, typically start from the exact same initial step. As explained below, we focused only on this first, component extraction step. From this analysis, two criteria were used to determine the number of components to retain: the scree test and the interpretability of the component solution. The eigenvalues (and variance accounted for) for each of the first four components were as follows: 8.03 (50.2%), 2.24 (14%), 0.89 (5.5%), and 0.76 (4.8%). Based on the scree plot and interpretability, it was clear that there were only two components. The component loadings are provided in Table 2.

The loadings for Component 1 range from .60 to .80 with a median of .73. As indicated by the uniformly high loadings of comparable magnitude, it appears that Component 1 is a general factor. This general factor has been repeatedly found in the literature (Prediger, 1982; Rounds & Tracey, 1993; Tracey, 1997; Tracey & Rounds, 1996a) and it reflects the tendency of some individuals to respond indiscriminately high or low to all items. In its simplest form, the general factor seems to capture the pattern of endorsement by individuals on extreme ends of the interest-endorsement

**Table 3.** Correlations Between the Component Scores and the Personal Globe Inventory (PGI) Scales ($N = 203$)

| | Factor Scores | |
|---|---|---|
| PGI Scale | 1 | 2 |
| Dimension Scales | | |
| People/Things | −.11 | .58** |
| Data/Ideas | −.01 | −.11 |
| Prestige | .13 | .28** |

**$p < .01$.

continuum; that is, the general factor is a representation of the endorsement styles of individuals (a) who have very broad interests and endorse most everything as appealing, and (b) who have very narrow interests and endorse only very select items that correspond with their predetermined interests. These disparate substantive differences have presented difficulties for interpretation that have confused researchers for decades. However, recent research has found that the general interest factor seems to be related to interest flexibility and can be viewed as a moderator in the person-environment fit-career outcome relation (Darcy & Tracey, 2003; Tracey & Robbins, 2006). So, although this interest pattern is important in some methods of assessment, the overall level of interests represented by the general factor should only be included when viewed in the correct moderation role, that of moderating the congruence–persistence relation (Tracey & Robbins, 2006). Furthermore, if the factor structure is rotated, it produces an artifactually confusing picture of the relations results and one that does not support RIASEC types (Prediger, 1982; Rounds & Tracey, 1993; Tracey, 1997; Tracey & Rounds, 1996a). Because the current study was not designed to assess the congruence–persistence relation of participants and for all the reasons provided above, we interpreted Component 1 as a general factor and did not attempt to examine any rotated solution.

The second component was thus the only component that reflected substantive content. It was a bipolar component, with seven of the cluster scales loading negatively and seven positively. Two of the cluster scales had zero loadings on this component. The negatively loading clusters tapped a Things orientation, while the positively loading scales tapped a People orientation. So, the second component appeared to represent Prediger's People/Things bipolar dimension. To examine this, the component scores from the PCA were correlated with the dimensional scores (People/Things, Data/Ideas, and prestige) from the PGI and these are presented in Table 3. Component 1 (the general component) did not significantly correlate with any of the three dimensions as would be expected given its lack of substantive variation. Component 2 correlated positively with both People/Things and Prestige. The large correlation of $r = .58$ ($p < .01$) with People/Things indicated that high scores on Component 2 were associated with high People and low Things interests. Prestige correlated at a moderate $r = .28$ ($p < .01$), with high scores on Component 2 being associated with more prestige. There was no significant relation of either component with Data/Ideas. For illustrative purposes, Figure 1 contains a graphical representation of CCIS scales plotted on Prediger's People/Things, Data/Ideas dimensions. If the CCIS scales adequately represented the dimensions of interest, then the scales should be spaced all around the People/Things, Data/Ideas interest space. As one can see in Figure 1, the CCIS scales are closely confined to only one area of the interest space, the People axis, represented by Prediger's dimensions. If the CCIS were adequately representing the domain of interests, we would expect to see the CCIS scales appearing throughout Prediger's interest space rather than the one single area found in this study. This provides a visual representation of the limitations of the CCIS and illustrates that the CCIS represents a very depleted sample of the interest space.

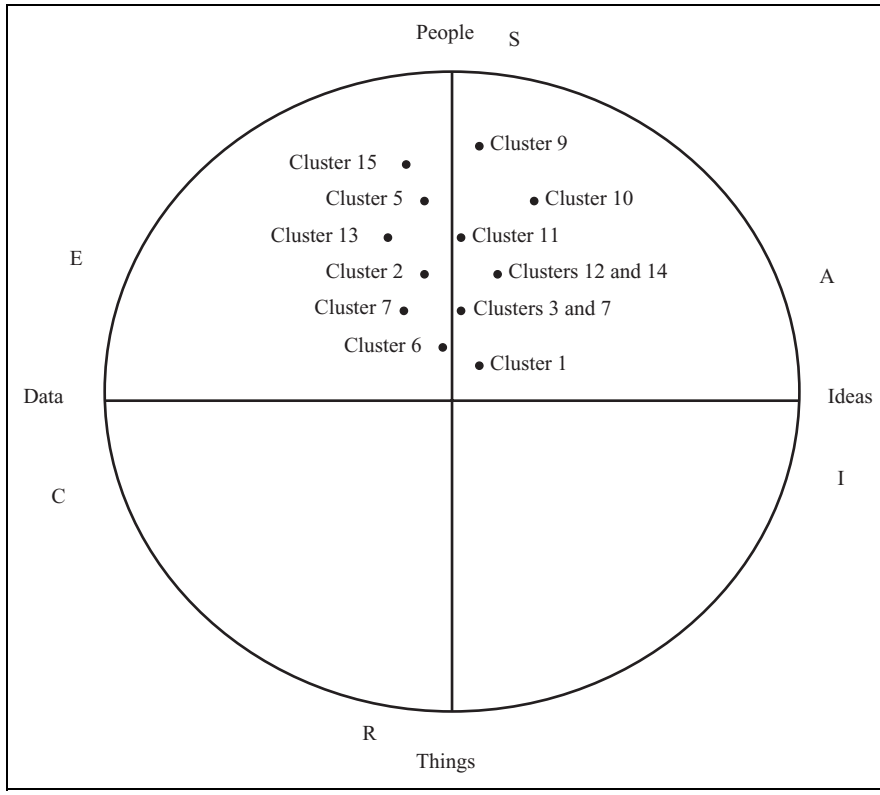


**Figure 1.** Hypothesized graphical representation of Career Clusters Interest Survey (CCIS) clusters mapped onto Prediger's People/Things and Data/Ideas dimensions.

To assess the concurrent validity between the CCIS and the PGI, the CCIS scale scores were correlated with the PGI cluster match scores. These correlations for each of the 16 clusters are presented in Table 4. The mean correlation between the 16 CCIS scales and the 16 PGI scales was −.05 and the *SD* was .10. So, clearly there was little similarity in the cluster scores across the two instruments. The three clusters with the highest correlation were *Marketing, sales, and service* scale ($r = .10$), the *Architecture and construction* scale ($r = .05$), and the *Information technology* scale ($r = .02$). These results further indicate that there is very little overlap between the CCIS and the interest structure represented by the PGI.

Another way to examine concurrent validity was to look at agreement within individuals. Instead of looking at the ranking of individuals for each cluster, we examined the ranking of clusters for each individual. To do this, we calculated the within individual correlation of the 16 PGI cluster scores with the 16 CCIS cluster scores, thus producing 203 correlations. The mean intraindividual correlation was $r = .47$ (range .31–.56) with a *SD* of .05. Although this value is higher than the correlations across individuals, it is still not at the levels desired for valid use.

Because the CCIS focuses most on the highest three cluster scores, we also examined the agreement between the high point scores for each test. The top score agreement between the PGI and the CCIS was 24% (kappa, $\kappa = .11$). This value is also low.

**Table 4.** Correlations of Career Clusters Interest Survey (CCIS) scores with match scores for Personal Globe Inventory (PGI; $n = 203$)

| Scale | *r* |
|---|---|
| Agriculture, food, and natural resources | −.04 |
| Architecture and construction | .05 |
| Arts, A/V technology, and communications | −.35 |
| Business, management, and administration | −.07 |
| Education and training | −.09 |
| Finance | −.08 |
| Government and public administration | −.04 |
| Health science | .01 |
| Hospitality and tourism | −.05 |
| Human services | −.10 |
| Information technology | .02 |
| Law, public safety, corrections, and security | −.08 |
| Manufacturing | −.03 |
| Marketing, sales, and service | .10 |
| Science, technology, engineering, and mathematics | −.01 |
| Transportation, distribution, and logistics | −.06 |

Notes: A/V = audio/video

## Discussion

The results of this study support the reliability of the CCIS scales but also demonstrate that the structure is quite limited and does not encompass much of the interest space. The separate CCIS cluster scales showed adequate internal consistency with α estimates ranging from .66 to .84. Two-week test–retest assessments yielded good correlations ranging from .58 to .90 indicating that these scale scores are fairly stable over time. So, it appears with respect to reliability that the CCIS measure is adequate. However, concerns arise with respect to what is being measured.

The results obtained from the component analysis were consistent with the existence of a two-component structure underlying the CCIS, with Component 1 resembling the common general factor found in most interest examinations. The meaning of this general factor has received some attention in the literature (e.g., Darcy & Tracey, 2003; Rounds & Tracey, 1993; Tracey & Rounds, 1996a); it is not clear what it represents (i.e., is it substantive or artifactual). However, the second component did have a substantive interpretation as it was similar to the bipolar People/Things dimension of Prediger (1982). So, the 16 cluster scales of the CCIS do a nice job of representing the People/Things dimension of interests. Prediger (1982; Prediger & Vansickle, 1992) demonstrated that factoring a broad representative set of interest scales results in a three-factor structure, with the first factor being the general factor, and the second and third factors representing the factors of People/Things and Data/Ideas. Rounds and Tracey (1993) conducted a meta-structural analysis and demonstrated that these three factors are found for interest scales from all major interest inventories (with the order of the second two factors varying along with the orientation). So, over all major interest inventories, factor or component analyses reveal three factors: a general factor and then People/Things and Data/Ideas. The CCIS demonstrated the first two factors and not the Data/Ideas factor. Thus, the interest space appears to be deficient.

To further explore whether this factor structure was deficient, the two factor scores were correlated with the People/Things, Data/Ideas, and prestige dimension scores from the PGI and these correlations supported the presence of the People/Things dimension and the omission of the Data/Ideas dimension. These results demonstrate that the CCIS is, at best, separating Things interests

from People interests. The interest space characterized by Prediger's People/Things and Data/Ideas dimensions is generally considered the base interest space from which vocational interests can be conceptualized. Therefore, this lack of representation of the Data/Ideas dimension calls into question the adequacy of the CCIS measure, as it appears to be capturing interests that fall along one of the dimensions and totally ignoring the other that needs to be represented as underlying a scientifically designed vocational interest assessment.

The lack of concurrent validity of the CCIS cluster scale scores with the scores from the PGI provides added support for the questionable interest domain representation of the CCIS. There was little covariation in the CCIS and PGI cluster scores when examined across scales, within-individual or in high-point agreement. The CCIS yielded a very different set of scores than the PGI did. Given the extant validity support for the PGI, this further calls into question the validity of the CCIS.

These results, of course, are tempered by some of the limitations of this study. Although representative, the sample obtained in this study was comprised of students enrolled in computer literacy, career development, and teacher education courses. Although these classes represent a very broad distribution of students in the university, this may have inhibited the ability to capture preferences, and thus represent, vocational interests such as agriculture or manufacturing. However, the internal consistency estimates did demonstrate the reliability of the scales on the CCIS (vocational or otherwise), so by simply obtaining a sample that included individuals with more vocational preferences, one would not negate the findings of this study. Although it would be important to assess the interest structure of the CCIS using a more vocationally oriented sample, Tracey (2002) found that the structure did not vary across these groups.

Similarly, the sample obtained in this study was comprised of more female students (154) than male students (49). This could possibly be interpreted as an area where the results are prone to bias. There are very well-documented gender differences in the means of interest scales (e.g., women score much higher on Holland's S type than men; Lippa, 1998; Tracey, Robbins, & Hofsess, 2005). There are, however, no differences in the structure of interests between men and women (Day, Rounds, & Swaney, 1998; Tracey, 2002; Tracey & Rounds, 1993). Although it would have been beneficial to examine structural differences between men and women, the sample size precluded such an examination. However, given the absence of any such findings of structural differences in the past and our focus on structure and not means or score magnitude in this study, we do not see this as a major problem.

Finally, because the CCIS is intended to provide high school students with areas for future career exploration, it may have been beneficial to administer the CCIS to a high school–aged population as the primary sample or as an ancillary sample for comparative purposes. However, although it may be possible that differences in responses might be witnessed between high school–aged and college-aged samples, it is highly unlikely that simply obtaining a high school–aged population would ameliorate the observed deficiencies in the CCIS.

The CCIS was developed to facilitate career exploration by matching individuals to the 16 career clusters endorsed by the U.S. Department of Education OVAE. The findings from this study indicate that the structure of the CCIS is quite limited and does not encompass much of the interest space represented by the scientifically supported People/Things and Data/Ideas dimensions. Specifically, the lack of representation of the Data/Ideas dimension seems to indicate that the CCIS may be, at best, separating two broad occupational domains (i.e., Things occupations from People occupations) from one another. One possible interpretation of these findings is that the OVAE's 16 career clusters are limited with respect to Prediger's two dimensions, and thus the observed limitations of the CCIS are simply an expression of the lack of representation of the Data/Ideas dimension in the clusters themselves. However, the cluster means embedded in the PGI demonstrate the occupational clusters do span all three dimensions of People/Things, Data/Ideas, and prestige. So, it does not appear that the problem is with the occupational clusters themselves. Another possible interpretation is that the

OVAE's 16 career clusters do indeed represent the occupational space, but the CCIS is unable to capture the full range of interests that would correspond to these occupations. Based on these data and the PGI, it appears that the problems are due to an inadequate representation of the interest space by the CCIS cluster scales.

Based on the findings of this study, individuals administering the CCIS are encouraged to use a broader measure that better represents the interest space. By doing so, test administrators can ensure with greater likelihood that test takers are given results that account for their interests across all dimensions and reveal the most appropriate occupations. One possible test to be administered in conjunction with the CCIS is the PGI because it is one of the few interest measures that provides interest-cluster match information. This study is the first that has examined the psychometric properties of the CCIS. In general, we found the instrument lacking validity support and its usage could provide a severely restricted set of options for individuals taking it.

## Authors' Note

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## Declaration of Conflicting Interests

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## References

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999). Standards for educational and psychological testing. Washington, DC: American Educational Research Association.

Darcy, M. U. A. (2005). Examination of the structure of Irish students' vocational interests and competence perceptions. *Journal of Vocational Behavior*, *67*, 321-333.

Darcy, M., & Tracey, T. J. G. (2003). Integrating abilities and interests into career choice: Maximal versus typical assessment. *Journal of Career Assessment*, *11*, 219-237.

Day, S. X., Rounds, J., & Swaney, K. (1998). The structure of vocational interests for diverse racial/ethnic groups. *Psychological Science*, *9*, 40-44.

Harmon, L. W., Hansen, J. C., Borgen, F. H., & Hammer, A. L. (1994). *Strong interest inventory.* Stanford, CA: Stanford University Press.

Hedrih, V. (2008). Structure of vocational interests in Serbia: Evaluation of the spherical model. *Journal of Vocational Behavior*, *73*, 13-23.

Holland, J. L. (1959). A theory of vocational choice. *Journal of Counseling Psychology*, *6*, 35-44.

Holland, J. L. (1973). *Making vocational choices: A theory of careers.* Englewood Cliffs, NJ: Prentice-Hall.

Holland, J. L. (1985). *Making vocational choices: A theory of vocational personalities and work environments* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Holland, J. L. (1994). *Self-directed search (SDS) Form R.* Odessa, FL: Psychological Assessment Resources.

Holland, J. L. (1997). *Making vocational choices.* Odessa, FL: Psychological Assessment Resources.

Kuder, G. F. (1964). *Kuder general interest survey: Manual.* Chicago: Science Research Associates.

Lippa, R. (1998). Gender-related individual differences and the structure of vocational interests: The importance of the "People-Things" dimension. *Journal of Personality & Social Psychology*, *74*, 996-1009.

Long, L. R., Adams, R., & Tracey, T. J. G. (2005). Generalizability of interest structure to China: Application of Personal Globe Inventory. *Journal of Vocational Behavior*, *66*, 66-80.

Long, L., Watanabe, N., & Tracey, T. J. G. (2006). Structure of interests in Japan: Application of the Personal Globe Inventory occupational scales. *Measurement and Evaluation in Counseling and Development*, *38*, 222-235.

Prediger, D. J. (1982). Dimensions underlying Holland's hexagon: Missing link between interests and occupations? *Journal of Vocational Behavior*, *21*, 259-287.

Prediger, D. J., & Vansickle, T. R. (1992). Locating occupations on Holland's hexagon: Beyond RIASEC. *Journal of Vocational Behavior*, *40*, 111-128.

Rounds, J., & Tracey, T. J. (1993). Prediger's dimensional representation of Holland's RIASEC circumplex. *Journal of Applied Psychology*, *78*, 875-890.

Rounds, J., & Tracey, T. J. G. (1996). Cross-cultural structural equivalence of RIASEC models and measures. *Journal of Counseling Psychology*, *43*, 310-329.

Ruffing, K. (2006). A brief history of career clusters: Supporting a new vision for CTE. Retrieved March 19, 2007, from http://www.careerclusters.org/whatis.cfm

Šverko, I. (2008). Spherical model of interests in Croatia. *Journal of Vocational Behavior*, *72*, 14-24.

Tracey, T. J. G. (1997). The structure of interests and self-efficacy estimations: An expanded examination of the spherical model of interests. *Journal of Counseling Psychology*, *44*, 32-43.

Tracey, T. J. G. (2002). Personal Globe Inventory: Measurement of the spherical model of interests and competence beliefs. *Journal of Vocational Behavior*, *60*, 113-172.

Tracey, T. J. G., & Rounds, J. (1993). Evaluating Holland's and Gati's vocational interest models: A structural meta-analysis. *Psychological Bulletin*, *113*, 229-246.

Tracey, T. J. G., & Rounds, J. (1996a). Spherical representation of vocational interests. *Journal of Vocational Behavior*, *48*, 3-41.

Tracey, T. J. G., & Rounds, J. (1996b). Contributions of the spherical representation of vocational interests. *Journal of Vocational Behavior*, *48*, 85-95.

Tracey, T. J. G., & Robbins, S. B. (2006). The interest major congruence and college success relation: A longitudinal study. *Journal of Vocational Behavior*, *69*, 64-89.

Tracey, T. J. G., Robbins, S. B., & Hofsess, C. D. (2005). Stability and change in interests: A longitudinal study of adolescents from grades 8 through 12. *Journal of Vocational Behavior*, *66*, 1-25.

U.S. Department of Labor. (1996). *Occupational outlook handbook, 1996-1997 edition.* Washington, DC: Government Printing Office.