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Multipotentiality Among the Intellectually Gifted: "It Was Never There and Already It's Vanishing"

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The theory of work adjustment was used as a conceptual framework in evaluating the concept of multipotentiality, taken from the psychological literature on counseling intellectually gifted individuals (viz., those with high–flat ability and preference profiles that may lead to career indecision and distress). An examination of over 1,000 intellectually gifted students (top 1%) in 4 separate cohorts, assessed with the Scholastic Aptitude Test, the Study of Values, and J. L. Holland's (1985) six interest themes, revealed little empirical support for the prevalence of multipotentiality within intellectually talented adolescents (<5%). Rather, it appears that the idea of an overabundance of high–flat ability and preference profiles among gifted students stems from the use of age-calibrated and, hence, developmentally inappropriate assessment tools having insufficient ceilings. The results have important implications for the use of traditional vocational assessment measures in counseling gifted students.

The concept of multipotentiality is a pervasive psychological theme in the scientific literature on the educational–vocational counseling of intellectually gifted individuals (Emmett & Minor, 1993; Kerr & Claiborn, 1991; Kerr & Colangelo, 1988; Kerr & Ghrist-Priebe, 1988; Milgram, 1991; Silverman, 1993). As defined by Fredrickson (1979), a multipotential person is "any individual who, when provided with appropriate environments, can select and develop any number of competencies to a high level" (p. 268). As discussed in the literature on gifted and talented individuals, multipotentiality describes students who earn uniformly high scores across ability and achievement tests and exhibit multiple educational–vocational interests at comparable intensities (Sanborn, 1979a, 1979b).[1] As a result of their "high–flat" interest and ability profiles, "multipotential" students are faced with an overwhelming array of equally attractive career options (Fredrickson, 1979; Kerr & Ghrist-Priebe, 1988). They flounder in a sea of possibilities (Fredrickson, 1986; Schroer & Dorn, 1986). Moreover, multipotentiality does not affect just a select few. It is believed to affect most gifted students, resulting in a unique source of conflict and stress for them (Fredrickson, 1979, 1986; Jepsen, 1979; Kerr, 1981; Kerr & Ghrist-Priebe, 1988; Marshall, 1981; Sanborn, 1979a, 1979b). Many gifted individuals have been reported to be fearful of committing to a "wrong" choice (i.e., to be concerned that committing to one area is tantamount to ignoring their potential in several others; Marshall, 1981). In the end, they become stagnant in their career decision-making process, falling into a career almost haphazardly (Kerr, 1981; Marshall, 1981).

Because of the assumption of multipotentiality among gifted individuals, some investigators have eschewed the use of traditional vocational assessment instruments. Kerr and Ghrist-Priebe (1988), for instance, stated the following:

> on commonly used, standardized vocational assessment instruments, such as the Strong-Campbell Interest Inventory [SCII], bright clients often present a 'high–flat' profile .... Therefore, Colangelo and Zaffrann (1979), Miller (1981), and

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[1] An anonymous reviewer pointed out that this usage of multipotentiality differs from the definition offered by Crites (1969) in his well-known text on vocational psychology. For Crites (1969), the problem of multipotentiality is one of three generic problems of indecision facing people struggling with vocational choice: "The multipotential individual has two or more choices, each of which agrees with his field of interest and is on the appropriate aptitude level. ... His problem is that he cannot decide among these choices" (p. 298). The reviewer suggested that multipotentiality as a concept really takes meaning only as it relates to problems of indecision and that this is the way it is typically studied in the context of vocational psychology more generally. In contrast, we focus on multipotentiality as it is used (ubiquitously) in the gifted literature. This usage includes concern about career indecision among gifted individuals; however, the term *multipotential* has developed to the extent that it is frequently applied to a majority of gifted students, probably because of suppositions made about their abilities and interests. As Emmett and Minor (1993) contended, "Multipotentiality is considered to be the cause of most of the difficulties gifted youth encounter in making career decisions (Kerr, 1981b, 1991)" (p. 351). A study focusing more directly on the factors related to career indecision among gifted individuals would be an important contribution to the literature but was not our focus. Because the present sample was composed of 12–13-year-olds (students who were several years from an actual career choice at the time they participated in the study), career indecision did not seem to be a variable of immediate developmental importance to our participants.

> others have concluded that career counseling for gifted clients must emphasize not abilities and interests, but values and needs. (p. 366)

Similarly, Kerr and Erb (1991) deemphasized the utility of traditional assessment instruments with gifted individuals: "Traditional career counseling, which matches students' abilities and interests to particular occupations, has little to offer the academically talented student" (p. 309).

Despite these claims, empirical evidence indicating that multipotentiality is more of a concern among gifted students than among any other population of students is lacking. Indeed, support for the notion of multipotentiality itself seems to rest primarily on unsystematic anecdotal evidence from counseling settings (Fredrickson, 1979; Kerr, 1981; Sanborn, 1979a, 1979b). Empirical investigations using the multipotentiality construct typically have evaluated interventions for the assumed problem without first measuring the prevalence of multipotentiality in their samples (Kerr & Erb, 1991; Kerr & Ghrist-Priebe, 1988).

Fox (1978), however, examined the vocational interest patterns among intellectually talented students empirically and revealed a picture of the gifted student quite different from the one painted earlier. She compared, on the SCII (Campbell, 1977), the interest profiles of gifted seventh-grade students with those of a normative sample of ninth-grade students. She found that gifted students scored significantly higher on interest scales relating to intellectual occupations (i.e., writing, mathematics, science, public speaking, and medical science). These categories represent 5 of 23 basic interest scales on the SCII. The ninth-grade norm group scored significantly higher than the gifted seventh-grade students on 1 scale: adventure. On the remaining 17 basic interest scales, no significant differences between gifted students and the normative sample were observed (Fox, 1978). On the basis of this evidence, it appears that gifted students, as a whole, do have greater interest in academic domains, in contrast to nonacademic areas, than students of average ability. Subsequent studies have supported Fox's (1978) findings. Students especially talented in mathematical or verbal reasoning abilities have stronger interests in academic but not other domains (cf. Humphreys, Lubinski, & Yao, 1993; Lubinski & Benbow, 1992, 1994; Lubinski & Humphreys, 1990).

Clearly, the issue of multipotentiality is in need of systematic empirical scrutiny. Empirical investigations to date lend little support for its pervasiveness. Because almost all of the anecdotal evidence for multipotentiality comes from educational and career counseling contexts, one might wonder how speculations would change if they were based on random samples of gifted adolescents. The present study addressed this issue by examining the pervasiveness of multipotentiality among such students.

The Theory of Work Adjustment

A useful model for structuring empirical investigations into the educational and career counseling needs of gifted adolescents is the theory of work adjustment (TWA; Dawis & Lofquist, 1984; Lofquist & Dawis, 1991). Although TWA was developed as a model of vocational adjustment, its constituent components are the same variables that function as determinants of critical decisions antecedent to vocational choice, such as choosing between contrasting educational tracks (Benbow & Lubinski, 1994; Lubinski, Benbow, & Sanders, 1993). Our adaptation of TWA integrates abilities and preferences (interests and values) into a coherent theory about work and educational adjustment. Both abilities and preferences warrant commensurate and detailed attention in educational–vocational decision-making contexts (Lubinski & Benbow, 1995), inasmuch as the manner in which each is expressed is conditional on the other (Dawis, 1991; Dawis & Lofquist, 1984; Lofquist & Dawis, 1991). One's interest in working with things and gadgets (an intense realistic theme, according to Holland's 1985 system) is expressed differently when coupled with spatial visualization abilities in the top 1% (possibly an engineer) than when coupled with such abilities in the top 85%–90% (possibly a mechanic).

Thus, TWA conceptualizes all work situations as an interaction between an individual and an environment, each making demands on the other. Most simply, the environment (educational track or occupation) demands certain skills and competencies from the individual. The individual, in turn, demands certain rewards from the environment to maintain performance. The degree to which the demands of both sides are met is termed *correspondence.*

In TWA, person–environment correspondence is conceptualized along two dimensions: satisfactoriness and satisfaction. The former is an external indicator of correspondence (i.e., the environment's demand on the individual and how the individual's behavior meets those demands); the latter is an internal indicator of correspondence (i.e., the individual's demand on the environment and how the environment meets these demands; Lofquist & Dawis, 1991). If satisfactoriness is to be achieved, there must be a high degree of correspondence between the abilities of a person and the ability requirements, or task demands, of the environment in which the person is operating. If a high level of satisfaction is to be reached, on the other hand, the needs or preferences of the individual must correspond to the types of reinforcers provided by the environment (e.g., particular working conditions). Preferences in TWA are often operationalized as interests and values (Dawis, 1991; Dawis & Lofquist, 1984). The predicted outcome of the joint correspondence on TWA's two major dimensions, satisfactoriness and satisfaction, is amount of time spent in a particular environment. The higher the levels of satisfactoriness and satisfaction, the more the environment and the individual will invest time in interacting with one another. Optimal adjustment, then, is predicted when personal abilities match ability requirements of the environment and personal preferences match the reinforcers available from the environment. Choosing optimal educational–vocational tracks, then, involves a configural approach to education and the world of work: using an individual's most salient strengths and tailoring performance rewards according to the individual's needs (Lofquist & Dawis, 1991).

Using the Theory of Work Adjustment to Analyze the Implications of Multipotentiality

As previously mentioned, the multipotential literature makes frequent reference to the assessment of abilities, interests, and values and decries the presence of high–flat ability and interest profiles among a large segment of the gifted population. One intervention proposed in the literature on counseling gifted students is to shift the focus away from abilities and interests and toward personal values when guiding these students through educational and career decision making (Colangelo & Zaffrann, 1979; Kerr & Erb, 1991; Kerr & Ghrist-Priebe, 1988; Miller, 1981; Perrone, 1986; Perrone & Van Den Heuvel, 1981). From a TWA perspective, however, such a focus ignores two important classes of variables: abilities and interests. We do not believe that this is necessary or desirable. Assessment of interests and abilities can be properly conducted for this population, but only if above-level instruments are used. We believe that the frequency of flat profiles for highly gifted individuals is primarily the result of nonuse of above-level assessment tools (Stanley, 1990). Grade- or age-appropriate instruments that are not developmentally appropriate give the impression of a flat profile (as a result of ceiling effects of the instruments) when, in reality, gifted individuals are typically quite differentiated.

In the ability domain, above-level testing has been routinely available for more than 20 years through talent searches (Cohn, 1991) that involve administering the College Board Scholastic Aptitude Test (SAT) to gifted seventh and eighth graders (Keating & Stanley, 1972; Stanley, 1974). Individual differences in ability within the top 1% are meaningful (Benbow, 1992); they predict differences in achievement 10 years after assessment at 13 years of age.

In the domain of preferences, systematic above-level assessment is a rather recent development. Our extension of above-level testing for abilities to above-level assessment of preferences was based on the idea that intellectually precocious children are, perhaps, precocious in many ways, including the development of their preferences for contrasting educational–vocational tracks. Confirmation of this idea is found in Lubinski, Benbow, and Ryan (1995), who have shown that it is possible to capture a glimpse of the ultimately secured vocational interest profile of gifted adults by using Holland's (1985) themes (described later) to assess these individuals' interests on the SCII (Campbell, 1977) at 13 years of age. This finding also has been replicated with the Allport–Vernon–Lindzey (1970) Study of Values (SOV) over a 20-year time frame in an independent sample of intellectually gifted individuals (Lubinski, Schmidt, & Benbow, 1995). These data suggest that preferences of intellectually gifted individuals crystallize somewhat precociously and that the use of interest and values questionnaires such as the SCII (Hansen & Campbell, 1985) and the SOV (Allport, Vernon, & Lindzey, 1970), long used to predict career satisfaction in adults (Dawis, 1991, 1992), is appropriate with gifted adolescents as well. Because the SCII and SOV were designed for young adults, administering these instruments to gifted young adolescents constitutes above-level assessment of preferences (Lubinski, Benbow, & Ryan, 1995; Lubinski, Schmidt, & Benbow, 1995).

The purpose of the present study was to examine whether measurement of abilities (using the SAT) and preferences (using the SOV and SCII) in gifted adolescents provides differentiated ability–preference profiles. Using data from Cohorts 1 through 4 of the Study of Mathematically Precocious Youth (SMPY; Lubinski & Benbow, 1994), we examined the ability and preference profiles of more than 1,000 highly gifted adolescents initially assessed at 13 years of age (all of whom were at or above the top 1% in general intellectual ability). Moreover, the usefulness of also measuring spatial and mechanical reasoning abilities was assessed. There is a growing consensus among leading psychometricians (Ackerman, 1989; Carroll, 1989; Humphreys, 1979; Snow & Lohman, 1989) that intellectual abilities are organized around three (not two) primary content domains whose communality defines the construct of general intelligence: verbal–linguistic, mathematical–numerical, and spatial–mechanical. Spatial abilities are especially critical for educational–vocational paths such as engineering, the physical sciences, architecture, and many of the creative arts (Humphreys et al., 1993). Thus, the inclusion of spatial–mechanical reasoning abilities is likely to cast further light on the precise prevalence of multipotentiality (as it has been defined in the literature on counseling gifted individuals).

We hypothesized that the assessment of abilities and preferences, in an above-level format, would reveal a substantively significant and clinically useful amount of profile differentiation for the majority of gifted adolescents in this sample. Such results would run counter to the assumed pervasiveness of multipotentiality among gifted individuals and lend support for the utility of using traditional vocational assessment devices for educational and career counseling of this population (Dawis, 1992).

Method

Participants

The participants were drawn from Cohorts 1, 2, 3, and 4 of SMPY's planned 50-year longitudinal study of intellectual talent (Lubinski & Benbow, 1994), currently in its third decade. Participants in Cohorts 1 through 4 were initially identified at 12 or 13 years of age, via talent searches, because they had scored in approximately the top 3% on standardized achievement tests appropriate for their grade level (Cohn, 1991). Then, as part of the talent search, these gifted students took the SAT, a test designed for college-bound high school juniors and seniors. The SAT consists of mathematical (SAT-M) and verbal (SAT-V) subtests. Students in the various cohorts were included in the present study if they had completed the SAT and either the SOV (Allport et al., 1970) or the SCII (Campbell, 1977; Hansen & Campbell, 1985) by 13 or 14 years of age. For Cohorts 1–3, the SOV and the SCII were administered to all students who were invited to and attended a special assessment session designed for students scoring highly in the talent search. Cohort 4 participants completed the instruments during research sessions conducted as part of their participation in summer academic programs at Iowa State University.

Cohort 1 (N = 2,188) is composed of students (96.1% Caucasian and 2.0% Asian) who scored, before age 14, 370 or higher on the SAT-V or 390 or higher on the SAT-M as part of SMPY's 1972, 1973, or 1974 talent search. These score cutoffs represented the average SAT performance of high school girls at that time and approximated the top 1% of general intellectual ability for seventh-grade students (Lubinski & Benbow, 1994). Members of Cohort 1 who qualified for inclusion in this study had completed the SOV (n = 364; 171 female and 193 male cohort members). These participants were drawn primarily from the state of Maryland, but a large concentration was from the greater Baltimore–Washington area.

Cohort 2 (N = 778) is composed of participants (89.2% Caucasian and 5.9% Asian) from the 1976, 1978, and 1979 talent searches who were among the top one third in terms of SAT scores (e.g., 430 or higher on the SAT-V or 500 or higher on the SAT-M); they represent approximately the top 0.5% in general intellectual ability for their age group. Cohort 2 members included in this study had completed either the SOV (n = 211; 66 female and 145 male cohort members) or the SCII (n = 286; 82 female and 204 male cohort members). These participants were drawn from mid-Atlantic states.

The most select group of SMPY participants, those in Cohort 3 (N = 423), was identified between 1980 and 1983. These students (76.8% Caucasian and 19.4% Asian) approximate the top 1 in 10,000 (or top 0.01%) in mathematical or verbal reasoning ability by having scored, before age 13, 630 or higher on the SAT-V or 700 or higher on the SAT-M. Included in the present study were students who had completed the SOV (n = 131; 25 female and 106 male students) or the SCII (n = 132; 26 female and 106 male students). These participants were drawn from talent searches throughout the entire nation.

Cohort 4 (N > 1,000) consists of students (87.5% Caucasian and 10.2% Asian) who scored 370 or higher on the SAT-V or 390 or higher on the SAT-M by age 13. Identification of Cohort 4 began in 1987, with participants added each year from those students who enroll in summer programs for intellectually talented youth through the Office of Precollegiate Programs for Talented and Gifted at Iowa State University. These participants are primarily from the Midwest, with a large concentration coming from the state of Iowa.

Similar to Cohort 2, Cohort 4 represents approximately the top 0.5% in terms of ability (Lubinski & Benbow, 1994), but we included some additional participants from other, less select Iowa State University precollegiate programs who met the top 1% criteria outlined for Cohort 1 (viz., a score of 370 or higher on the SAT-V or 390 or higher on the SAT-M by age 13). To be included in this facet of our study, Cohort 4 participants also must have completed both the SOV and the SCII (n = 273; 108 female and 165 male cohort members). Finally, all of these participants took a standardized three-dimensional spatial visualization and mechanical reasoning test at 13 or 14 years of age. We analyzed data from these two instruments as well.

Measures

Strong–Campbell Interest Inventory. For each cohort, a current version of the SCII (T325; Campbell, 1977; Hansen & Campbell, 1985) was used. Participants in the most recent cohort (i.e., Cohort 4) are administered the research version of the Strong (available through Consulting Psychologists Press, Palo Alto, California, and simply referred to as the Strong henceforth). This instrument is an augmented version of the SCII (T325) and includes some additional biographical items and experimental objectively scored questions about data, people, and things (Harmon, Hansen, Borgen, & Hammer, 1994). Both the SCII and the Strong contained identical measures of Holland's RIASEC themes (Holland, 1985). They were the focus of the present study.

RIASEC is an acronym for Holland's hexagonal system of six vocational interest themes (brief descriptions are given in parentheses): realistic (interests in working with things and gadgets, working in the outdoors, and need for structure), investigative (scientific interests, especially mathematics and the physical sciences, and independent work), artistic (interests in creative expression in writing and the arts and preference for little structure), social (people interests and attraction to the helping professions), enterprising (preference for leadership roles aimed at achieving economic objectives), and conventional (preference for well-structured environments and chains of command, such as that found in office practices, and tendency to follow rather than lead). The utility of mapping the vocational interest domain with RIASEC has been discussed by Rounds and Tracey (1993) and Tracy and Rounds (1992, 1993). Configural and test–retest stability of these themes for intellectually gifted individuals 13 to 28 years of age can be found in Lubinski et al. (1995); validity data on RIASEC can be found in Harmon et al. (1994).

Study of Values. The SOV (Allport et al., 1970) is an ipsatively scaled measure of personality-related values conceptualized as basic motives or interests. Like the SCII, the SOV yields scores along six dimensions (brief descriptions are given in parentheses): theoretical (concern for the discovery of truth and tendency to think in empirical, critical, and rational terms), economic (appreciation for what is practical or useful and tendency to judge matters in terms of tangible, financial implications), aesthetic (dominant proclivities toward form and harmony and sensitivity to grace, beauty, and symmetry), social (altruistic and genuine philanthropic love of people and tendency to be kind, sympathetic, and unselfish), political (interest primarily in power, influence, renown, and leadership), and religious (value unity and tendency to be spiritual in orientation and to relate oneself to a higher reality). Configural and test–retest stability of these themes for intellectually gifted participants 13 to 33 years of age can be found in Lubinski, Schmidt, and Benbow (1995); SOV validity data can be found in Allport et al. (1970) and Dawis (1991). The SOV has not been updated in recent years; thus, in SMPY, minor language modifications have been made on all versions of the SOV administered since 1990 to modernize the instrument and to incorporate gender-neutral language.

Two measures were chosen for inclusion in this study to capture the construct depicted by Vernon's (1961) major group factor, practical–mechanical–spatial. A number of studies have revealed the applied utility of this dimension for technical educational–vocational tracks (Humphreys, 1986; Humphreys et al., 1993; Smith, 1964), but such abilities remain underappreciated by contemporary applied psychologists (Humphreys & Lubinski, in press). Although we are unaware of published reports documenting the validity of these measures for intellectually gifted students, the validity of conceptually equivalent measures has been reported in above-average samples (top 20% in Grades 9 through 12; Humphreys et al., 1993) as well as other adult samples (Austin & Hanisch, 1990; Lunneborg & Lunneborg, 1975; Smith, 1964; Vernon, 1961). Because of these auxiliary findings, we have tested our students systematically on these measures over the past 4 years. Given their 1-year temporal stability, coupled with the exceptional scores that gifted adolescents earn on these indexes, we anticipate that these measures will add incremental validity to longitudinal forecasts of educational–vocational criteria based on the SAT (Benbow, 1992), as they have in other contexts.

Bennett Mechanical Comprehension Test (BMCT). The BMCT

(Form S; Psychological Corporation, 1980) was designed to assess comprehension of physical and mechanical principles in practical situations. It is a 30-minute timed test and contains 58 multiple-choice items. The mechanical skills assessed by the BMCT are especially relevant to educational–vocational tracks involving a degree of "realistic interests" (according to Holland, 1985) or "things" (according to Prediger's 1976 data–people–things–ideas map of the world of work). Validity data for these tracks are cited in the BMCT manual (Psychological Corporation, 1980). We are unaware of published above-level usage of this instrument with intellectually gifted young adolescents; however, our Cohort 4 participants scored beyond the high school senior mean and, for 109 Cohort 4 repeaters (i.e., those who attended the program again the following year), the 1-year test–retest reliability on this instrument was .82. Some validity data may be gleaned from BMCT's correlational pattern across responses to questions from SMPY's background questionnaire, structured by the following statement: "When you think about your future occupation, how important do you think skills in each of the following areas will be?" This item is rated on a 5-point scale ranging from *not important* (1) to *extremely important* (5). Correlations between the BMCT and responses to this question were calculated for mathematics (r = .14), physics (r = .21), computer science (r = .21), literature (r = −.26), writing–composition (r = −.25), social studies (r = −.16), and foreign languages (r = −.12; $ns \geq 907$, $ps < .01$). Furthermore, this questionnaire also asks participants to rank order their three favorite academic courses and their three favorite occupations. These open-ended responses were dichotomized into dummy variables as follows: math–science (mathematics, computer science, biology, physical science, engineering, and industrial arts; 1) versus non–math–science (all other responses; 0). Correlations between the BMCT and the three favorite classes listed (from first choice to third choice) were .14, .18, and .01 (with the first two statistically significant at $p < .01$, $ns \geq 907$); correlations between the BMCT and the three favorite occupations listed (from first choice to third choice) were .31, .28, and .24 (all significant at $p < .01$, $ns \geq 540$).

Vandenberg Mental Rotation Test (MRT). The MRT (Vandenberg & Kuse, 1978) measures three-dimensional spatial visualization and uses figures similar to those originally designed by Shepard and Metzler (1971). Standard procedures were used in administering and scoring the MRT (maximum score = 40). Participants were given 5 min for each of the two sections (10 items in each section). Participants were required to match a standard figure to two identical but rotated figures; there are four options to choose from. The two "correct" or identical figures are randomly sequenced with two distracters (mirror images of the standard or images with slight feature differences from the standard). Skills assessed by this instrument are particularly relevant to highly technical domains such as engineering. For Cohort 4 repeaters, the 1-year test–retest reliability on this instrument (n = 109) was .80. Participants responded to the question "When you think about your future occupation, how important do you think skills in each of the following areas will be?" Correlations between the MRT and responses to this question were calculated for physics (r = .13), computer science (r = .10), literature (r = −.17), and writing–composition (r = −.20; $ns \geq 907$, $ps < .01$). Finally, correlations between the MRT and the three favorite classes listed (from first choice to third choice) were .09, .13, and .01 (with the first two statistically significant at $p < .01$, $ns \geq 907$); correlations between the MRT and the three favorite occupations listed (from first choice to third choice) were .22, .19, and .18 (all significant at $p < .01$, $ns \geq 540$).

Aggregation of these latter two measures, the BMCT and MRT, mirrors Vernon's (1961) hierarchical model of the structure and organization of human abilities, which also corresponds to a radex representation (Snow & Lohman, 1989) of human abilities (see Lubinski & Dawis, 1992, for a review). For a clearer appreciation of the range of individual differences captured by these measures, participants' scores were standardized through the use of the mean and standard deviation of the complete Cohort 4 sample (n = 273).

Procedure

At approximately age 13, participants in Cohorts 1–4 completed the SOV, the SCII, or both as part of an extensive battery of assessment instruments and background questionnaires given in SMPY. These two preference measures, along with the specific measures of ability used for selection (viz., the SAT-M and SAT-V), were the primary variables of interest here. Because participants from Cohort 4 took the SAT, SCII, and SOV (whereas participants in Cohorts 1 through 3 typically completed only one preference questionnaire), we focus our discussion on Cohort 4's data, allowing the other three cohorts to serve as fragmentary replications across three different time frames.

For all cohorts, the criteria used to assess flat ability and preference profiles were as follows: For abilities, SAT profiles were judged flat if math and verbal scores were less than one standard deviation apart.[2] For both RIASEC and SOV, the criterion for flatness was less than 1 standard deviation difference between the average of the three highest themes minus the average of the three lowest themes. Our rationale for the latter was as follows. For all six scales on each instrument, across adult normative samples and intellectually gifted adolescents, standard deviations range between 6 and 9 for the SOV, and the standard deviation is 10 for all RIASEC themes. We used an average difference (i.e., three highest minus three lowest) of 10 or greater to define differentiated profiles so as to be conservative. If the average of the three highest themes minus the average of the three lowest themes is greater than one standard deviation, this clearly would not constitute a flat profile in the view of most vocational counselors.[3] In addition, use of the distance between the three highest and three lowest themes to define profile differentiation is

[2] The precise criterion for defining flat (undifferentiated) ability profiles was $|SAT\text{-}M - (SAT\text{-}V + 70)| < 83$, where 83 represents the average standard deviation on the SAT in gifted adolescent populations identified over the past 5 years by the Iowa Talent Search and 70 represents the approximate point difference between the SAT-M and SAT-V score scale. Thus, 83 marks one standard deviation on the SAT in this study, and 70 points were added to each participant's SAT-V score to adjust for mean differences between the SAT-V and SAT-M.

[3] The issue of defining profile flatness–differentiation for interest measures has been reviewed at length by Sackett (1993). Prior investigators have primarily used Holland's (1975) definition of profile differentiation to assess the construct. Holland suggested using the range (numeric difference between score extremes) as an index of score differentiation, with smaller ranges denoting less differentiation. The methodology used by Sackett and Hansen (1995) in their research on the SCII (credited to Donald Super) was that of calculating the standard deviation of the six general occupational theme scale scores (measures of the RIASEC themes) within each individual's profile. This method was chosen because it took into account all six scores rather than just the extreme scores. The authors then arbitrarily selected the top and bottom quartiles of scores within their sample and designated them as differentiated versus undifferentiated (i.e., flat). The present study

Table 1
Proportion of Participants With Flat Abilities, Interests, and Values Profiles

Cohort numbers	Abilities		Interests		Values		Abilities and interests		Abilities and values		All variables	
	Proportion	%	Proportion	%	Proportion	%	Proportion	%	Proportion	%	Proportion	%
Cohort 1												
Male	71/179	39.7	—	—	32/193	16.6	—	—	15/179	8.4	—	—
Female	105/160	65.6	—	—	41/171	24.0	—	—	20/160	12.5	—	—
All	176/339	51.9	—	—	73/364	20.1	—	—	53/339	10.3	—	—
Cohort 2												
Male	206/348	59.2	57/204	27.9	31/145	21.4	29/203	14.3	23/144	16.0	—	—
Female	100/147	68.0	35/82	42.7	22/66	33.3	28/81	34.6	13/66	19.7	—	—
All	306/495	61.8	92/286	32.2	53/211	25.1	57/284	20.1	36/210	17.1	—	—
Cohort 3												
Male	30/113	26.5	34/106	32.1	12/106	11.3	7/106	6.6	0/106	0.0	—	—
Female	9/26	34.6	4/26	15.4	1/25	4.0	1/26	3.8	1/25	4.0	—	—
All	39/139	28.1	38/132	28.8	13/131	9.9	8/132	6.1	1/131	0.8	—	—
Cohort 4												
Male	93/165	56.4	53/165	32.1	39/165	23.6	33/165	20.0	21/165	12.7	9/165	5.5
Female	65/108	60.2	24/108	22.2	24/108	22.2	15/108	13.9	15/108	13.9	4/108	3.7
All	158/273	57.9	77/273	28.2	63/273	23.1	48/273	17.6	36/273	13.2	13/273	4.8

Note. See text for information on ability, interest, and values criteria. Dashes indicate data were only obtained in small frequencies.

in good accord with interpretive schemas used by many vocational counselors (Holland, 1985). When interpreting results, vocational counselors often help clients focus on the top two or three themes of the SCII and the SOV.

It should be emphasized that these criteria were intentionally conservative so as to capture the majority of participants whose true ability and preference profiles were indeed undifferentiated (or multipotential). This increased the likelihood that participants whose ability–preference profiles were found to be differentiated across these criteria were not likely to be multipotential (as typically construed in the contemporary gifted literature; Emmett & Minor, 1993; Kerr & Claiborn, 1991; Kerr & Colangelo, 1988; Kerr & Ghrist-Priebe, 1988; Milgram, 1991; Silverman, 1993). Finally, we examined average differences between all six RIASEC and SOV themes for Cohort 4 participants with flat versus differentiated SAT ability profiles to offer a more detailed picture of the RIASEC and SOV profile scatter.

We examined Cohorts 1 through 4 for the proportion of flat versus differentiated (individual) ability, interest, and values profiles and then (conjoint) ability–interest, ability–values, and ability–interest–values profiles. Cohort 4 participants, because of the comprehensiveness of their assessment, were analyzed in greater detail. First, they were segregated into flat versus differentiated ability groups. Then the respective means for both groups' most salient preference dimension, irrespective of its nature (for both the RIASEC and SOV), were computed and plotted. The same was done for RIASEC and SOV dimensions ranked second, third, fourth, fifth, and sixth for each participant in the two groups. The six resulting rank-ordered means for each instrument illustrated the amount of profile scatter for participants with flat versus differentiated abilities. Our analyses culminated with a detailed, idiographic look at the Cohort 4 participants who met all of the criteria for flatness across the SAT, RIASEC, and SOV. We examined, in particular, the amount of additional information afforded by mechanical reasoning and spatial ability assessments.

Results

Proportions of participants with flat profiles are reported in Table 1. One of the most noteworthy findings in Table 1 is the percentage of flat profiles observed when abilities alone were used. With Cohort 4 as representative of all four cohorts, only 58% qualified as flat. That is, 42% of our participants manifested substantively significant profile scatter before interests and values were even consulted. When interests and values were consulted, only 13 of 273 participants in Cohort 4, (4.8%) were classified as having a flat profile across all three instruments (SAT, RIASEC, and SOV). Although Cohorts 1 through 3 were incomplete in terms of either interests or values, the conjoint ability–interest and ability–values proportions were in accord with corresponding entries from Cohort 4. Cohort 3 appeared to be much more differentiated, but this was expected given the stringent ability criteria used (top 1 in 10,000 in either verbal or math) in their selection.

Throughout all four cohorts and across all three instruments, the picture is clear. There is substantively significant profile differentiation across all individual and conjoined cells in Table 1. Indeed, the cells containing interests and values alone all contain a majority of differentiated profiles.

For our most comprehensively assessed cohort (Cohort 4), Figure 1 reveals the magnitude between successive rank orders of the six SCII and SOV measures for ability-differentiated versus ability-undifferentiated participants independent of the category that a particular score represented; that is, the first value on the x axis (1) represents the average elevation of all participants' dominant themes; the second value (2) represents the average for their second most salient themes, and so forth. For both the SOV and RIASEC

used yet another method to assess differentiation, one that, like the definition used by Sackett and Hansen, took into account all of the six RIASEC scores. Sackett (1993) noted that comparisons between different indexes of differentiation have not been made in the literature; thus, at present, there are no data on the relative merits of each method.

themes, there were marked effect size differences between all adjacent themes, regardless of whether participants had flat or differentiated ability profiles. The average difference between contiguous themes for both instruments was 4.6 raw-score units. For the SOV, the average effect sizes of differences between adjacent themes were 1.25 for flat ability profiles and 1.34 for differentiated ability profiles (all five contiguous contrasts were significantly different at $p < .001$); for the RIASEC themes, the average effect sizes of differences between adjacent themes were 0.56 for flat ability profiles and 0.58 for differentiated ability profiles (all five contiguous contrasts significantly different at $p < .005$).

Figure 2 simply reveals that the degree of differentiation reported in Figure 1 was not moderated by gender. On the SCII, female participants appeared to have slightly higher interest scores than the male participants; however, on each measure, the magnitude of successive differentiation was approximately equal for both sexes.[4]

Finally, in Table 2, complete idiographic profiles are provided for the 13 Cohort 4 participants whose ability, interest, and values profiles were all classified as flat. It is useful, we believe, to examine these individual profiles closely because, among other things, they reveal the degree of profile scatter remaining when conservative criteria are used to define flatness. In addition, in Table 2, we have added data from the mechanical comprehension and spatial ability tests. Even though these are not fully developed (or mature) profiles and were selected for their flatness, we believe, nevertheless, that they reveal meaningful individual differences fruitful for self-exploration. Of course, when considering the following inferences, like all idiographic conjectures based on psychometric indicators, keep in mind that these are hypotheses that require in-session validation before one can be justified in acting on them in counseling contexts.

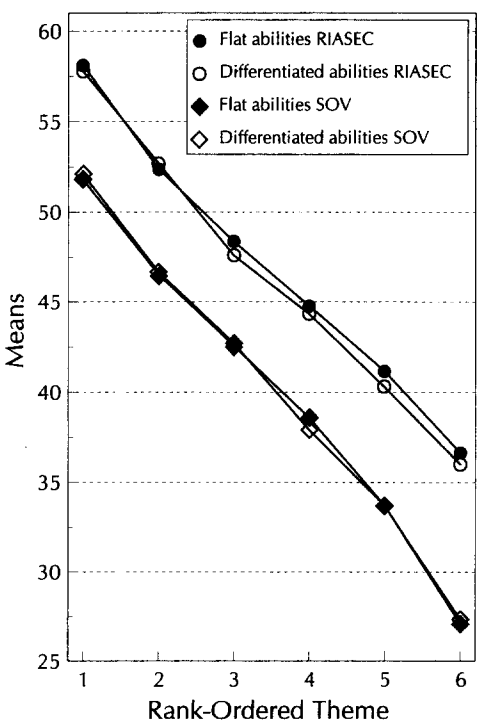

Figure 1. Cohort 4 preference profiles by flat versus differentiated abilities. Plots represent means of rank-ordered RIASEC (see text for description) and Study of Values (SOV) themes for participants with flat (n = 158) and differentiated (n = 115) ability profiles. The average Scholastic Aptitude Test mathematical minus SAT verbal differences for the flat and differentiated ability participants were 41.8 and 150.8, respectively.

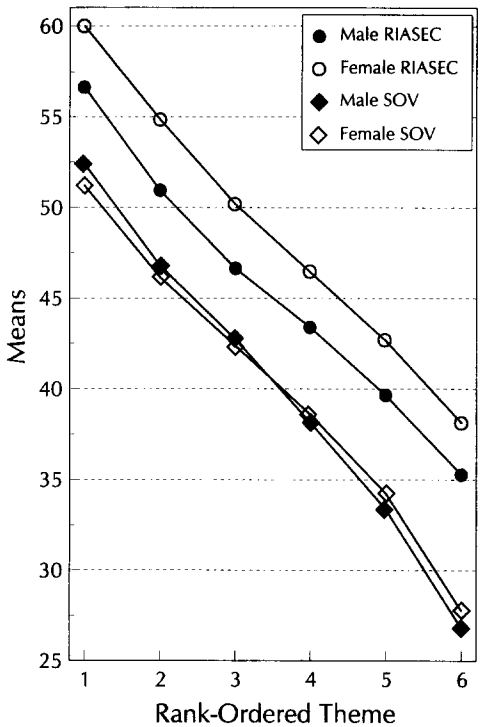

Figure 2. Cohort 4 preference profiles by gender. Plots represent means of rank-ordered RIASEC (see text for description) and Study of Values (SOV) themes (female n = 108, male n = 165).

An example is Participant A. She is particularly investigative in her interests and distinguished by her theoretical value orientation. This, coupled with her impressive quantitative abilities and mechanical comprehension, suggests that she is especially well suited for a career in the physical sciences. Participant B appears to be more of a "people person." She has high social, low realistic interests and a dominant social value; this is coupled with much stronger verbal (relative to nonverbal) abilities. The ability and preference patterns for Participant C are less clear cut, but it is noteworthy that this individual has a dominant religious value orientation, along with somewhat elevated artistic and

[4] Readers interested in the relative frequencies of each of the six themes, across differentiated–undifferentiated and male–female partitionings, are referred to Appendices A and B, respectively. Here the percentages of each theme for each rank order are provided for all four groups shown in Figures 1 and 2.

Table 2
Interest, Value, and Ability Profiles of 13 "Multipotential" Participants in Cohort 4

Profile	Female cohort members				Male cohort members								
	A	B	C	D	E	F	G	H	I	J	K	L	M
Interests													
Realistic	38	36	30	50	55	43	44	52	39	51	51	52	57
Investigative	55	47	36	62	60	55	43	55	49	45	37	67	49
Artistic	48	46	45	56	48	48	44	60	39	45	32	59	38
Social	48	49	44	55	48	44	29	48	41	48	41	51	55
Enterprising	47	44	36	48	52	50	36	48	29	52	34	56	50
Conventional	41	48	41	55	54	55	41	54	41	51	38	61	51
Values													
Theoretical	48	40	42	42	51	43	41	41	39	43	41	39	39
Economic	38	42	40	40	37	44	41	42	41	39	37	40	39
Aesthetic	41	36	37	35	40	38	40	33	36	40	49	41	35
Social	45	47	39	42	37	30	31	42	44	46	37	42	44
Political	32	33	38	48	38	47	43	44	46	38	42	41	44
Religious	36	42	44	35	37	38	45	38	34	35	36	37	39
Abilities													
SAT mathematical	500	490	550	480	690	670	410	610	580	530	450	460	520
SAT verbal	430	500	440	360	600	520	370	520	450	520	380	420	370
MRT	−0.22	−0.55	−1.76	−2.09	1.31	1.31	1.31	0.65	0.65	1.31	0.43	−0.44	−0.87
BMCT	0.99	−0.74	−0.87	−2.73	0.33	0.59	1.39	1.66	1.39	0.59	−0.74	−0.87	−0.87

Note. Strong–Campbell Interest Inventory, Study of Values, and Scholastic Aptitude Test (SAT) scores are reported as scaled scores specific to each measure. The Mental Rotation Test (MRT) and the Bennett Mechanical Comprehension Test (BMCT) scores have been converted to z scores for ease of interpretation (MRT M = 28.04, SD = 9.12; BMCT M = 48.55, SD = 7.52).

social interests. The SOV religious theme has a relatively low base rate for dominance among gifted individuals. It might be illuminating, therefore, to discuss with this participant the role that spirituality plays in her life.

Moving to the male participants and focusing on the most clear-cut configurations, one finds the following. Participant E has a relatively distinct engineering–physical scientist profile: He manifests a clear investigative–realistic interest pattern and a salient theoretical value orientation, coupled with exceptional nonverbal abilities. Similar hypotheses, but with slightly different emphases, could be extended to Participants F and G. Further profile interpretation is left to the reader, who will notice that hypothesis generation is quite possible for many of these "flat" profiles.

Discussion

We examined the scientific significance of the multipotentiality concept (high–flat ability and preference profiles on variables critical to educational–vocational choice) among intellectually gifted individuals. Empirical analyses based on data collected over 20 years from more than 1,000 intellectually gifted participants in SMPY's longitudinal study revealed profound individual differences among gifted individuals in every class of variables underscored by TWA as relevant to educational–vocational choice.

The use of above-level assessment devices and conservative criteria to define undifferentiated profiles resulted in fewer than 20% of the students in SMPY's four cohorts having flat ability–interest or ability–value profiles and only 4.8% having flat ability, interest, and values profiles. Thus, when gifted adolescents are appropriately assessed on dimensions critical to educational and career decision making, significant individual differences emerge both across and within classical educational–vocational assessment tools.

In addition, clinical, idiographic assessments of Cohort 4's 13 participants classified as having undifferentiated ability, interest, and values revealed a considerable degree of profile scatter remaining for a number of participants, mostly because of the conservative criteria used in this study to define flatness. For some, meaningful hypotheses emerged for educational–vocational self-exploration. This idiographic analysis also highlighted the importance of augmenting conventional ability assessments of quantitative and verbal abilities with mechanical reasoning and spatial ability tests. Although the former are clearly more relevant to exceptional performance across most intellectually demanding academic–vocational contexts, mechanical comprehension and spatial abilities are critical for high-level performance in engineering and many of the physical sciences, as well as some of the creative arts (Humphreys et al., 1993). In another context, we have argued that mechanical comprehension and spatial ability measures could be teamed in selection to uncover a heretofore untapped talent pool for engineering and the physical sciences, namely those who are gifted in spatial visualization (Humphreys et al., 1993; Lubinski & Benbow, 1994). In the present context, we found that these measures also can enhance ability–preference profile definition and facilitate educational–vocational self-exploration in counseling settings.

Furthermore, it is important to keep in mind that, if anything, a more precise random sample of intellectually

gifted adolescents would manifest more heterogeneity on the measures we examined here. SMPY participants are especially gifted in mathematical or verbal reasoning, or both. That is, some of our participants were primarily talented in verbal reasoning, others were talented in mathematical reasoning, and some exceptional students were talented in both areas when they qualified for educational acceleration. None, however, were selected on the basis of their talent in mechanical reasoning or spatial visualization. Like mathematical and verbal abilities, spatial abilities have a unique pattern of external correlates (and these correlates include vocational interests and values; cf. Humphreys et al., 1993). If anything, our study underestimates the amount of individual differences manifested by the intellectually gifted on conventional vocational interest and values questionnaires.

If the results of this study are as robust as they appear to be, the following question arises: Why is the notion of multipotentiality in regard to gifted students so pervasive in educational and counseling circles? We suggest that the idea of an overabundance of high–flat ability–preference profiles among gifted individuals stems from the use of age-calibrated and hence developmentally inappropriate assessment tools having insufficient ceilings. That is, the typically encountered high–flat ability profile on age-calibrated instruments (e.g., standardized, grade-appropriate achievement tests) for gifted students may create an illusion that they are equally competent at everything (and relatively uniform intellectually) when, in fact, they are not. This, combined with the observation that gifted students typically are involved in several school and nonschool activities (Colangelo & Kerr, 1990; Kerr & Colangelo, 1988)—and so are believed to possess several competing interests—might explain how the widespread misconception of gifted students suffering from multipotentiality developed. And the extent to which this conjecture exemplifies a Dawesian (1994) *House of Cards* phenomenon has not escaped our attention.

Given that intellectually gifted students tend to begin career exploration early (Kerr & Erb, 1991; Milne, 1979; Willings, 1986), have interests and values that tend to crystallize precociously (Lubinski, Benbow, & Ryan, 1995; Lubinski, Schmidt, & Benbow, 1995), often accelerate educationally with much satisfaction and success (Benbow, 1991; Benbow, Lubinski, & Suchy, in press; Benbow & Stanley, 1983; Swiatek & Benbow, 1991a, 1991b), and are more likely than students of average ability to pursue careers requiring advanced educational credentials (Lubinski & Benbow, 1992; Lubinski & Humphreys, 1990), helping these students in their early teens begin to understand their ability–preference pattern is likely to facilitate better informed educational and vocational decisions at crucial choice points in their development.

Our findings further suggest that future researchers in this area need to take a multivariate approach when framing research problems, as suggested by TWA. Exclusively relying on measures of abilities (competence) or interests and values (preferences) is delimiting to a more precise characterization of client uniqueness (Dawis, 1992). Multivariate assessments of gifted clients fit nicely with TWA's multifaceted approach to defining educational and occupational ecologies. Such environmental ecologies are structurally defined by TWA through the nature and intensity of their ability requirements and reinforcer patterns.

Our results should come as good news to counselors and educators who have been perplexed by the supposition of multipotentiality among gifted individuals. Straight A students, students with high scores across the board on grade-level achievement tests, and those with many academic and extracurricular interests are among the most difficult and challenging cases faced by counselors of gifted individuals (Fredrickson, 1979; Kerr, 1981; Kerr & Erb, 1991; Kerr & Ghrist-Priebe, 1988; Rothney & Sanborn, 1966; Sanborn, 1979a, 1979b; Tyler, 1992). By using TWA as a guiding framework (with its commensurate emphasis on satisfaction and satisfactoriness), along with preexisting instrumentation (SAT, RIASEC, and SOV), counselors are equipped with powerful tools for educational and career counseling involving intellectually talented adolescents. Through developmentally appropriate above-level assessments, counselors are likely to ascertain useful information for helping gifted adolescents, their parents, and teachers begin to explore appropriate educational and career options. As a result, gifted individuals may gain a better understanding of themselves (and each other) through a more refined appreciation of the unique and salient features of their individuality.

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Appendix A

Percentages of Rank-Ordered Preference Themes for Cohort 4 Participants With Differentiated (D) and Undifferentiated (U) Ability

	Investigative/ theoretical		Artistic/ aesthetic		Enterprising/ economic		Social/ social		Realistic/ political		Conventional/ religious	
Rank order	D	U	D	U	D	U	D	U	D	U	D	U
1	42/36	46/34	22/18	22/18	6/10	6/13	5/9	6/9	16/12	13/15	10/15	8/11
2	29/23	28/21	11/13	21/18	3/26	6/20	16/14	13/17	17/10	18/19	23/6	15/5
3	17/23	13/23	10/13	14/13	13/20	13/18	17/16	18/15	22/34	14/22	22/3	35/11
4	9/10	8/11	26/25	9/16	23/17	23/22	12/21	14/18	16/20	23/25	15/7	16/8
5	3/5	5/9	12/20	15/18	28/17	28/15	20/26	22/27	19/13	16/12	18/18	15/20
6	1/4	1/2	19/10	19/18	27/9	23/11	30/15	28/15	10/11	16/8	12/50	12/46

Note. The themes listed for each rank order are from the Strong–Campbell Interest Inventory/Study of Values (SOV). For example, under investigative/theoretical for Rank Order 1, the data indicates that 42% of the participants with differentiated abilities had investigative ranked first in their Holland (1985) profile and 36% had theoretical ranked first in their SOV profile, etc.

(Appendix B follows on next page)

Appendix B

Percentages of Rank-Ordered Preference Themes for Cohort 4 Participants by Gender

	Investigative/ theoretical		Artistic/ aesthetic		Enterprising/ economic		Social/ social		Realistic/ political		Conventional/ religious	
Rank order	M	F	M	F	M	F	M	F	M	F	M	F
1	54/41	29/26	8/12	43/28	6/15	6/7	3/4	9/17	22/16	2/10	7/13	12/12
2	26/26	31/15	13/10	23/24	5/30	5/12	6/10	26/24	27/21	3/16	2/3	12/9
3	9/22	23/23	16/10	6/17	14/21	12/15	10/12	29/19	17/28	18/15	34/5	13/11
4	7/6	10/18	19/25	13/12	25/21	20/19	15/18	11/21	18/23	23/22	17/7	22/7
5	4/4	5/13	19/24	6/10	31/8	24/29	25/38	15/9	10/10	28/17	12/17	23/22
6	1/1	2/6	25/19	10/9	19/5	33/18	42/18	10/9	5/2	27/20	8/54	18/38

Note. The themes listed for each rank order are from the Strong–Campbell Interest Inventory/Study of Values. M = male participants; F = female participants.

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