A Comparison Study of the Paper, Personal Computer (PC), and Internet Versions of Holland's Self-Directed Search*:* Technical Report No. 30

Jill A. Lumsden
James P. Sampson, Jr.
Robert C. Reardon
Janet G. Lenz

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The Center for the Study of Technology in Counseling and Career Development
University Center, Suite A4100
The Florida State University
Tallahassee, FL 32306-2490

850-644-6431 (voice) 850-644-3273 (FAX)
http://www.career.fsu.edu/techcenter/

Jill A. Lumsden, M.S./Ed.S., is Career Development Coordinator in the Career Center at Florida State University in Tallahassee, Florida. James P. Sampson, Jr., Ph.D., is Professor in the Department of Educational Psychology and Learning Systems and Co-Director of the Center for the Study of Technology in Counseling and Career Development at FSU. Robert C. Reardon, Ph.D., is Professor and Program Director for Instruction, Research, and Evaluation in the Career Center, and an author of the interpretive reports used in the PC and Internet versions of the Self Directed Search. Janet G. Lenz, Ph.D., is Associate Director for Career Advising, Counseling, and Programming in the Career Center. Appreciation is expressed to Dr. Gary Peterson for comments on an earlier draft of this paper and to Julia Panke Makela for her assistance with statistical analyses. Correspondence concerning this report should be addressed to James P. Sampson, Jr., Center for the Study of Technology in Counseling and Career Development, The Career Center, Florida State University, UCA 4100, Tallahassee, Florida 32306-2490. E-mail: jsampson@admin.fsu.edu.

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Abstract

The equivalence of three different modes of administration of the Self-Directed Search (SDS) was studied with 93 college students. Scale scores and congruence were compared for the paper, personal computer (PC), and Internet versions of the SDS. Student preferences for different versions were also examined. Results showed significant positive correlations between the Internet, PC, and paper versions of the SDS on both scale scores and a measure of congruence. Overall, students preferred a computer format (either PC or Internet) to the paper version, but there was no strong preference when comparing PC and Internet versions.

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As the number of computer and Internet-based versions of career assessment instruments grows, there is an increased need for research to ascertain the equivalency of these instruments, especially as it relates to reliability and validity issues. The Standards for Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999) specify that "a clear rationale and supporting evidence should be provided for any claim that scores on different forms of a test may be used interchangeably" (Standard 4.10; p. 57). In order to be confident in the results of new versions or administration formats of career assessment instruments, equivalency must be established.

We located more than 11 studies that demonstrated the equivalence of score results obtained from paper-and-pencil and computer-assisted administrations of assessment instruments (Beaumont & French, 1987; Booth-Kewley, Edwards, & Rosenfeld, 1992; Davis & Morse, 1991; Davis et al., 1992; Hansen, 1987; Kapes & Vansickle, 1992; Reardon & Loughead, 1988; Roper, Ben-Porath, & Butcher, 1991; Sawyer, Sarris, & Baghurst, 1991; Simola & Holden, 1992; Vansickle & Kapes, 1993; Wilson, Thompson, & Wylie, 1982). However, a few published studies have shown that different administration modalities affect the equivalence of the score results (Allred & Harris, 1984; Beaumont & French, 1987; Watson et al., 1990; Watson, Thomas, & Anderson, 1992).

Although the existing literature seems to suggest that traditional paper-pencil and computer administration tend to be equivalent more often than not (Hofer & Green, 1985; Moreland, 1987; Roid, 1984), some data suggest these alternate forms are not necessarily

equivalent. This would suggest it is important for each instrument to be examined individually to clearly establish equivalency of scores and that blanket assumptions of equivalency are unwarranted (French, 1986). Moreover, it is important to examine the equivalency of assessment formats in terms of treatment effects as well as score results, e.g., increased self-knowledge, increased information-seeking behavior. With the Internet being the newest modality for many forms of testing, there is a need to have research data on the equivalence of the Internet form to paper and pencil and computer versions (Gati & Saka, 2001).

The Self-Directed Search Form R (SDS; Holland, 1994) is one of the most widely used interest inventories (Spokane & Holland, 1995), and one of only a few instruments available in multiple formats, e.g., paper-pencil, personal computer, Internet, mail-in scoring (Professional Report Service), and kit (Vocational Exploration and Insight Kit) (Reardon & Lenz, 1998). This study examined only the first three versions of the SDS mentioned above. The personal computer version was first published in 1985, and a study conducted by Reardon and Loughead (1988) looked at equivalence of administration procedures and score results for the paper-and-pencil and personal computer versions. The researchers examined scale scores, Iachan agreement index scores, and differentiation scores, and found no significant differences in the two formats. However, they did find differences in administration time and student preferences. The personal computer version was completed in about 25% less time than the paper-and-pencil version, and students strongly preferred the personal computer version to the paper-and-pencil version. Such differences in administration times and user preferences of the SDS in various formats raise issues for program administrators about the use of the SDS in practice.

The SDS Internet (Holland, Reardon, Latshaw, Rarick, Schneider, Shortridge, & St. James, 2001) is the most recent version of the of the SDS, and no prior research has been reported on the equivalence of this format to the paper-and-pencil or personal computer versions. The purpose of this study was to examine the equivalence in score results from the administration of three different formats of the Self-Directed Search Form R, the paper-pencil version, the personal computer version, and the Internet version. We also wanted to assess the reactions of students using the three formats of the SDS. Results of the study would enable us to determine if the administration method has an impact on the results obtained, and to provide an equivalency study as required by the standards of practice.

Method

Design

This study used a 2 x 2 correlational within-subjects design that was counterbalanced for each of the 3 groups (Paper-Personal Computer; Personal Computer-Internet; Internet-Paper). Counterbalancing the order of the SDS administrations was intended to distribute any potential ordering effect. The independent variable in each group was method of SDS administration, computer versus paper-and-pencil versus Internet format. The dependent variable was the equivalence between the SDS summary codes for the two formats completed by each participant.

Sample

Ninety-three undergraduate students enrolled in an introductory psychology course at a large southeastern university volunteered to participate in a study of career interest inventories, which also fulfilled a research participation requirement for the course.

Numerous other research options existed for students to fulfill this course requirement. The sample consisted of 33% male and 67% female students. The majority of the participants (67%) were freshmen, while 22% were sophomores; 9% juniors; and 2% seniors. The mean age of the participants in the sample was 18.7, and 37% of the participants were undecided about their major. Of the 93 participants, 81% were White, non-Hispanic; 9% were Hispanic, Latina(o), or Chicana(o); 5% were Asian American; 3% were Black or African American; 1% were Multiracial; and 1% marked "other." Over 67% of participants in this sample reported having a personal computer at home with both a printer and Internet access. All participants reported having access to a personal computer, even if they did not have one at home.

Instruments

Five instruments were utilized in this study: (1) the standard paper-and-pencil version of the SDS Form R (Holland, 1994); (2) the computer version of the SDS Form R (SDS: CV; Reardon, PAR Staff, & Holland, 1996); (3) the Internet version of the SDS Form R (Holland, Reardon, & PAR Staff, 1999); (4) a questionnaire (The Self-Directed Search Comparative Rating Form) adapted from Reardon and Loughead (1988) and modeled after an evaluation standard developed by Sampson and Peterson (1984); and (5) a participant information form. These instruments are described in the following paragraphs.

The paper-and-pencil version of the Self-Directed Search (SDS) was first published in 1970, and revised in 1977, 1985, and 1994. It includes the Assessment booklet, with a Daydreams section and 228 items, and the Occupations Finder, which lists 1,335 occupations employing 99% of U.S. workers. The paper-pencil SDS also includes the You

and Your Career booklet, which discusses the scientific ideas supporting the inventory, how to use the scores and codes, personality characteristics associated with codes, and suggestions for successful career planning.

The SDS: CV was published in 1985 (DOS version) and revised in 1996 (Windows version). It includes the complete SDS Form R Assessment booklet (including the Daydreams section) and the My Vocational Situation (MVS; Holland, Daiger, & Power, 1980). The SDS: CV produces a 10-12 page Interpretive Report and a 2-3 page professional summary of seven diagnostic signs for the counselor. The interpretive report adapts material from the Assessment booklet, You and Your Career booklet, and the *Dictionary of Holland Occupational Codes* (3rd edition; Gottfredson & Holland, 1996), and provides lists of occupational titles from the Occupations Finder, lists of fields of study from the Educational Opportunities Finder, and lists of leisure options from the Leisure Activities Finder. The MVS provides the practitioner with a measure of vocational identity, need for information, and perceived barriers to career choice.

The SDS Internet Version was published in 1999. It includes the complete Form R Assessment booklet but does not include the Daydreams section or MVS. It also produces the Interpretive Report. It includes a section on "How To Find A Career Counselor" and links to Internet sites for career assistance and information.

Internal consistency coefficients on the summary scale coefficients on the paper version of the SDS ranged from .90 to .94 (Holland, Fritzsche, & Powell, 1994a). Test-retest reliability correlations for the summary scales ranged from .76 to .89 (Holland, Fritzsche, & Powell, 1994a). Since prior research (Reardon & Loughead, 1988) has shown

that scores on the personal computer version are equivalent to the paper version, we can extrapolate that the reliability of the personal computer version is also high.

The research questionnaire, the SDS Comparative Rating Form, was composed of 42 items using a semantic differential 7-point format. Three versions were created (Appendixes A, B, and C), with two versions of the SDS as polar opposites on each version (one form compared the SDS Paper with the SDS Personal Computer; one compared the SDS Paper with the SDS Internet; and one compared the SDS Personal Computer with the SDS Internet). As in the Reardon and Loughead (1988) study, the questionnaire items were grouped into nine categories: (1) career decision making; (2) personal knowledge; (3) identified career options; (4) understanding the world of work; (5) integrating personal-work information; (6) action plan; (7) general impressions; (8) SDS evaluation; and (9) other satisfaction items. A 43rd item was an open-ended "additional comments" question. The Comparative Rating Form is not conclusively reliable or valid, yet fairly straightforward and face valid. One aspect of the instrument's design is that participants were forced to choose between two versions of the SDS (Reardon & Loughead, 1988), and each SDS format version was not rated independently.

The participant information form (Appendix D) included student demographic information, such as age, sex, year in school, major, and ethnicity. In addition, the Occupational Alternative Question (OAQ; Zener & Schnuelle, 1972; modified by Slaney, 1980) was administered, and questions about computer access were asked as part of the participant information form. The OAQ consists of two sections: 1) "list all the occupations you are considering right now" and 2) "which occupation is your first choice? If undecided, write undecided." The OAQ has demonstrated concurrent validity with other

measures of career indecision (Slaney, 1980; Slaney, Stafford, & Russell, 1981). The responses on the OAQ are scored as follows: 1 = first choice listed with no alternatives; 2 = first choice listed along with alternatives; 3 = no first choice listed, just alternatives; and 4 = neither first choice nor alternatives listed (Peterson et al., 1994). For this sample, the average score on the OAQ was 2.44, with a standard deviation of .73. This means that a participant in this sample typically had occupational alternatives, either with a first choice or with no first choice. An ANOVA performed on the three groups with respect to the OAQ revealed that the difference among the groups was not statistically significant, $F(2, 90) = .090$, $p > .05$.

Procedures

All data were collected in the career center at a large southeastern university. Data collection occurred over a three-week period, with each of three groups meeting once a week on a particular night. Each participant was randomly assigned to one of the three groups, paper versus personal computer, personal computer versus Internet, or paper versus Internet. They were also randomly assigned to complete one version of the SDS first. Participants completed each assigned version according to standard administration procedures provided with the instrument, i.e., participants completed all components of each version of the SDS as described in the instruments section. The data collection sessions lasted approximately 60 to 90 minutes. In the first meeting, participants received an overview and orientation to the career center, signed informed consent documents, completed the participant information form (Appendix D), and completed one version of the Self-Directed Search. In the second session, participants completed a second version of the SDS. The third session consisted of filling out the Comparative Rating Form and

debriefing. Participants were encouraged to come into the career center after the completion of the study if they had questions about their results. Both the computer and Internet versions of the SDS were administered in the career center's computer labs on IBM compatible computers.

Results

Pearson-product moment correlations reported in Table 1 between the paper version of the SDS and the personal computer version were very high, ranging from .85 to .95 on each of the scale scores. Correlations shown in Table 2 between scale scores of the paper version and Internet version ranged from .91 to .97. For the Internet and personal computer versions, correlations on the scale scores ranged from .92 to .98 (Table 3). All correlations were significant at $p < .001$. These reliability coefficients based on a one-week interval are higher than the test-retest reliability coefficients of the paper-pencil SDS instrument reported by Holland, Fritzsche, and Powell (1994a). They indicated that a sample of 73 persons, including high school students, college students, and adults tested over a period of 4 to 12 weeks, had test-retest coefficients ranging from .76 to .89.

For each participant's two SDS scores, an Iachan agreement index (Holland, 1994b) was calculated (Table 4). The possible values on this measure of code agreement range from 0 to 28. The mean index score for the paper and personal computer versions was 24.5 (SD=4.1). For the paper and Internet versions, the mean index score was 26.2 (SD=2.6). The mean index score for the Internet and personal computer versions was 25.9 (SD=3.6). It should be noted that 40 of the 93 participants had a perfect code match on two versions of the SDS. An ANOVA applied to compare the means of the three groups revealed that the difference among the groups was not statistically significant, $F(2, 90) = 2.73$, $p > .05$.

Comparative descriptive data on the administration time for the three versions is presented in Table 5. The mean time for completion of the paper version was approximately 31 minutes, for the personal computer version 28 minutes, and for the Internet version approximately 14 minutes. An ANOVA comparing the means of the three groups found that the difference among the groups was statistically significant, F (2, 65) = 53.89, $p < .01$. The omission of the Daydreams section and the MVS from the Internet version likely contributes to the lower administration time for this version.

As noted previously, three versions of the Comparative Rating Form were used, each with two versions of the SDS as polar opposites. By examining the mean scores across each group, the participants' SDS format preferences can be ascertained. The CRF used a differential 7-point format, with 4 being a midpoint score, showing no preference for either of the polar opposites. If the score is below 4, it shows a preference toward the SDS form on the left of the rating form, and if the score is above 4, it shows a preference toward the SDS form on the right of the rating form. Table 6 lists the means and standard deviations for each of the 42 items for each of the 3 groups.

Overall, participants preferred some type of computer format (either PC or Internet) in 37 of the 42 items on the CRF. Of those 37 items, the Internet version was preferred in 20 items, and the PC version was preferred in 17 items. In the paper version versus the personal computer version, the PC version was preferred in 39 of the 42 items. In the paper version versus the Internet version, the Internet was preferred in 37 of the items, and 2 items being exactly at midpoint, with neither preferred. In the PC version versus the Internet version, the Internet version was preferred in 21 items, while the PC version was also preferred in 21 items.

To determine if the preferences for either version were significant, a series of independent *t*-tests were run for all 42 items, comparing the mean score to the midpoint score of 4 (which would indicate no preference for either version). In comparing the PC version to the paper version, there were 13 items that showed significant differences at the $p \leq .01$ level and 5 items that showed significant differences at the $p \leq .001$ level, all of which showed preference toward the PC version. There were no significant differences in comparing the PC version to the Internet version. When comparing the paper version to the Internet version, 10 items showed significant differences at the $p \leq .01$ level and 4 items showed significant differences at the $p \leq .001$ level. All of these preferences were toward the Internet version.

The final item of the CRF states, "if I had to make a choice, I would prefer _____." On this item, a rating of 4.0 was the midpoint on the 7-point rating scale and indicated no preference for either version of the SDS being compared. Results showed that the PC version was favored over the paper version (mean score, 2.75) with significant difference at the $p = .01$ level, the Internet version was favored over the paper version (5.61) with significant difference at the $p = .001$ level, and when comparing PC versus Internet versions the mean score was 4.03, indicating an almost equal preference for both versions, with no significant difference.

Discussion

We conducted a study to examine the equivalence in score results from the administration of three different formats of the Self-Directed Search Form R, the paper-pencil version, the personal computer version, and the Internet version. We also wanted to assess the reactions of students using the three formats of the SDS. Our study did not

examine the impact of the three versions of the SDS on career decision-making skills, vocational identity, or other outcomes. Participants were 93 undergraduates in an introductory psychology course who volunteered to participate in a study of career interest inventories in order to complete a course requirement. Almost 40% of the participants were undecided about their major field of study, and two-thirds were freshmen and/or female. It might be noted that this participant profile resembles the client profile of persons coming to the university career center for career planning assistance. Each participant completed two of the three versions of the SDS in a random order.

The results of this study suggest that there are no statistically significant differences in the scores on the three administration versions of the SDS Form R. These findings are consistent with the findings of 11 studies reported earlier and the conclusions of Hofer and Green (1985), Moreland (1987), and Roid (1984). The six scale scores of the SDS are highly correlated for the paper-pencil, personal computer, and Internet administration formats, ranging from .85 to .98. Furthermore, the Iachan agreement indexes in each group, comparing the two SDS three-letter codes, were in high agreement. These scores ranged from 24 to 26 on a scale of 0 to 28, with no significant differences between the groups. These results suggest that administration method of the SDS does not affect the score results obtained, that the three versions of the SDS are essentially equivalent in the summary scores produced.

These results replicate the earlier study by Reardon and Loughead (1988) with the 1985 edition of the paper-pencil and computer versions of the SDS. In the current study, Pearson-product moment correlations between the paper version of the SDS and the personal computer version were very high, ranging from .85 to .95 on each of the scale

scores. Reardon and Loughead (1988) reported correlations ranging from .86 to .94. The present study further supports the equivalence of scores between the paper version and personal computer version of the SDS.

The results of this study also suggest that the newest version of the SDS, the Internet version, is equivalent to both the paper and personal computer versions. As required by the Standards for Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999), these results provide evidence that scores on the Internet version may be treated the same as those on the paper and personal computer versions. This is important for practitioners who wish to use the SDS supplemental materials (i.e., Occupations Finder, Educational Opportunities Finder, Leisure Finder) to support the results of the Internet version of the SDS.

We also found a strong computer preference effect in general. Participants preferred taking the SDS on the computer, either a stand-alone personal computer or a computer connected to the Internet, to taking the SDS on paper. We suspect that the immediate detailed, personalized feedback provided by the SDS Interpretive Report and perhaps the sample of college students, who as a group are very computer and Internet savvy, may have contributed to the preference of the computer versions over the paper version, but this issue requires further study. Both the Internet and PC versions of the SDS utilized this report, while the SDS paper version results were provided in the Occupations Finder and the You and Your Career booklets. Over 67% of participants in this sample of college students reported having a personal computer at home with both a printer and Internet access, and all participants reported having access to a personal computer, even if

they did not have one at home. These findings have implications for the planned use of the Internet in career services delivery. A national survey of adults conducted by The Gallup Organization for the National Career Development Association suggested that a "career information digital divide" might be emerging (NCDA, 2000). The Gallup survey revealed that 23% of college graduates would use the Internet to obtain information for career problem solving and decision making, compared to only 7% of high school graduates.

The results of this study have additional implications for the design and development of career intervention programs. The administration time is much less for the Internet version, with a mean administration time of 14 minutes for participants in this study. This is approximately 17 minutes less than the mean time for the paper version, and 13 minutes less than the mean time for the personal computer version. The completion times observed for participants in this study may have been affected by their voluntary participation as research participants from an undergraduate psychology course. This effect would apply equally to all three versions of the SDS. Completion times for actual clients may be longer. If a career service center wants to reduce costs and limit time per client contact, the SDS Internet version might be the SDS version of choice. The Internet version appears to be a brief intervention that participants preferred over the paper version, and which is significantly less time-consuming than both the paper and PC versions. It may be particularly appropriate for circumstances where time is limited. The reduced time for the Internet version may also be a result of the reduced content, i.e., no Daydreams section or MVS. The longer completion times for the PC version and especially the paper version may be warranted if the additional features inherent in these versions are desired.

The costs per individual administration of each of the three versions of the SDS vary considerably at this time, which may be important to program managers. For example, the paper-pencil version of the SDS (Assessment booklet, Occupations Finder, You and Your Career booklet) costs about $3.25 per administration, the computer version of the SDS (software module) costs about $2.80, and the single administration of the Internet version of the SDS is $8.95 (Psychological Assessment Resources, 2002). (It should be noted that price reduction discounts to $4.95 per administration are available for the Internet version of the SDS.) It might be noted that a fourth version of the SDS Form R is also available from the publisher, but it was not included in this study. The SDS Professional Report Service is a mail-in version of the SDS that uses a four-page bubble answer sheet that does not include the MVS or Daydreams sections, but produces a 10-12 page interpretive report like those produced by the PC and Internet versions of the SDS. It costs $6.80 per administration and would be suitable for large volume use. The SDS paper version is clearly the least expensive version of the SDS Form R.

Although the three versions of the SDS Form R appear to produce equivalent score results, there are important practical differences in these materials. For example, the Internet version does not include the Daydreams section and does not provide a Professional Summary for a counselor to use in interpreting the SDS results. This means that the counselor does not have access to the user's recorded vocational aspirations or to SDS item responses when using the Internet version. This material is available with the personal computer and paper-pencil versions. However, the Internet version may come closest to a "self-help" or "self-directed" application of the SDS, because a counselor does not have to be present for the user to have access to the instrument. Indeed, the Internet

version is truly a stand-alone career assessment, unless the user is referred to the SDS Internet version by a counselor.

Questions have been raised about scoring errors with the paper version of the SDS throughout its history (Miller, 1997); Tracey & Sedlacek, 1980). Regarding the most recent edition of the SDS Form R, Holland, Powell, and Fritzsche (1994b) acknowledge that test-takers do make scoring errors and the results should be rechecked. They reported that scoring errors have been reduced for each edition of the SDS Form R, and that the error rate of the high point code for the 1994 edition was 3.7% for a sample of 107 high school, college, and adult users. We conducted a post hoc analysis of the 63 SDS paper versions completed in this study. We 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, which is reassuring for practical use of the SDS paper version, and one case involved a change in the second letter (IAE to IEA). 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. Tables 7, 8, and 9 show the differences in our analyses between the original data and the corrected data after the scoring errors were fixed.

We were surprised to find so many scoring errors with the SDS paper version in this sample. We admonished participants to carefully check the scoring of the SDS upon completion, and we had research assistants quickly scan the summary scores when the materials were completed. These results are a reminder to pay more attention to finding

and correcting scoring errors with the paper version of the SDS. We found errors in the paper version that did not involve arithmetic calculations, such as transposing letters into the summary code even though the calculations were correct (actual SEC summary score recorded as ESC). For this reason, we are not persuaded of the superiority of the Internet or PC versions of the SDS in solving all of the problems of scoring errors with the paper version. For example, some users may hit the wrong key in completing the electronic forms of the SDS, just as others may make coding errors with the paper version.

The practitioner's selection of a particular SDS version should be based on the appropriateness of the various features and costs for the individuals being served and the philosophy and policies of the organization delivering the services. For example, the PC version of the SDS produces a customized Interpretive Report that can be edited for the provision of site-specific information, and it produces the most detailed information in the Professional Summary detailing both raw scores and normed scores for MVS results, RIASEC scores, Daydreams Summary Code, and information about differentiation, consistency, congruence, coherence of aspirations, and other indicators (Reardon & Lenz, 1999). The paper version is especially "transparent" in that the user can easily preview the entire assessment activity immediately by paging through the Assessment booklet before beginning the activity. This is not possible with the PC or Internet versions.

The SDS paper version is slower, has many features, is the most transparent, overcomes equity problems in technology access, and would be good where a counselor is available. The SDS PC version is also fast, has the most features, is somewhat transparent, and would be good for applications where a counselor is present. The SDS Internet version appears to be faster than either of the other versions, has fewer features, is the least

transparent, and would be good for distance guidance applications and for brief interventions.

Future research might focus on comparing different versions of the SDS to an external criteria, such as vocational identity or negative career thoughts. For example, do students with low vocational identity or negative career thoughts have more or less preference for the paper, personal computer, or Internet version of the SDS? Another area of research might investigate the extent to which the availability of occupational daydreams influences client satisfaction and outcomes resulting from using the SDS. Also, given that the SDS Internet version could more easily be completed away from a supportive context or environment in comparison to the paper and personal computer versions, how does using the SDS on a self-help basis outside the context of counseling services impact the effectiveness of the SDS? Although almost 40% of the participants in this study were undecided about their major, replication of this study could be conducted with clients actively seeking career assistance. The SDS summary profile of students in this study was SEIACR, with corresponding average summary scores of 33.5, 28.7, 23.8, 21.6, 21.5, and 15.3. Examining the profiles of other samples used in SDS research might produce different findings. And, given the aversion that some older persons have to computers, would different age groups report different preferences for the three administration formats of the SDS than this group of college students?

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Table 1

Means, Standard Deviations, and Correlations for Paper and Personal Computer SDS Scale Scores

	Paper		Personal Computer (PC)		
Scale	*M*	*SD*	*M*	*SD*	*r*
R	15.3	9.0	16.1	8.8	.92*
I	24.7	8.4	23.7	8.6	.92*
A	22.3	11.5	21.7	10.8	.95*
S	35.4	9.7	34.4	9.3	.86*
E	30.8	8.1	30.7	7.9	.85*
C	23.3	9.6	24.7	10.1	.87*

*$p < .001$

Table 2

Means, Standard Deviations, and Correlations for Paper and Internet SDS Scale Scores

	Paper		Internet		
Scale	*M*	*SD*	*M*	*SD*	*r*
R	14.1	9.3	15.7	9.8	.97*
I	23.8	11.2	24.8	11.2	.96*
A	23.1	10.5	23.2	10.6	.94*
S	32.7	9.3	32.7	9.2	.92*
E	26.3	10.4	26.4	10.8	.91*
C	18.8	8.6	19.1	7.8	.92*

*$p < .001$

Table 3

Means, Standard Deviations, and Correlations for Internet and Personal Computer SDS Scale Scores

	Internet		Personal Computer (PC)		
Scale	*M*	*SD*	*M*	*SD*	*r*
R	15.6	10.3	15.2	10.0	.96*
I	20.9	9.2	20.1	8.7	.92*
A	20.9	13.6	19.6	13.3	.98*
S	34.2	10.7	33.4	10.5	.92*
E	29.3	11.0	28.6	10.1	.93*
C	21.1	9.6	21.4	9.6	.94*

*$p < .001$

Table 4

Average Congruence Between Three Versions of SDS

	Congruence Score of Sample			
Versions	Minimum [a]	Maximum [b]	Mean	Standard Deviation
Paper vs. Personal Computer (PC)	16	28	24.53	4.09
Paper vs. Internet	16	28	26.23	2.64
Internet vs. Personal Computer (PC)	16	28	25.90	3.56
			$F(2, 90) = 2.10$ $p>.05$	

[a] Minimum possible congruence score: 0

[b] Maximum possible congruence score: 28

Table 5

Administration Time for Three Versions of SDS

	Administration Time (minutes)			
Version	Minimum	Maximum	Mean	Standard Deviation
Paper	22	41	31.17	5.27
Personal Computer (PC)	19	42	27.58	6.18
Internet	8	21	14.32	3.54
			$F(2, 65) = 53.89$ $p<.01$	

Table 6

Means and Standard Deviations for Three Groups (Personal Computer-Paper, Personal Computer-Internet, Paper-Internet) for Each Item of the Comparative Rating Form

	Personal Computer vs. Paper			Personal Computer vs. Internet			Paper vs. Internet		
COMPARATIVE RATING FORM QUESTION	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1. Helped me to become more confident of being able to choose a satisfying occupation.	32	3.69	1.18	30	3.73	1.26	31	4.26	1.55
2. Helped me to identify a logical series of steps to take in making a career decision.	32	3.94	1.44	30	3.77	1.38	31	4.00	1.46
3. Was too rigid in its approach to career decision-making. (R)	32	4.25	1.39	30	3.97	1.19	31	4.32	1.51
4. Made me feel less anxious about making a career choice as a result of using the instrument.	32	3.41	1.36	30	4.23	1.19	31	3.87	1.69
5. Was helpful in accurately clarifying my interests.	32	3.53	1.72	30	4.13	1.46	31	4.52	1.18
6. All in all, confused me with too much information about myself. (R)	32	3.63	1.52	29	4.28	1.25	31	4.39	1.23
7. Satisfied me with the variety of career options it gave me to explore.	32	3.34	1.58	30	4.00	1.31	31	4.29	1.77
8. Satisfied me with the number of career options it gave me to consider.	32	3.38	1.41	30	4.03	1.59	31	4.26	1.77
9. So overloaded me with the number and variety of career options present that I don't know where to go from here. (R)	32	3.69	1.12	30	4.23	1.07	31	4.13	1.12
10. I can seriously consider most of the occupations suggested.	32	3.81	1.60	30	3.73	1.14	31	4.35	1.60
11. Was helpful in prioritizing the field of potential occupational choices to a manageable number.	32	3.25*	1.48	30	4.20	1.06	31	4.29	1.10
12. Was frustrating in the process of reducing the field of potential occupations. (R)	32	3.66	1.41	29	4.07	1.46	30	5.10*	1.60
13. Helped me feel confident that I would find most of the final list of potential occupations satisfying.	32	3.78	1.75	30	4.13	1.25	30	4.57	1.65
14. Left me confused as to what the next step should be in making a career choice. (R)	32	3.69	1.33	28	4.04	.92	30	4.30	1.24
15. Helped me to identify additional sources of information that would be helpful in making a career choice.	32	3.63	1.84	30	3.77	1.38	30	3.80	1.47
16. Generally, I found it helpful.	32	3.09*	1.63	30	3.83	1.49	30	4.77	1.55
17. Presented information that was easy to understand.	32	3.13	1.91	30	3.77	1.50	30	5.03*	1.77
18. Gave me printed materials that will be helpful in the future.	32	2.47**	1.80	29	3.52	1.24	30	5.10*	1.65

COMPARATIVE RATING FORM QUESTION	Personal Computer vs. Paper			Personal Computer vs. Internet			Paper vs. Internet		
	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
19. Found myself getting bored with the instrument after a while. (R)	32	3.31	1.99	29	4.14	1.46	30	5.37**	1.56
20. (Would have preferred learning about career decision-making more from a counselor than from the instrument. (R)	32	3.31	1.57	30	4.60	1.54	30	4.87*	1.48
21. Felt in control of what I wanted to do with the instrument.	32	3.69	1.93	29	3.79	1.59	30	4.83	1.78
22. Felt I gave information that was truthful.	31	3.52	1.41	29	3.97	1.32	30	4.33	1.45
23. Helped me to feel more hopeful of finding a satisfying occupation.	32	3.56	1.46	30	3.57	1.25	31	4.35	1.28
24. Can take the information it gave me seriously.	32	3.75	1.41	30	3.77	1.25	31	4.81*	1.45
25. Answered most of my career questions to my satisfaction.	32	3.59	1.13	30	3.93	1.01	31	4.52	1.23
26. Using it for career guidance seemed like playing a game.	32	2.81**	1.33	29	4.24	1.50	31	4.52	1.52
27. Was easy to use.	32	2.19**	1.28	29	4.24	1.50	31	6.13**	1.45
28. Would be willing to use it again in the future.	32	2.97*	1.93	30	3.83	1.62	31	5.26*	1.86
29. Suggested many jobs I would not consider. (R)	32	4.22	1.60	30	4.13	1.25	31	4.71	1.87
30. Helped me to understand myself better now.	32	3.81	1.12	30	3.77	.94	31	4.10	.83
31. Using it made me worry about my career. (R)	32	3.69	1.06	29	4.28	1.07	31	4.42	1.09
32. Increased my confidence in my original vocational choice.	32	3.38*	1.10	29	3.69	1.23	31	4.45	1.31
33. My family or friends will like the outcomes suggested by it.	32	3.47	1.24	29	3.72	1.00	31	4.48	1.26
34. See more occupational opportunities than I did before using it.	32	3.31*	1.23	30	3.67	1.30	31	4.32	1.56
35. Would recommend it to a friend.	32	2.41**	1.48	30	3.87	1.59	31	4.74	1.67
36. Felt better about my career after I used it.	32	3.62	.94	30	3.83	1.32	31	4.23	1.48
37. Took too much time to use. (R)	32	2.56**	1.50	30	4.33	1.27	31	5.65**	1.40
38. Plan to get more career information after using it.	32	3.25*	1.32	29	3.55	1.35	31	4.00	1.48
39. Needed more help from a counselor before using it. (R)	32	3.47*	.92	29	4.07	.96	31	4.32	.98
40. Needed more help from a counselor after using it. (R)	32	4.16	1.35	30	4.03	1.40	31	4.03	1.25
41. Using it is like working with a career counselor.	32	3.63	1.29	28	4.21	1.32	31	4.10	1.49
42. If I had to make a choice, I would prefer	32	2.75*	2.31	29	4.03	2.23	31	5.61**	2.06

*$p \leq .01$

**$p \leq .001$

(R): Reversed items.

Table 7

Means, Standard Deviations, and Correlations for Paper and Personal Computer SDS Scale Scores Showing Differences in Calculations as a Result of Scoring Errors

	Paper				Personal Computer (PC)			
Scale	M^o	M^c	SD^o	SD^c	*M*	*SD*	r^o	r^c
R	14.7	15.3	9.0	9.3	16.1	8.8	.92*	.92*
I	24.5	24.7	8.2	11.2	23.7	8.6	.90*	.92*
A	22.5	22.3	11.6	10.5	21.7	10.8	.95*	.95*
S	35.4	35.4	9.7	9.3	34.4	9.3	.86*	.86*
E	30.7	30.8	8.0	10.4	30.7	7.9	.84*	.85*
C	23.0	23.3	9.3	8.6	24.7	10.1	.88*	.87*

*$p < .001$

^{o} Shows calculations with original data before scoring errors in the paper version were corrected.

^{c} Shows calculations with corrected data to account for scoring errors in the paper version.

Table 8

Means, Standard Deviations, and Correlations for Paper and Internet SDS Scale Scores Showing Differences in Calculations as a Result of Scoring Errors

	Paper				Internet			
Scale	M^o	M^c	SD^o	SD^c	*M*	*SD*	r^o	r^c
R	14.1	14.1	9.3	9.1	15.7	9.8	.97*	.97*
I	23.8	23.8	11.2	9.7	24.8	11.2	.96*	.96*
A	23.1	23.1	10.4	10.9	23.2	10.6	.94*	.94*
S	32.7	32.7	9.3	9.5	32.7	9.2	.91*	.92*
E	26.8	26.3	10.9	9.6	26.4	10.8	.80*	.91*
C	18.7	18.8	8.5	9.3	19.1	7.8	.92*	.92*

*$p<.001$

^{o} Shows calculations with original data before scoring errors in the paper version were corrected.

^{c} Shows calculations with corrected data to account for scoring errors in the paper version.

Table 9

Average Congruence Between Three Versions of SDS Showing Differences in Calculations as a Result of Scoring Errors

	Congruence Score of Sample						
Versions	Min. [a,c]	Min. [a,o]	Max. [b,o,c]	Mean[c]	Mean[o]	Standard Deviation[c]	Standard Deviation[o]
Paper vs. Personal Computer (PC)	16	14	28	24.53	24.31	4.09	4.16
Paper vs. Internet	16	16	28	26.23	26.26	2.64	2.66
Internet vs. Personal Computer (PC)	16	16	28	25.90	25.90	3.56	3.56
				$F(2, 90) = 2.10$ $p>.05$	$F(2, 90) = 2.73$ $p>.05$		

[a]Minimum possible congruence score: 0

[b]Maximum possible congruence score: 28

[o] Shows calculations with original data before scoring errors in the paper version were corrected.

[c] Shows calculations with corrected data to account for scoring errors in the paper version.

Appendix A

Comparative Rating Form Personal Computer versus Paper

Appendix B

Comparative Rating Form Paper versus Internet

Appendix C

Comparative Rating Form Personal Computer versus Internet

Appendix D

Participant Information Form