INCREASING DIFFERENTIATION ON VOCATIONAL ASSESSMENTS AMONG GIFTED HIGH SCHOOL STUDENTS

THESIS

Present to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

By

Cindy L. Kidner, B.S.
Denton, Texas
August, 1997

Multipotentiality makes career counseling with gifted students difficult. High-flat vocational profiles give the impression that gifted students can develop a wide range of abilities to an equally high level. High-flat vocational profiles may be due to assessments that consider abilities and disregard interests and values, and ceiling effects from the use of age-appropriate, rather than cognitively-appropriate measures. Subjects included 170 gifted students from a residential, early college entrance program (M=15.9 yrs., SD=.361). Subjects completed the Scholastic Aptitude Test, Self-Directed Search, and Study of Values. McNemar's Test of Correlated Proportions shows the proportion of multipotential profiles decreases significantly when cognitively-appropriate measures of interests and values are considered, in addition to abilities. Pearson Chi-square shows no ethnic differences.
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INTRODUCTION

The most widely accepted goals for career education and guidance are to (a) explore a variety of career options; (b) consider, based on individual abilities and interest, a smaller number of career options in depth; (c) set career goals; and (d) develop a long-term plan to accomplish these goals (Milgram, 1991). Goals (a), (c), and (d) are contingent on goal (b), unless the individual already knows his or her skills and type of career desired. Therefore, an assessment of abilities and interests is desirable to assist in vocational counseling. Vocational counseling with the gifted, however, is difficult because gifted students possess characteristics and are faced with special issues that make career decisions difficult (Emmett & Minor, 1993). These characteristics and issues include: sensitivity to the expectations of others, perfectionism, career as lifestyle, career as investment, social isolation, lack of adult role models, superior intelligence, and multipotentiality (Emmett & Minor, 1993; Sanborn, 1979a, Herr & Watanabe, 1979).

Multipotential individuals are proficient in a number of academic and career areas and also have multiple interests (Sanborn, 1979a; Sanborn, 1979c). Multipotentiality is thought to be manifested by high-flat profiles on measures of abilities, interests, and values (Sanborn, 1979c). Multipotentiality appears repeatedly in the literature as one of the main factors that makes career decisions difficult for the gifted.

Statement of Problem

Traditional vocational assessments have focused on measures of ability and aptitude. Gifted students often score highly in a wide range of abilities on traditional aptitude measures (Silverman, 1993). The lack of differentiation between measured abilities, multipotentiality, makes career counseling with gifted populations difficult and not always
helpful. This high-flat profile gives the impression that these individuals have the potential to develop any of a miriad of competencies to an equally high level. Guidance counselors often make this assumption, and in doing so, fail to meet the needs of their gifted students. Students may be dismissed with the optimistic statement, "You can do anything you want to (Kerr & Ghrist-Priebe, 1988)." This abundance of options may, at times, place gifted students at risk of over-extending themselves with too many interests and activities (Kerr & Erb, 1991). Multipotentiality can lead to frustration for academically talented college students as well. These students tend to delay career decision-making and change majors more frequently than average students (Kerr & Erb, 1991). Multipotential students often wish to keep their options open, or fear choosing the wrong vocation (Emmett & Minor, 1993).

The literature offers only vague information regarding the prevalence of multipotentiality among the gifted. Sanborn (1979c) states that the vast majority of gifted students can be classified as multipotential, presenting uniformly high profiles on a wide range of ability and interest measures, while only a small minority of gifted students show a concentration of both interest and ability in one area. Fredrickson (1979) states that both highly and moderately gifted students have problems with multipotentiality.

While Fredrickson (1979) supports the concept of multipotentiality, he offers another explanation for these high-flat profiles. High-flat profiles may be the result of ceiling effects from the use of age-appropriate, rather than cognitively-appropriate measures. These age-appropriate measures cannot discriminate between individuals at high levels of ability (Fredrickson, 1986). Fredrickson (1979) and Stanley (1990) suggest that the use of above level measures with higher ceilings may result in more differentiated profiles. For example, Achter, Lubinski, and Benbow (1996) used above-level measures to study multipotentiality in gifted junior high school students.
Sanborn (1979a) suggests the use of interest measures in addition to ability measures when counseling gifted individuals. Several authors suggest that ability and interests measures are still insufficient to deal with multipotentiality, and recommend the use of values in addition to these measures (Colangelo & Zaffrann, 1979). The Theory of Work Adjustment (TWA), which seeks to optimize the fit between an individual and the individual's environment, supports the use of ability, interest, and value measures in career counseling with gifted populations (Dawis & Lofquist, 1984; Lofquist & Dawis, 1991). Based on the TWA, it can be hypothesized that the more information that is known about the individual, the more differentiated the individual's vocational profile will become. In summary, these problems have been identified: Due to the lack of research and confusion surrounding the use of insufficient or inappropriate vocational measures, prevalence rates of multipotentiality are vague. Multipotentiality makes career counseling with the gifted difficult and not always effective. Multipotentiality may place gifted students at risk of over-extending themselves. Because of a fear of limiting one's options, or choosing the wrong vocation, multipotential students tend to delay career decision making and change college majors more frequently.

Statement of Purpose

The purpose of this study is to: (a) based on TWA, examine vocational profile differentiation when interests, values, and verbal and quantitative abilities are considered, and (b) examine gender and ethnic differences in vocational differentiation.

The value of this study is that it provides results which may improve vocational counseling to gifted populations by helping them choose a career that fits their ability, interests and values. Value based career counseling also increases the development of identity and purpose (Kerr & Erb, 1991). Knowledge of gender and ethnic differences in gifted populations on measures of verbal and mathematical abilities, interests, and values
will lead to a better understanding of group differences. Finally, this study yields information regarding the value of including multiple assessment instruments to assist in student admissions and planning.

**Hypotheses**

Based on the literature, the following hypotheses regarding gifted students are made:

1. Vocational profiles will be more differentiated when interests and values are considered in addition to verbal and quantitative abilities.
2. Among the different ethnic groups in the study, differences exist in the proportion of gifted students identified as multipotential.

**Research Questions**

This study seeks to answer the following four questions concerning multipotentiality:

1. What proportion of male and female gifted students are multipotential?
2. Among the different ethnic groups, what proportion of male and female students are multipotential?
3. Does the proportion of multipotential profiles decrease when interests and values are considered, in addition to abilities?
4. Do gender and ethnic differences exist in the proportion of gifted students who present as multipotential?

**Definition of Terms**

For the purpose of the study, the following terms are used as defined below:

- **Above level measures**—Refers to the use of measures developed for use with older subjects.
- **Age-appropriate**—Refers to measures developed for and used with a particular age-group.
- **Cognitively-appropriate**—Refers to the use of measures that are intellectually appropriate, rather than age-appropriate for the subject. In the case of gifted subjects, these measures
would be intellectually more challenging than those measures normally given to their same age peers.

**Ethnic groups**—Refers to Anglo, Asian, and Hispanic groups represented in the sample.

**Gifted**—Possessing outstanding intellectual abilities.

**High-flat profile**—Uniformly above average scores on all scales in a measure, and/or all measures included in a vocational assessment.

**Multipotentiality**—Possession of a wide range of abilities and interests, manifested by a high-flat vocational profile.

**Profile differentiation**—Refers to the degree of variation between an individual's scores on different measures of ability, interest, and values.

**Texas Academy of Mathematics and Science (TAMS)**—A residential early college entrance program for gifted high school students, in the State of Texas, who have demonstrated an interest in pursuing careers in mathematics and science. The program is located on a university campus near a large metropolitan area in North Texas.

**Undifferentiated profile**—For the Scholastic Aptitude Test (SAT), the criterion for undifferentiated profiles is a profile with less than eighty-three points, one standard deviation difference between math and verbal scores. For the Self-Directed Search (SDS), the criterion for undifferentiated profiles is less than eight points difference, based on the standard error of difference scores, between the average of the three highest themes minus the average of the lowest three themes. For the Study of Values (SOV), the criterion for undifferentiated profiles is less than one standard deviation, nine points, difference between the average of the three highest themes or dimensions minus the average of the lowest themes or dimensions (Achter, et al., 1996).

**Vocational profile**—A subject's scores on a battery of measures including the Scholastic Aptitude Test, the Self Directed Search, and the Study of Values.
Limitations of Study

Any conclusions drawn from this study are limited by the following factors:

1. Because the TAMS population is unique, results cannot be generalized to all gifted high school students.
2. The SOV was most recently revised in 1960, therefore, the norming sample is outdated.
3. Due to the age of the SOV, slight changes in wording were made to correct for gender-biased language.
4. Sample sizes are too small for some statistical analyses.

Literature Review

Multipotentiality

Sanborn (1979a) identified four critical factors of career guidance with gifted students: career as investment, career as lifestyle, pressure from the expectations of others, and multipotentiality. Career as investment and career as lifestyle refer to the significant investment of time and financial resources involved in pursuing higher education and advanced careers. Pressures from the expectations of others, such as parents and teachers, include pressure to earn the best grades, attend the most prestigious universities, and enter highly respected professions (Zaffrann & Colangelo, 1979). Sanborn (1979a) identified multipotentiality as the most significant of these four factors. Multipotential individuals are proficient in a number of academic and career areas, and possess a wide variety of interests (Sanborn, 1979a). As a result guidance counselors may need to devote more time to gifted students because the number of realistic career choices for them is greater than for their non-gifted peers (Sanborn, 1979b).

Fredrickson (1979), discusses unique issues in career development for gifted individuals. These issues include: social expectations, premature career decisions,
frustration of multiple career choices, no one best career choice, and multiple competencies. Although Fredrickson does not label these issues as "multipotentiality", he states that most gifted individuals are multipotential. He continues by discussing many of the implications of multipotentiality. These implications include: (a) gifted individuals have many career options, (b) there is not one best occupation for gifted individuals, and (c) that gifted individuals have above average abilities in many areas. Jepsen (1979) reiterates these issues. The multiple potentials of gifted individuals are manifested in measures of ability and interest. By definition, multipotential individuals are those who score uniformly high on all ability measures (Achter, Lubinski, & Benbow, 1996). Additionally, these individuals frequently present undifferentiated profiles on vocational interest measures (Kerr & Colangelo, 1988).

Although multipotentiality is a widely accepted construct, most of the discussion is theoretical and anecdotal. Emmett and Minor (1993) lend empirical support to the construct of multipotentiality with their investigation of the career decision difficulties experienced by gifted individuals. A content analysis of structured interviews with gifted adolescents, revealed twenty factors identified as important in career decisions. These factors clustered into five groups: sensitivity to others' expectations, perfectionism, developmental issues, superior intelligence, and multipotentiality.

Several authors have offered suggestions for dealing with the difficulties presented by multipotentiality. Gifted students have a greater awareness of career choices open to them (Milne, 1979). Increasing this awareness through traditional career exploration may serve to increase students difficulty in selecting a career (Milne, 1979). Milne suggests a narrowing of possibilities by eliminating those occupations that are not of interest to the gifted student. The use of Holland code types may be one way to narrow the possibilities by eliminating careers that do not correspond to the individual's code type. Milne (1979)
also suggests program changes in career education that would increase the gifted students' exposure to work related activities. Perrone (1986) suggests that guidance counselors should encourage gifted students to keep career options open until well into college.

The Career Motivation Program was designed to incorporate these suggestions. The Career Motivation Program provided ten structured activities designed to allow gifted students to gather information about their abilities, interests, career values, strengths, and personality (Schroer & Dorn, 1986). Pretest and posttest comparisons of the Career Decision Scale showed decreases in career indecision for both males and females, after participation in the program (Schroer & Dorn, 1986). Males also exhibited decreases in personal conflict and perceived fewer external barriers (Schroer & Dorn, 1986). Females, however, exhibited significant increases in personal conflict and perceived more external barriers after participation in the Career Motivation Program (Schroer & Dorn, 1986).

Milgram (1991) suggests that career development of gifted students could be improved by the inclusion of experiential career education, such as mentorships, internships, and apprenticeships. These experiences would expose gifted students to the realities of different occupations. Intuitively, these experiences would seem to be helpful, but many gifted students do not have access to such opportunities.

Silverman (1993, p.221) offers several suggestions for guidance counselors to assist them in providing helpful career counseling to multipotential students. These suggestions include:

1. preparing multipotential students for many options
2. exploring with them careers in which they would have the opportunity to synthesize interests in many fields
3. allowing them to delay decision-making until college
4. providing real-life experiences in some of their avenues of interest
5. discussing the possibility of serial or concurrent careers
6. helping multipotential students determine which of their interest they could maintain as avocations
7. suggesting the possibility of creating new careers
8. exploring life themes as a basis for career choice

The manual for the Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) offers these suggestions for dealing with multipotential profiles:

1. changing occupations frequently
2. pursuing an occupation that entails contact with people who have highly diverse interests
3. pursuing an occupation that incorporates constant variety and change
4. taking up several different hobbies and leisure activities
5. cultivating friends with interests in a wide range of activities

Some of these suggestions might be helpful, but many of them are unrealistic and would seem to do little to decrease the difficulties of multipotential students. The literature does not support that allowing gifted students to postpone decision-making until college decreases their difficulty with vocational choice. Changing occupations frequently would allow gifted students to utilize their interests and abilities in many areas, but financially, this solution may not be advantageous or even realistic.

The Guidance Laboratory at the University of Nebraska-Lincoln was created to design and evaluate career development interventions for the gifted (Kerr & Ghrist-Priebe, 1988). Kerr and Ghrist-Priebe (1988) compared 56 high school participants in the day-long workshop with 31 students who were wait-listed and scheduled to participate in the workshop the following semester. The workshop included completing the Holland's Self-Directed Search and the Edwards Personal Preference Schedule (Kerr & Ghrist-Priebe,
The participants were also asked to rank thirty values and complete a short questionnaire about academic and extracurricular activities (Kerr & Ghrist-Priebe, 1988). Individual participants then selected a part of the university to visit and were escorted by a student host (Kerr & Ghrist-Priebe, 1988). Participants also selected and attended a university class related to one of their career interests (Kerr & Ghrist-Priebe, 1988). After lunch with the guidance laboratory counselors, the high school students participated in individual and group counseling sessions (Kerr & Ghrist-Priebe, 1988). The goals of the individual sessions were to clarify the gifted students' interests, needs, and values; convey understanding of the gifted students' concerns; encourage goal setting; and persuade the gifted student to continue the process of career decision making (Kerr & Ghrist-Priebe, 1988). Group sessions consisted of four to seven students and were focused on the participants' desired future lifestyles, the identification of barriers to, and the possibilities for attaining those lifestyles (Kerr & Ghrist-Priebe, 1988). A follow-up telephone survey was conducted two months after the last workshop.

Chi-square tests were used to compare survey results of participants to wait-listed non-participants. Several significant differences emerged. Participants were significantly more likely to have discussed career development and to have seen a counselor in the two months prior to telephone contact. Of the participants, 100% reported that the workshop was helpful, 31% reported changing their career or educational plans based on the workshop, and 38% reported that the workshop had confirmed their career plans (Kerr & Ghrist-Priebe, 1988). While the career development workshop appeared to be helpful, because of the time and financial cost involved with such an individualized intervention, it may not be a realistic option for dealing with the problems presented by multipotentiality.

Sanborn (1979a) recommended the use of measures of interest in addition to aptitude. In a discriminant analysis, Austin and Hanisch (1990) studied the relationship between
ability, interest, gender, and socioeconomic status and occupational attainment. Results suggested that interests do contribute to an individual's choice of occupation (Austin & Hanisch, 1990). Lubinski, Benbow, and Ryan (1995) lended support to the temporal stability of vocational interests among the gifted. Subjects were administered the Strong-Campbell Interest Inventory at age 13 and again at age 28. Chi-square analysis suggested that an individual's most dominant occupational theme is likely to be a prominent theme in that individual's adult vocational profile (Lubinski, Benbow, & Ryan, 1995).

Many have concluded that considering abilities and interests in vocational counseling of the gifted is still insufficient to deal with issues of multipotentiality, and therefore, values and needs should be considered (Colangelo & Zaffrann, 1979). Rounds (1990) performed a multiple regression analysis to examine the relationship between job satisfaction, and interests and work values. Results showed that work values accounted for a significant amount of the satisfaction variance (Rounds, 1990). Rounds (1990) concluded that both interests and work values play a role in job satisfaction, and recommended that both be considered in career counseling with adults. Lubinski, Schmidt, and Benbow (1996) lended support to the use of values with gifted adolescents. Subjects completed the Study of Values at age 13, and twenty years later at age 33. Values themes present at age 13, were more likely than chance to be present at age 33 (Lubinski, Schmidt, & Benbow, 1996). This was especially true for Theoretical, Economic, Aesthetic and Religious themes (Lubinski, Schmidt, & Benbow, 1996). Similarly, Kerr and Erb (1991) found significant increases in development of purpose and identity in a pretest-posttest evaluation of a value-based career counseling intervention for gifted students.

The literature on gender differences among the gifted offers little information regarding gender differences in multipotentiality. Other gender differences are discussed, for example, factor analysis of verbal, logical, visuospatial, and mathematical abilities show
significant gender differences in a sample of college students (Wormack, 1980). Three factors were identified for males: verbal, visuoperceptual, and mathematics (Wormack, 1980). Two factors were identified for females: verbal-mathematics-visuospatial and verbal (Wormack, 1980). Kelly and Colangelo (1990) studied the effects of gender and academic ability on career development in junior high school students. The Career Maturity Inventory Attitude Scale was used to measure cognitive resources for decision-making and decision-making certainty. Among the gifted subjects, gender differences in career maturity were not found. The literature suggests that gifted women may experience conflict between career and family roles (Zaffran & Colangelo, 1979; Wolleat, 1979). Dick and Rallis (1991) examined factors influencing the career choices of high school seniors from nine schools in Rhode Island. For males, salary was a more important influence on career choice than for females. For females not choosing careers in engineering or science, genuine interest was a more important influence on career choice than for males (Dick & Rallis, 1991). Interestingly, these gender differences were not found among students who had a strong course background in mathematics and science (Dick & Rallis, 1991).

The literature is lacking in information on gifted minorities. African-Americans, Hispanics, and Native Americans are underrepresented in gifted education classes (Chinn & Hughes, 1987). Hadaway and Marek-Schroer (1992) conclude that this underrepresentation is the result of ineffective identification procedures, and suggest a multi-modal assessment for the identification of gifted minorities. It is speculated that gifted minorities face the challenges of multipotentiality, as well as, the challenges presented by being a member of an ethnic minority (Frasier, 1979). Gifted minority students may be less aware of their academic and career options. Counselors can be helpful to gifted minority students by helping them develop a better understanding of their
options (Frasier, 1979). Additionally, being identified as gifted may cause some minority students to feel alienated from their culture. Counselors need to be sensitive to this feeling of alienation (Frasier, 1979). Several suggestions may be helpful when counseling minority students. Successful gifted minority students often report the importance of mentor relationships (Frasier, 1979). Frasier (1979) suggests that counselors encourage a questioning attitude in gifted minority students. Specific questions include: Who am I?, Where am I going?, How will I get there?, and How will I identify my success upon arrival? (Frasier, 1979).

Theory of Work Adjustment

It has been proposed that the Theory of Work Adjustment (TWA) can be used to evaluate the concept of multipotentiality and identify differentiated abilities in gifted populations (Dawis & Lofquist, 1984; Lofquist & Dawis, 1991). Tinsley (1993, p.73) called the TWA "the most comprehensive model of vocational adjustment." The Theory of Work Adjustment suggests that the relationship between an individual and the work environment is reciprocal, each making demands of the other. The work environment demands certain abilities in the individual, while the individual demands that personal interests and values be met by the work environment. A basic assumption of the TWA is that an individual will seek to obtain and maintain the correspondence between the individual and the environment. The process by which the individual seeks to do this is called work adjustment (Lofquist & Dawis, 1969). High person-environment fit is associated with higher levels of job satisfaction and extrinsic success, such as promotions and salary increases (Bretz & Judge, 1994). To evaluate this fit, Dawis and Lofquist (1984) suggested including measures of abilities, interests and values in vocational assessments.
Based on TWA, the fit between a gifted student and his or her academic and future vocational environment can be optimized by increasing the understanding of the individual's abilities, interests, and values. Achter, Lubinski, and Benbow (1996) used this premise to evaluate if gifted individuals would present a more differentiated profile when cognitively-appropriate, rather than age-appropriate, measures of interests and values, as well as verbal and quantitative abilities, were considered. They found that when interests and values were considered, in addition to verbal and quantitative abilities, fewer individuals presented a multipotential profile. Achter, Lubinski, and Benbow (1996) did not conduct statistical analyses to determine if the decrease in multipotential profiles was significant, nor did they examine gender and ethnic differences.

METHOD

Subjects

The sample population consists of one hundred seventy gifted students, ranging in age from 15 to 17 (M = 15.9, SD = .361, Mdn = 16), who are currently enrolled in the Texas Academy of Mathematics and Science (TAMS), a residential early college entrance program for gifted students. Admissions criterion for the TAMS is a score of 1000 on the SAT, with a minimum 550 on the mathematics section. The ethnic distribution of the TAMS's population is 54.1% Anglo, 24.1% Asian, 15.3% Hispanic, 5.9% African American, and 0.6% Native American. This distribution attempts to represent the ethnic distribution of students identified as "gifted" in the state of Texas (Texas Education Agency, 1993.)

Measures

Measures used in this study included the Scholastic Aptitude Test (SAT), the Self Directed Search (SDS), and the Study of Values (SOV).
SAT

The SAT was used to measure verbal and mathematical abilities. The mean corrected correlation between composite SAT score and freshman college grade-point-average, for high academic students, is .60. The average corrected SAT score correlations with course grades are, .54 for calculus, .64 for advanced physical science and engineering, and .50 for computer science (Ramist, Lewis, & McCamley, 1990).

SDS

The SDS was used to measure vocational interests. The SDS is a self-administered, self-scored, and self-interpreted vocational assessment tool based on Holland's typology. Holland's typology is based on several assumptions:

1. Most people can be categorized as one of six personality types.
2. Work environments can be categorized into these same six types.
3. People search for work environments that will let them exercise their skills and abilities, express their attitudes and values, and take on agreeable problems and roles (Holland, 1979).

These six personality and environment types include: realistic, investigative, artistic, social, enterprising, and conventional. The six scales on the SDS estimate the individual's resemblance to each of these personality types. The three types that the individual resembles most is that individual's code type. The individual can then match his or her code to a list of work environments (occupations) with the same or similar codes (Holland, 1979).

The corrected split-half reliability coefficients for the summary scales range from .83 to .95. For an individual's high-point code, predictions of occupational choice three years after the SDS assessment yield hit rates of 43 percent for males and 65.7 percent for females (Holland, 1979).
SOV

The SOV was used to measure values based on personality-related motives. The SOV assesses values along six dimensions: theoretical, economic, aesthetic, social, political, and religious. Test-retest mean reliability coefficients are .89 for one month and .88 for two months (Allport, Vernon, & Lindzey, 1970). Slight changes in wording were made to correct for gender-biased language. These changes, along with the outdated norms, presented limitations for the study. Despite these limitations, the measure was used because it is the only cognitively-appropriate measure of work values.

Procedure

The first year TAMS population are required to attend a weekly seminar. During the spring semester, several of these weekly seminars were devoted to vocational guidance. During this time, the TAMS students were administered the SDS and the SOV. To maintain confidentiality, TAMS removes all identifying information and stores assessment results in a number coded research file. SAT, SDS, and SOV scores were obtained from this research file.

The proportion of individuals with undifferentiated profiles was determined for the following combinations of variables:

1. SAT
2. SDS
3. SOV
4. SAT and SDS
5. SAT and SOV
6. SAT and SDS and SOV.

For the SAT, the criterion for undifferentiated profiles was those profiles with less than one standard deviation difference between math and verbal scores. The standard deviation
used was eighty-three points, the average standard deviation of the gifted adolescent population as identified by the Iowa Talent Search (Achter, Lubinski, & Benbow, 1996). To adjust for mean differences between math and verbal scores, 70 points were added to each subject’s verbal score (Achter, Lubinski, & Benbow, 1996). For the SDS, the criterion for undifferentiated profiles was less than eight points difference, based on the standard error of difference scores, between the average of the three highest themes minus the average of the lowest three themes. For the SOV, the criterion for undifferentiated profiles was less than one standard deviation difference between the average of the three highest themes or dimensions minus the average of the lowest themes or dimensions.

College norms, rather than high school norms, were used because they represent cognitively-appropriate, rather than age-appropriate norms. The standard deviations for the six scales of the SOV range from six to nine points (Allport, Vernon, & Lindzey, 1970). To be conservative, a nine point difference was used (Achter, et al., 1996).

Statistical Analysis

McNemar’s Test for Correlated Proportions was used to determine if the proportion of undifferentiated profiles differs among the combinations of variables, for each sample group (e.g. Anglo males, Anglo females, Asian males, etc.). McNemar's test was chosen because it allows comparisons of proportions from the same sample, and therefore does not require the assumption of independence. The null hypothesis was that the expected proportion of undifferentiated profiles for the combinations of variables would be the same as the proportion of undifferentiated profiles when abilities alone are considered.

To determine if gender and ethnic differences in the proportion of undifferentiated profiles were present, Pearson chi-square tests were performed. In order not to violate the assumption of independence each variable combination had to be considered individually. McNemar’s test could not be used because the ethnicity variable was not
dichotimous. Tests for which the expected cell frequency was less than five were not performed. As a result, analyses were not conducted for the African American or Native American sample groups.

RESULTS

The purpose of this study was to investigate multipotentiality among gifted students. Several hypotheses and research questions were developed and are summarized in the following questions:

1. What proportion of gifted male and female students are multipotential?
2. Among different ethnic groups, what proportion of male and female students are multipotential?
3. Does the proportion of multipotential profiles decrease when interests and values are considered, in addition to abilities?
4. Do gender and ethnic differences exist in the proportion of gifted students who present as multipotential?

Each subject completed the SAT, the SDS, and the SOV. The means and standard deviations for each scale on these measures are given in Tables 1, 2, and 3.

Table 1

SAT Means and Standard Deviations

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical</td>
<td>664.82</td>
<td>65.35</td>
</tr>
<tr>
<td>Verbal</td>
<td>620.35</td>
<td>79.73</td>
</tr>
</tbody>
</table>
Table 2

**SDS Means and Standard Deviations**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realistic</td>
<td>19.96</td>
<td>9.75</td>
</tr>
<tr>
<td>Investigative</td>
<td>36.94</td>
<td>8.10</td>
</tr>
<tr>
<td>Artistic</td>
<td>25.65</td>
<td>10.80</td>
</tr>
<tr>
<td>Social</td>
<td>26.78</td>
<td>10.27</td>
</tr>
<tr>
<td>Enterprising</td>
<td>28.37</td>
<td>10.91</td>
</tr>
<tr>
<td>Conventional</td>
<td>20.44</td>
<td>9.22</td>
</tr>
</tbody>
</table>

Table 3

**SOY Means and Standard Deviations**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical</td>
<td>44.28</td>
<td>10.16</td>
</tr>
<tr>
<td>Economic</td>
<td>40.08</td>
<td>9.35</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>40.70</td>
<td>9.34</td>
</tr>
<tr>
<td>Social</td>
<td>36.95</td>
<td>9.29</td>
</tr>
<tr>
<td>Political</td>
<td>39.30</td>
<td>8.27</td>
</tr>
<tr>
<td>Religious</td>
<td>37.63</td>
<td>12.53</td>
</tr>
</tbody>
</table>

Frequencies of multipotential profiles (Table 4) were calculated by summing the number of multipotential profiles when the various combinations of measures were considered. These combinations of measures include:

1. SAT
2. SDS
3. SOV
4. SAT and SDS
5. SAT and SOV
6. SAT, SDS, and SOV.

Table 4
Frequency of Multipotential Profiles by Group

<table>
<thead>
<tr>
<th>Test</th>
<th>SAT</th>
<th>SDS</th>
<th>SOV</th>
<th>&amp; SDS &amp; SOV</th>
<th>SDS &amp; SOV</th>
<th>TOTAL N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>SAT</td>
<td>SDS</td>
<td>SOV</td>
<td>&amp; SDS &amp; SOV</td>
<td>SDS &amp; SOV</td>
<td>TOTAL N</td>
</tr>
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<td>10</td>
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<td>2</td>
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<td>1</td>
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<tr>
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<td>10</td>
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<td>7</td>
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</tr>
<tr>
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<td>0</td>
</tr>
<tr>
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<td>2</td>
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</tr>
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<td>5</td>
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<td>Males</td>
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<td>0</td>
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<td>0</td>
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<tr>
<td>Females</td>
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<td>3</td>
<td>0</td>
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<td>0</td>
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<tr>
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<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Males</td>
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<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Females</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>
Proportions of multipotential profiles were calculated by dividing the frequency of multipotential profiles in each sample group by the number of subjects in that group. The proportions of multipotential profiles for each variable combination are given in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Group</th>
<th>Test</th>
<th>SAT</th>
<th>SDS</th>
<th>SOV</th>
<th>&amp;SDS</th>
<th>&amp;SOV</th>
<th>SDS &amp; SOV</th>
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</thead>
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<tr>
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<td>.656</td>
<td>.059</td>
<td>.076</td>
<td>.029</td>
<td>.059</td>
<td>.006</td>
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<td>.057</td>
<td>.034</td>
<td>.023</td>
<td>.034</td>
<td>.011</td>
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<tr>
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<td>.573</td>
<td>.061</td>
<td>.122</td>
<td>.037</td>
<td>.085</td>
<td>.000</td>
</tr>
<tr>
<td>Anglo</td>
<td></td>
<td>.565</td>
<td>.054</td>
<td>.033</td>
<td>.033</td>
<td>.011</td>
<td>.000</td>
</tr>
<tr>
<td>Males</td>
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<td>.043</td>
<td>.000</td>
<td>.022</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
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<td>.522</td>
<td>.065</td>
<td>.065</td>
<td>.043</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>Asian</td>
<td></td>
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<td>.024</td>
<td>.122</td>
<td>.000</td>
<td>.122</td>
<td>.000</td>
</tr>
<tr>
<td>Males</td>
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<td>.048</td>
<td>.095</td>
<td>.000</td>
<td>.095</td>
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<tr>
<td>Females</td>
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<td>.317</td>
<td>.000</td>
<td>.073</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
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<tr>
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<td>.769</td>
<td>.115</td>
<td>.115</td>
<td>.038</td>
<td>.115</td>
<td>.038</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td>.867</td>
<td>.133</td>
<td>.067</td>
<td>.067</td>
<td>.067</td>
<td>.067</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td>.636</td>
<td>.091</td>
<td>.182</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

Results show the proportion of multipotential profiles decreases when interests and values are considered in addition to abilities. The following comparisons were made using
McNemar's test, and significant differences in proportion of multipotential profiles were found for all subject groups:

1. SAT v. SDS
2. SAT v. SOV
3. SAT v. SAT and SDS
4. SAT v. SAT and SOV
5. SAT v. SAT, SDS, and SOV

A summary of z-scores from McNemar's test are presented in Table 6. The addition of the SDS, the SOV, or both to the vocational profile, significantly reduced the proportion of multipotential profiles for all subject groups. The SDS and the SOV, when examined individually, were equivalent in reduction of proportion of multipotential profiles with the exception of females and Asians. For females, the SDS reduced the proportion of multipotential profiles more than the SOV. For Asians, the SOV reduced the proportion of multipotential profiles more than the SDS. The SAT did not contribute significantly to the reduction of the proportion of multipotential profiles.

In the analysis of gender differences, more males than females presented as multipotential on the SAT ($\chi^2(1, N = 170) = 4.44, p < .05$). More females than males presented as multipotential on the SOV ($\chi^2(1, N = 170) = 4.64, p < .05$). These gender differences were not present among the ethnic groups. Chi-square analysis yielded no significant ethnic differences in proportions of multipotentiality, for the various combination of measures.
Table 6

McNemar's Test of Correlated Proportions (z values)

<table>
<thead>
<tr>
<th>Group</th>
<th>SDS</th>
<th>SOV</th>
<th>SAT</th>
<th>SAT &amp;SDS</th>
<th>SAT &amp;SOV</th>
<th>SAT &amp;SDS &amp;SOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>10.05*</td>
<td>9.90*</td>
<td>10.30*</td>
<td>10.05*</td>
<td>10.48*</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>7.68*</td>
<td>7.81*</td>
<td>7.87*</td>
<td>7.91*</td>
<td>7.94*</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>6.48*</td>
<td>6.08*</td>
<td>6.63*</td>
<td>6.32*</td>
<td>6.86*</td>
<td></td>
</tr>
<tr>
<td>Anglo</td>
<td>6.86*</td>
<td>7.00*</td>
<td>7.00*</td>
<td>7.14*</td>
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</tr>
<tr>
<td>Males</td>
<td>5.10*</td>
<td>5.29*</td>
<td>5.20*</td>
<td>5.29*</td>
<td>5.29*</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>4.58*</td>
<td>4.58*</td>
<td>4.47*</td>
<td>4.90*</td>
<td>4.90*</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>5.29*</td>
<td>5.00*</td>
<td>5.77*</td>
<td>5.00*</td>
<td>5.77*</td>
<td></td>
</tr>
<tr>
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<td>3.87*</td>
<td>4.12*</td>
<td>3.87*</td>
<td>4.12*</td>
<td></td>
</tr>
<tr>
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<td>3.16*</td>
<td>3.61*</td>
<td>3.61*</td>
<td>3.61*</td>
<td></td>
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<tr>
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<td>4.36*</td>
<td>4.12*</td>
<td>4.36*</td>
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<tr>
<td>Males</td>
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<td>3.46*</td>
<td>3.46*</td>
<td>3.46*</td>
<td>3.46*</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>2.45*</td>
<td>2.24*</td>
<td>2.65*</td>
<td>2.65*</td>
<td>2.65*</td>
<td></td>
</tr>
</tbody>
</table>

Note. Negative signs have been removed from z values.

p < .05.

DISCUSSION

The first hypothesis proposed in this study was that vocational profiles of gifted students are more differentiated (e.g., fewer multipotential profiles) when interests and values are considered in addition to abilities. The results of the study supported this
hypothesis. Significantly fewer students were identified as multipotential when measures of interest were considered along with the student's abilities. Significantly fewer students were identified as multipotential when measures of values were considered along with the student's abilities. The use of all three measures, abilities, interest, and values, resulted in the smallest proportion of students being identified as multipotential. Nearly 66% of the gifted students were multipotential when only abilities were considered. That figure dropped to less than 1% when abilities, interests, and values were considered. In the case of the sample population, only one student out of one-hundred seventy, was multipotential when all three measures were considered.

Many authors have supported the use of interests and values in vocational counseling with gifted students, but few have lend empirical support for the suggestion. This study lends empirical support to the use of interests and values measures to help deal with multipotentiality. Achter, et. al. (1995), reported similar results with younger gifted students.

The decrease in proportion of multipotential profiles may be the result of more than the addition of variables for consideration. Fredrickson (1979) suggested that multipotentiality may be in part a function of ceiling effects from the use of inappropriate measures. He suggests using measures that are cognitively-appropriate, rather than age-appropriate for gifted students. The measures used in this study are measures typically used with older populations. Reducing ceiling effects may have influenced the proportions of multipotentiality obtained in the study.

The second hypothesis proposed by the study is that ethnic differences exist in the proportions of gifted students who present multipotential profiles. This hypothesis was not supported by this study. No significant differences were found in the proportions of multipotential profiles among the different ethnic groups. Although the samples sizes for
some ethnic groups in the study were small, the results suggest that multipotentiality may be a universal construct. Further research with larger samples is needed to clarify this finding.

In addition to the two hypotheses discussed previously, the study sought to offer information regarding the prevalence rates of multipotentiality among males and females in different ethnic groups. The results of the study yielded proportions of multipotentiality for these different groups. As mentioned previously, no significant differences were found between genders or ethnic groups. While other studies have not examined gender and ethnic differences in prevalence rates of multipotentiality, the results of this study are of limited utility because small sample sizes limited the statistical analyses that could be performed. The results offer a starting point but, prevalence rates vary significantly with how multipotentiality is defined and measured. Again, that no significant gender and ethnic differences were found, may be useful in future research that seeks to further clarify the construct of multipotentiality.

As mentioned previously, this study is subject to limitations. One limitation is the generalizability of the sample. The TAMS population is unusual in that they are participants in a unique, residential, early college entrance program, and their results may not be generalizable to other gifted students. The SOV is outdated, and wording was changed to corrected for sexist language. New norms for this measurement, or a new comparable values measure are needed. Another important limitation of the study is the small sample sizes for some ethnic groups.

Literature on multipotentiality is lacking and this study raises many suggestions for future research. Replication of this study is needed to add support to the lack of gender and ethnic differences. Replication with different samples of gifted students would aide in the generalizability of the results. The present study was not designed to differentiate
between changes in the proportion of multipotentiality due to the use of measures of interests and values in addition to abilities, or change due to the use of cognitively-appropriate measures of abilities, interests, and values. A study comparing the proportions of multipotential profiles yielded by age-appropriate and cognitively-appropriate measures, respectively, would aide in clarifying the construct of multipotentiality. Both the SDS and the SOV contain several different scales. Closer examination of these scales might yield gender and ethnic differences in specific interests and/or values that would aide in vocational choice and improve vocational counseling for the gifted. Perhaps the most interesting, and beneficial, direction for future research lies with longitudinal studies. Longitudinal studies into the predictive validity of abilities, interests, and values on such variables as college major, academic success, vocational choice, vocational success, and vocational satisfaction would be most useful in improving vocational counseling for the gifted.
REFERENCES


