The Influence of Item Response Indecision on Self-Directed Search (SDS) Scores

The idea for this research began with a question from a client during an interpretation of the Self-Directed Search (Holland, 1994). The client stated, "I wasn't sure how to respond to some of the items. Would this make a difference in my score?" The counselor suggested that they try to answer the question by having the client identify the SDS items that were in question and then change her response to the other available option, such as changing a "like" to "dislike" for the activity "Fix electrical things." Rescoring of the client's SDS showed that her summary code had not changed. When asked by the counselor, "Are you more confident in the results?" the client responded, "Yes."

In discussing this case, we recalled similar comments we had heard over the years from a small number of other clients taking the SDS. "If I took the test on a different day, I think my results would be different." A client's perceptions that responses to an interest inventory tend to vary considerably from day to day potentially reduces the face validity of the measure. As a result, some clients may have little confidence in the results they obtain from such an assessment. We decided that this matter needed investigation. How often are clients uncertain about responding to SDS items? If they are, what influences uncertainty in responding to SDS items? Are other clients uncertain about responding to SDS items? If so, what influences uncertainty in responding to SDS items? What implications does this uncertainty have for practice and research?

We operationalized client uncertainty as indecision about answering test items, which we labeled "item response indecision." While research investigating the impact of indecision on test scores is limited, research has shown that poor decision-making can impair performance on cognitive and affective tasks (Rubinsztein, Michael, Underwood, Temptest, & Sahakian, 2006). These researchers found that participant responses were impaired on tests of visual and spatial recognition for participants diagnosed with depression. Den Hartog, Erix, van Bemmel, Kremer, and Jolles (2003) tested the cognitive speed hypothesis which states that depression is characterized by slowed cognitive responses and found that depressive symptomology correlated with deficits in cognitive processing. This impairment in decision making could affect a person's ability to follow instructions and comply with a variety of tasks requiring cognitive processing (Rubinsztein et al., 2006). Other authors have also found that depressed participants expressed indecision by deliberating for longer periods of time during cognitive tasks, which impacted test results (Murphy, Rubinsztein, Michael, Rogers, Robbins, Paykel & Sahakian, 2001).

No research to date has examined the prevalence or impact of interest inventory item response indecision. Research does exist, however, on the impact of changing items on the SDS. Boyd (1976) established that making occupational titles gender neutral for SDS items resulted in no significant change in summary codes. Siebel and Walsh (1977) found that modifying instructions from present to future tense in the Activities and Competencies sections of the SDS resulted in significant code changes in the Activities section (for Realistic items) and the Competencies section (Realistic, Artistic, Enterprising, and Conventional items). Given that research is needed about the prevalence of interest inventory item response indecision, the following research questions were developed for the current study.

1. What is the relationship between item response indecision and SDS summary code permutations?

2. What is the relationship between the highest RIASEC type (letter) in participants' SDS code and item response indecision?
3. What is the relationship between item response indecision and the SDS secondary constructs (Congruence, Consistency, Differentiation, Coherence), negative thoughts, profile elevation, and demographic variables?

The researchers hypothesized that when items are reversed, SDS summary code permutations will not include new Holland types. No significant relationship is expected to exist between the first letter of a person's SDS code and item response indecision. For students with item response indecision, significant differences in scores on secondary construct and profile elevation between participants' two summary codes is not expected. The SDS secondary constructs and profile elevation are being examined because they can be used to identify individuals who are more likely to experience difficulty in career decision-making. It's possible that individuals with low Congruence, Consistency, Differentiation, Coherence and SDS profile elevation will show more indecision in responding to items on an interest inventory. It is expected that students with item response indecision will score higher on a measure of negative career thinking. The researchers do not hypothesize that the variables gender, year in school will be related to item response indecision.

Method

Participants

Participants were 247 undergraduate students enrolled in ten sections of an undergraduate career development course offered at a large Southeastern research university. Demographic information for this sample is provided in Table 1. The students who volunteered to participate consisted of 102 females (41%) and 145 males (59%). Of the 247 participants, 16% were African American, 2% Asian American, 68% Caucasian, 12% Hispanic American, and 3% identified as "Other." Thirteen percent of the participants were freshmen, 32% sophomores, 24% juniors, and 30% seniors.

Instruments

The Self-Directed Search (SDS; Holland, 1994) is a 228-item self-report interest inventory that yields scores for Holland's six types. Individuals rate their preferences for activities, competencies, and occupations, and provide self-estimates of abilities in terms of the RIASEC areas. The SDS also incorporates individuals' occupational aspirations, or daydreams. In addition to a three letter Holland Code, the SDS measures various secondary constructs. Coherence is the degree to which occupational daydreams codes belong in the same Holland category; congruence may be defined as the degree of match between two codes (e.g., a summary code and an aspirations code); consistency is the distance between the first two code letters on the hexagon; and differentiation measures the level of definition or distinctness of a personality profile. In addition, the construct of profile elevation can be calculated by summing the six section scores on the SDS (the total number of positive responses and the two self-estimates scores). Test–retest reliabilities for SDS summary scores range from .76 to .89, and internal consistencies (KR-20s) range from .90 to .94 (Holland, Fritzsche, & Powell, 1994). Substantial support for the concurrent and predictive validity of the SDS is reported in the technical manual (Holland, Fritzsche, & Powell, 1994).

In the current study, the paper-and-pencil version was utilized with modified instructions for the students. Modified instructions were included in order to allow participants to indicate uncertainty with SDS items (Item Response Indecision) on the Self-Directed Search. The modified version of the SDS included all of the standard instructions with the following stapled onto the first page of items:

> Dear student, as you complete the Activities, Competencies, and Occupations section of the Self-Directed Search booklet, place a question mark (?) by any item if you have difficulty deciding on a Like, Dislike, Yes, or No response. Thank you!!

The Career Thoughts Inventory (CTI; Sampson, Peterson, Lenz, Reardon, & Saunders, 1996) is based on Cognitive Information Processing theory. The 48-item instrument assesses an individual's level of dysfunctional thinking about career related issues. Items are endorsed using a four point Likert type scale ranging from strongly disagree (0) to strongly agree (3). In addition to providing information about an individual's overall level of negative career thoughts (the CTI total score), the CTI also assesses the individual on three constructs: Decision-Making Confusion, Commitment Anxiety, and External Conflict (Sampson, Peterson, Lenz, Reardon, & Saunders, 1996).

Decision Making Confusion (DMC) assesses an individual's inability to engage in the career decision-making process due to disabling emotions and/or a lack of understanding about the decision-making process (Sampson, Reardon, Peterson, & Lenz, 2004). The Commitment Anxiety (CA) scale indicates an individual's inability to commit to a specific career choice due to anxiety about the decision-making process or the result of the decision. The final construct, External Conflict (EC), reflects an individual's inability to balance the importance of self-perceptions with the importance of input from significant others, resulting in a reluctance to assume responsibility for decision making (Sampson, Reardon, Peterson, & Lenz, 2004). According to Sampson, Reardon, Peterson and Lenz (2004) the internal consistency (alpha) coefficients of the CTI total score range from .97 to .93 and the three construct scales alpha coefficients range from .94 to .74. In addition, the CTI has been found to be a valid instrument (Sampson, Reardon, Peterson, & Lenz, 1996).

The Student Data Sheet is a document created for the career development course that provides demographic information about the participants, e.g., gender, ethnicity, and educational classification. It is administered each semester in line with course policy.

Procedure

Data collection occurred during two semesters of the course in regularly scheduled class meeting times. Participants were asked to complete the Student Data Sheet, which requests demographic and occupational decision-making information. This document and the SDS are completed as a regular part of the course and are used for intervention purposes outside this study. To provide for student anonymity, students were assigned a unique anonymous identification code by which all data were recorded. Only the authors, a career advisor, and the Career Center program assistant had access to the information connecting participant identities to the unique code.

During the second week of class, students were asked to complete the paper-and-pencil version of the SDS with the additional instructions. After students completed the assessment

booklet, the SDS results were scored using the SDS Software Portfolio System (Reardon & PAR, 2001) and a Professional Summary was produced. The Professional Summary provided information related to the students' summary code, congruence, differentiation, consistency, and coherence. Each SDS booklet was reviewed for completion of the 228 items and presence of question marks. 114 participants (46%) had one or more question marks in their booklets, indicating item response indecision. After Professional Summaries were produced for these participants, their SDS responses were reversed, i.e., items with question marks beside them were switched to the alternative response ('Like' became 'Dislike,' 'Yes' became 'No,' etc.) and a new Professional Summary Code was generated.

Results

To analyze the data, correlation coefficients and t-tests were computed to determine the degree to which SDS secondary constructs would change after participant answers were switched. Additionally, a multivariate analysis of variance was performed to measure the difference between groups for eight dependent variables: Decision Making Confusion, Commitment Anxiety, External Conflict, SDS profile elevation, and scores on the SDS secondary constructs Differentiation, Congruence, Consistency, and Coherence.

Missing data were not problematic. Seven percent of participants had missing data (4% in the Questions group, and 10% in the No-Questions group). A screening of the data suggested no outliers were present, and results of evaluation of assumptions of normality were satisfactory. The test of the assumption of homogeneity of covariance matrices in the three groups resulted in a fail to reject decision (Box's $M = 43.5$, F [1.167], $p =. 226$), indicating there was not a violation of the assumption. Levene's test of the assumption of homogeneity of variance for each of the dependent variables resulted in fail to reject decisions for all variables. The means and standard deviations for the seven dependent variables are summarized in Table 1.

Table 1:

	Mean	SD
Decision Making Confusion	12.2	8.1
Commitment Anxiety	14.7	5.4
External Conflict	4.8	2.8
Differentiation	6.0	2.6
Congruence	18.1	7.3
Coherence	2.0	.8
Consistency	2.1	.8
Profile Elevation	129	29.8

Item Response Indecision (IRI) was shown on 609 SDS Form R items by 114 study participants. Nine percent of IRI items were for the Realistic type; 14% for the Investigative and Artistic types; 23% for the Social type; 22% for the Enterprising type; and 18% for the Conventional type. When answers were switched for those participants with item response indecision 18% of codes changed, while 82% remained exactly the same. Of the three letters in the SDS summary code, the third letter was the one most likely to change, i.e., become another letter

not previously included in the summary code. This occurred in 9% of cases. The first and second letters never changed to another letter not previously included in the summary code, but did switch positions in 6% of cases. The second and third letters also switched positions in 3.5% of cases. The frequency of changes to SDS codes are reported in Table 2.

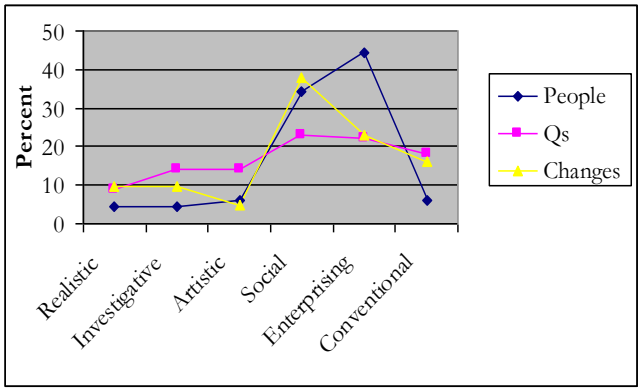
Table 2:

	N	%
No Code Change	93	81.6
First/Second Letter Reversal	7	6.1
Second/Third Letter Reversal	4	3.5
Third Letter Change	10	8.8

In order to demonstrate that changes in SDS summary codes were not significant, the secondary constructs for the two summary codes for the group with item response indecision were compared using paired *t*-tests and Pearson-product moment correlations. Scores on profile elevation were also compared. *T*-tests revealed that participants' scores on secondary constructs and profile elevation were not significantly different between trials. Additionally, correlations between secondary constructs and profile elevation ranged from .93 to .98 and were significant at the .001 level. See Table 3.

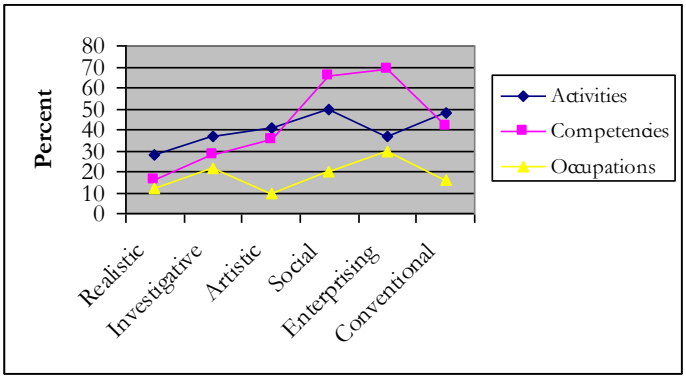
The majority of participants' first letters, item response indecision and code changes occurred in Social and Enterprising areas. An ANOVA confirmed that no significant relationship existed between item response indecision, code changes and Holland type, significance level = .09. Figure 1 provides information on the percentage of people, item response indecision, and code changes per Holland type.

Figure 1:



When examining the percentage of item response indecision endorsed per Holland type per section of the SDS (Activities, Competencies, and Occupations), an interesting trend was observed. For four of the types (Realistic, Investigative, Artistic, and Conventional) item response indecision was most commonly indicated in the Activities section, followed by the Competencies, and Occupations sections. For the Social and Enterprising types, item response indecision were most often indicated in the Competencies section, followed by Activities and then Occupations.

Figure 2:



Pearson-product moment correlations between the dependent variables are reported in Table 3. Item response indecision was found to be significantly correlated at the .01 level with scores on Decision Making Confusion (.21), Commitment Anxiety (.18), Coherence 1 and 2 (-.19, .17 respectively), Consistency 1 and 2 (-.19, .22 respectively) and at the .05 level with Differentiation (-.15; -.22 for trial 1 and 2 respectively), and External Conflict (-.13).

The correlation between the first and second scores on Differentiation (.97), Congruence (.95), Coherence (.92), Consistency (.93), and Profile Elevation (.97) was found to be significant at the .01 level. Also significant at the .01 level were the relationships between Differentiation 1 and Congruence 2 (.22), Congruence 1 and Coherence 1 and 2 (.17, .19 respectively), Differentiation 1 and Congruence 2 (.22), Congruence 1 and Consistency 1 and 2 (.17, .16 respectively), Coherence 1 and Consistency 1 and 2 (.91, .88 respectively), and Coherence 2 and Consistency 1 and 2 (.94, .91 respectively).

Table 3: Correlation Matrix

	IRI	DMC	CA	EC	Diff_1[a]	Diff_2	Con_1[b]	Con_2	Coh_1[c]	Coh_2	Cons_1[d]	Cons_2	Pro_1	Pro_2
IRI	1													
DMC	.21**	1												
CA	.18**	.65**	1											
EC	.13*	.50**	.54**	1										
Diff_1	-.15*	-.16*	-.11	-.06	1									
Diff_2	-.22*	-.24*	-.29	-.19*	.97**	1								
Con_1	-.44	.01	.06	.16*	.22**	.11	1							
Con_2	-.10	.01	.08	.12	.18	.11	.95**	1						
Coh_1	-.19**	-.07	-.02	-.06	.05	.05	.17**	.20*	1					
Coh_2	-.17**	-.09	-.05	-.04	.07	.06	.19**	.24*	.92**	1				
Cons_1	-.19**	-.08	-.02	-.07	.06	.05	.17**	.22*	.91**	.94**	1			
Cons_2	-.22**	-.06	-.03	-.09	.05	.04	.16**	.18*	.88**	.91**	.93**	1		
Pro_1	.21	-.06	.04	.04	-.16*	-.18	-.10	-.22*	-.14*	-.11	-.11	-.11	1	
Pro_2	.19	.07	.17	.10	-.16	-.18	-.21*	-.22*	-.04	-.07	.01	.02	.97**	1

** Significant at the .001 level.
*Significant at the .05 level.
a. 'Diff' represents Differentiation.
b. 'Con' represents Congruence.
c. 'Coh' represents Coherence.
d. 'Consis' represents Consistency.

The multivariate null hypothesis of equality of the means over all groups for all variables resulted in a fail to reject decision at the .05 level (Wilke's lambda = .82, $F = 6.34$, $p < .001$; Pillai's statistic [.18] and Hotellings test statistic [2.2] also resulted in *p* values that were less than .001. The small *p* value resulting from the overall test supported confidence that true mean differences do not exist among the two groups. The Wilke's multivariate effect size was relatively small at .18.

To identify the dependent variables that contributed to the rejection of the multivariate null hypothesis, univariate ANOVA's were conducted for Decision Making Confusion, Commitment Anxiety, External Conflict, Differentiation, Congruence, Coherence, and Consistency. All but two of the ANOVA hypotheses resulted in fail to reject decisions. Significant differences between groups were observed for scores on the secondary construct Coherence. The computed values of *F* for Decision Making Confusion, Commitment Anxiety, External Conflict, Differentiation, Congruence, Coherence, and Consistency were (.318, .583, 3.177, .744, 1.580, 39.68, and 3.56) respectively. The values of strength of association (η^2) for the same variables were .04, .03, .04, .01, .02, .15, and .04. The three covariates used in this study (gender, race, and class), did not significantly impact the scores between groups, except for one variable. Scores on *External Conflict* and the covariate *class* were positively correlated and significant at the .01 level.

Discussion

The results of this study add to the extensive research on the Self-Directed Search. The Self-Directed Search Form R (4th ed.) is a career assessment about which much is known. The *SDS Professional User's Guide* (Holland, Powell, & Fritzsche, 1994) includes 30 case study reports and a 143 item reference list. The accompanying *SDS Technical Manual* (Holland, Fritzsche, & Powell, 1994) summarizes the results of SDS outcome studies, and includes 189 references and 87 tables. Since 1994, scores of additional studies on the SDS have been published. Holland et al. (1994) noted that succeeding editions of the SDS have contained fewer and fewer bad items, because established inventories are slow to revise items because "bad" items have been eliminated in earlier editions. This means fewer potential items that might be susceptible to item response indecision.

In examining SDS item response indecision, it is significant to consider the information on scoring errors. Holland et al. (1994) reported that in scoring the SDS, 3.7% of users produced scoring errors affecting the first code letter across all norm groups. Lumsden, Sampson, Reardon, and Lenz (2002) conducted a post hoc analysis of the 63 SDS paper versions completed in their study of alternate forms of the SDS. They found 11 (18%) contained scoring errors, and 5 (8%) of these errors affected the summary code. In no case was the first letter of the summary code affected and only one case involved a change in the second letter (IAE to IEA). This is reassuring for practical use of the SDS paper version. The full exploration of this code would have produced the same list of occupations. The other four cases involved substituting a different third code letter, e.g., SEA to SEC, SEA to SEC, ESR to ESI, and ESI to ESC. These four cases are of more concern and of practical importance because they would have produced different lists of occupations.

This study was concerned with the comparison of variables related to career thoughts and vocational interests for two groups defined by item response indecision on an interest inventory. Respondents marked those items about which they were uncertain or indecisive with a "?" Analyses reveled that item response indecision was infrequently noted by the participants in this

study. Only 609 items out of 53,352 possible responses were marked with a question mark, about .01%. While 46% of participants had some item response indecision, ranging from 1 to 54, with a mean of 5.3 and *SD* of 7.7, the median was 2 and the mode was 1. Item Response Indecision and code changes were more common for those people with Social and Enterprising as their first Holland type. Because our sample was largely composed of these Social and Enterprising types, and because item response indecision was also most commonly expressed in these areas, we conclude that clients tend to express item response indecision in the areas they like rather than dislike. However, this result should be viewed with caution because the sample was heavily skewed in favor of Social and Enterprising types (34%, and 44% respectively). In comparison, the other four types combined accounted for (22%) of participants.

In the present study, 82% of respondents had no change in the summary code order of letters, and 92% had no changes in any of the 3 letters appearing in their code. This is important because Holland et al. (1994) provided the Rule of Full Exploration in interpreting the SDS, meaning that all five permutations of the 3-letter code should be used in exploring occupational options in the SDS Occupations Finder. Nine percent of respondents obtained a new third letter in their code when response indecision was considered in calculating the SDS results. This suggests that the critical issue with SDS response indecision pertains to the third and fourth letters in the Summary Code, more than the first letter. As Holland et al. (1994) noted, the Rule of Eight should be used in interpreting SDS results when summary scores differ by 8 or fewer points.

Results from the MANCOVA showed that the groups only differed significantly on Coherence. From this we conclude that participants with item response indecision are less certain of their *expressed* occupational interests. Additionally, the three covariates, gender, race, and class (year in school) did not have a significant impact on SDS codes. However, class did significantly impact the scores on External Conflict on the CTI. Further analysis revealed that sophomores tended to have higher scores on External Conflict. We concluded that because Sophomores are heavily pressured by academic advisors, administrators, and others to declare a major, negative thinking due to external factors increases.

Implications for Practice

Overall, it does not appear that item response indecision is a significant practical problem in using the SDS Form R. The fact that scores on Differentiation, Congruence, and Consistency were so highly correlated between trials indicates that participants' secondary constructs are not impacted by item response indecision. This finding is important for practitioners because it suggests that, if secondary constructs do not change significantly when answers are reversed, practitioner interpretations of secondary constructs would remain unimpacted by client uncertainty.

Implications for Research

The present study demonstrated that groups did not significantly differ on a measure of negative career thoughts, and only differed on one of the SDS secondary constructs, Coherence. This implies that response indecision might be better explained by some other, untested variable. More research is needed to uncover the differences between SDS users with/without item response indecision. Additionally, the sample for the current study was composed only of traditional aged college students. Adult and adolescent populations need to be addressed in future studies.

In summary, the results of this study show that SDS scores are robust and stable. While 46% of participants had some item response indecision, fewer than 10% obtained a new third letter in their codes. Counselors interpreting SDS results can more confidently allay user fears that the results might not hold on a different day or at some future point in time. As this study shows, even when SDS users are encouraged to act upon item response indecision the results will not be affected in a significant way.

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