

Longitudinal Change and Maternal Influence on Occupational Aspirations of Gifted Female American and German Adolescents

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This study assessed 43 gifted adolescent females in the United States and Germany over a 4-year period (in 7th or 8th grade and again during the 11th or 12th grade). Factors that were examined included the daughter's career selection, the prestige level and the education required to pursue that career, and the impact of the mother's gender role attitudes on these factors. Both American and German girls remained consistent in their career selections over time and selected moderately prestigious careers. German girls, as compared to American, selected less traditional female occupations and careers that require more educational training. Giftedness, cultural differences, and the implications for career counseling of gifted adolescent females are addressed.

Numerous studies have examined vocational development, and researchers in various fields have attempted to explain why certain careers remain male-dominated despite the academic and cultural advances of women. A number of researchers have studied the career selection process of girls and women to try to understand their vocational development patterns (see reviews by Hartung, Porfeli, & Vondracek, 2005; Low, Yoon, Roberts, & Rounds, 2005). Gifted girls are of specific interest as researchers want to know if these early talents or vocational interests are realized and how they contribute to initial career choices. Thus, identifying developmental influences on adolescents and their selection of career paths is of particular importance, especially in gifted education.

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Studies have found that girls with high self-esteem are more likely to choose nontraditional occupations (Hartung et al., 2005; Watson & McMahon, 2005). In gifted adolescents, however, the positive relationship between ability and self-efficacy (belief in one's ability) may be negated by low self-concepts that many gifted adolescents hold (Kerr & Sodano, 2003). According to Kerr and Sodano (2003), the perfectionist qualities found in many gifted students often result in an inaccurate perception of their own skills and lower self-efficacy. Additionally, this trend is seen in females studying traditionally male-dominated fields such as mathematics, science, and engineering. Despite earning similar grades in these subjects as their male counterparts, female students in high school and college consistently report feeling less competent and more unsure of themselves (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Freeman, 2004).

The National Science Board (2008) reported that during high school girls were more inclined than boys to study biology and chemistry. Currently, women obtain more than half of all bachelor degrees awarded. However, men clearly outnumber females in engineering, physics, and computer sciences degrees and, as a result, women account for just 26% of this workforce. These facts make studying the career selection process of gifted female adolescents particularly relevant as gifted girls have the talents to major in male-dominated fields, but are not selecting to do so. Lubinski, Benbow, and Sanders (1993) suggested that gender differences in achievement among gifted students—especially the underrepresentation of women in mathematics and science—are more a result of differences in interests than aptitude differences.

In childhood and early adolescence, gifted girls display a higher interest in nontraditional and prestigious careers and report a higher self-efficacy for those fields than in late adolescence or early adulthood (Hartung et al., 2005; Kerr & Sodano, 2003; O'Brien, Friedman, Tipton, & Linn, 2000). Mendez and Crawford (2002) found that gifted girls in grades 6–8 were more apt to select prestigious or nontraditional female careers if they viewed themselves as highly motivated and hard working. Tracey, Robbins, and Hofsess (2005) observed that the interest areas of gifted adolescent girls remained relatively stable over the course of the 4 years from 8th grade through 12th grade, and O'Brien et al. (2000) saw that, although women may choose occupations that underutilize their abilities, the occupations match

their interests. However, with less than 1% of the 207 young women in that study ranking their career pursuits as more important than family pursuits, it appears that both gifted and nongifted girls may limit their career choices to occupations they see as being conducive to raising a family (O'Brien et al., 2000). Achter, Lubinski, Benbow, and Eftekhari-Sanjani's (1999) study examined 432 gifted students at age 13 and then followed up when the students were 23 years old. Of the college majors selected by the gifted students, 23% of the variance could be explained by their age (13 vs. 23 years), their ability, and their value scores. Gender alone could not be used to predict college major groupings. This research would suggest that career aspirations are affected by variables other than interest alone.

Another topic of importance is the fact that parents play a significant role in the development of their children's self-efficacy, thereby influencing the career choices that their children make. Researchers have found that, for both boys and girls, the mother's career has a strong influence over the child's career choices. Girls are much more likely to work outside the home if their mothers have a part-time or full-time job outside the home as well, and the traditionality and level of the mother's career has a more significant impact on the choices of their children than does that of the father. The vocational aspirations of children are generally associated with the occupational level of the mother. Gifted girls whose mothers hold nontraditional positions report a greater number of possible career choices and are more likely to enter male-dominated spheres themselves than are the daughters of women who do not work or who work in traditional female fields (Hartung et al., 2005; Watson & McMahon, 2005; Whiston & Keller, 2004). Additionally, longitudinal research conducted by Bleeker and Jacobs (2004) showed that the mothers' early gender role beliefs shaped their perceptions of their children's ability at age 12 and that these perceptions ultimately continued to influence their daughters' career selection in nontraditional occupations (mathematics and science related fields) at age 24.

The United States and Germany are Western cultural realms that should be comparable based upon the strong American influence on post-World War II Germany. However, given the many cultural similarities, there are also subtle differences that validate comparisons in the field of career development (Costas, 2002). By specifically

addressing each country's educational system and questions of gender equity, the career development of gifted female adolescents in the United States and Germany can be further examined. This summary is based on a report of the German social and academic system by Costas (2002). The German academic system was founded on the Humboldtian ideal (unity between research and teaching) in 1810 and was so successful that it was exported to other countries, including the United States. Due to Germany's numerous sustained accomplishments in science and research in the 19th and 20th centuries, academic careers and positions became socially prestigious and desirable and were occupied almost exclusively by males. This trend of gender segregation in academia continued to be present until the late 1980s (almost 30–50 years later than academic trends in the United States of America). Since 1990, the German federal government has provided funding programs to strongly promote women in science and achieve gender equality. It is important to realize that these affirmative action programs are not limited to academia and to the top-level educational positions, but they are far-reaching instruments that have helped to overturn a centuries long gender inequality that was cemented at various societal levels.

Fiebig (2003) examined gifted American and German early adolescent females and their desire to select certain careers. From a list of traditional female, neutral, or nontraditional (i.e., male dominated) careers, it was found that American gifted girls were selecting neutral career choices while the German girls were selecting somewhat more nontraditional choices. The current study expands on Fiebig's (2003) earlier work by exploring longitudinal data on career choices in gifted adolescent females in the United States and Germany. The purpose of this study is to determine (a) if gifted adolescent females differ in their selection of possible career choices over time (7th/8th grade vs. 11th/12th grade), (b) the impact of their mother's gender role attitudes, and (c) the extent that country of origin and cultural forces influence development. It was hypothesized that these talented girls would persist in their career selections and that if there were any differences, they would be minor. This hypothesis was based on a meta-analysis conducted on longitudinal vocational change (Low et al., 2005) and more specifically on work with gifted females (Tracey et al., 2005) that found vocational interests remain stable from middle school through high

school. Additionally, we anticipated that mothers working at least part-time and/or in nontraditional female occupations would have daughters who were more apt to aspire to more male-dominated careers (e.g., Hartung et al., 2005; Watson & McMahon, 2005; Whiston & Keller, 2004). Based on the results of our previous study, we predicted German girls would select more nontraditional jobs than their American counterparts. The results presented here will add a critical longitudinal connection between gifted girls, cultural impact, maternal influence, and their career development.

Method

Participants

Twenty-one American and 22 German gifted girls in the 11th or 12th grade and their mothers volunteered to complete a follow-up battery of separate inventory scales. The original study was conducted 4 years prior to the current study, when the girls were in the 7th and 8th grades (see Fiebig, 2003). Participants originated from Ventura County, CA, and from the states of Bavaria and Baden-Württemberg, Germany. Although multiple attempts were made to contact all previous participants and encourage their participation, only 57% of the original American population and 85% of the German population chose to take part in the current study. There was no measurable way to identify whether these participant “survivors” were different from their nonparticipating counterparts. Due to their lower attrition rates and because the data collection procedure was identical, it would appear that the German girls are much more committed to the longevity of and participation in the study. Although this appearance may be subjective, it could be an early indication of cultural differences.

Giftedness: Original Selection Procedure in the Seventh or Eighth Grade (Fiebig, 2003)

Selection of U.S. sample. In 2003, the first author of the current research conducted a study in which adolescents were selected

from two public middle schools and two private Catholic schools. Public school participants were selected based on their involvement in the Gifted and Talented Education (GATE) program, which is made up of students scoring in the top 2% on state-wide scholastic ability tests (California Department of Education, 2001). Private schools do not qualify for GATE funding, but both private school principals indicated that these girls would qualify as GATE students in a public school. This assessment was based on scores that the adolescents received on a national test in sixth grade, as well as their records of academic achievement (grade point average).

Once girls were identified as gifted/talented, they were given an informational flyer with a permission slip to take home explaining the study and requesting their assistance. After both the mother and daughter agreed to participate, the mother signed a permission, form, thereby agreeing that a questionnaire packet could be mailed to their home.

Selection of German sample. Adolescents do not undergo annual nationalized assessment tests once they are placed in the *gymnasium* (college-bound track of education) system. Therefore, another means of selecting gifted/talented students had to be devised. The states of Bavaria and Baden-Württemberg have organizations designed to assist gifted children and their parents. Gifted students enter the organizations based on recommendations from teachers or other school officials. Therefore, the coordinators of these gifted organizations were contacted. After determining which of their members fit the study's criteria (e.g., gifted, female, and in either seventh or eighth grade), these organizations sent informational flyers to the mothers of those members asking for their assistance. As with the American participants, questionnaire packets were mailed to the homes of those who agreed to take part in the study.

Current Participants and Common Procedures Used in Both Countries

The questionnaire packets were mailed to the mothers with a one-page set of instructions explaining what they received, the number of sections in each packet, the estimated time for completion, and a request not to discuss their opinions or answers to questions until after their daughters had completed their packet. Questionnaire packets were

marked clearly as either the “Mother’s packet” or “Daughter’s packet.” Packets were completed at home, returned by mail, and once returned were assigned a number to maintain confidentiality. To encourage participation, all returned packets were entered into a \$100 drawing.

The mothers’ packet consisted of a consent form, the demographic section, and several open-ended questions. The mothers’ three open-ended questions asked if they were (1) currently employed—and if so, in what field of work and how many hours per week, (2) if they had obtained more educational/occupational training during the last 4 years, and (3) if they hoped their daughters would continue their education after high school. The daughters’ packet consisted of a brief demographic section, the Occupational Checklist (OCL), and a section containing open-ended questions. The daughters’ two open-ended questions focused on (1) if they anticipated continuing their education after high school and if so, what they plan to study and (2) if they hoped to have a career once they finish their education and if so, what career.

The American and German questionnaire packets were identical except for the language. Packets were translated from their original English into German by a native German speaker. The German version was then translated back into English by a native English speaker. Discrepancies were discussed between the author and the two translators to arrive at the final German version.

Instruments

Occupational Checklist (OCL). The Occupational Checklist (OCL) was developed by Brooks, Holahan, and Galligan (1985) to assess a female adolescent’s interest in nontraditional occupations. The OCL contains 75 occupations that are weighted according to how many women are represented in that career. Careers are defined as traditional if 70% or more of the workers are female (25 occupations = 1 point each), neutral if 30%–70% of the workers are female (25 occupations = 2 points each), and nontraditional if 30% or less of the workers are female (25 occupations = 3 points each). The adolescent was asked to select either “Might choose” or “Would not choose” for each career based solely on interest and the assumption that she has the ability, financial resources, and freedom to choose that occupation. To obtain a mean Sex Type score, all the “Might choose” careers

are summed with the corresponding value for that item and the total is divided by the number of "Might choose" items checked. The higher the Sex Type mean, the more the girl favors nontraditional female occupations.

Brooks et al. (1985) assessed the OCL with female middle school and high school students and the 2-week, test-retest reliability was reported as .85 and .86, respectively. The mean recognition of occupations at the pretest for both groups was 97%. Rainey and Borders (1997) updated the occupation titles to correspond with the 1991 U.S. Bureau of Labor Statistics (e.g., "Grain buyer" was no longer on the 1991 census report and was replaced by "Animal caretaker" on the current list). For the present study, as with Fiebig's (2003) study, the updated list from Rainey and Borders was utilized. Additionally, the current authors examined the female-to-male ratio for the 75 occupations listed (to assure that occupations were still traditional, neutral, or nontraditional female occupations) against the 2000 U.S. Census Bureau (2004) data for workers between the ages of 35–54 and in large occupations, defined as 500,000 workers who are employed year round and full-time. Given this criteria (which excludes small businesses or self-employed jobs such as an artist or a plumber), 20 occupations out of the 75 were listed and all 20 held consistent to the 1985 OCL statistics for traditional, neutral, or nontraditional female occupations.

The Education Level scores are calculated in much the same manner as the Sex Type scores. Occupations are assigned the following point values: 1 = occupations requiring a high school degree or less; 2 = occupations requiring a bachelor's degree, but less than a master's degree; and 3 = occupations requiring a graduate degree or more. Therefore, all the "Might choose" careers are summed with the corresponding value for that item and the total is divided by the number of "Might choose" items checked.

The Prestige Level score is based on the occupational prestige values cited in the Duncan Revised Socioeconomic Index of Occupational Status (Stevens & Featherman, 1981). The first author located all of the OCL occupations on the Index, recorded each occupation's prestige value, and tallied up each value and divided by the total selected by each girl to arrive at their mean prestige score. The prestige values ranged from 18.06 (restaurant cook) up to 87.14 (physician).

Gender role attitudes of the mothers. The Attitudes Toward Women Scale for Adolescents (AWSA) was created to assess adolescents' attitudes about women's roles and rights in society (Galambos, Petersen, Richards, & Gitelson, 1985). The AWSA, derived from the short form of the Attitudes Toward Women Scale (Spence, Helmreich, & Stapp, 1973), is composed of 12 items on a 4-point Likert scale (1 = *agree strongly*, 4 = *disagree strongly*). Questions are designed to assess attitudes regarding the roles and rights of women in educational, occupational, and intellectual domains (e.g., "On the average, girls are as smart as boys") as well as dating and social etiquette (e.g., "It is all right for a girl to ask a boy out on a date"). The higher the score, the less traditional the attitudes. Fiebig (2003) used the AWSA to test both the daughters and mothers. For the current study, the mothers' AWSA scores from 2003 are being compared against the current OCL scores of the daughters. For the maternal population in 2003, internal consistency (Cronbach's alpha) was calculated as .72 for the American mothers and .78 for the German mothers.

Demographic questionnaire. Each mother completed a brief written questionnaire regarding her age, ethnicity, and open-ended questions (as listed above). The daughters were also asked to complete a brief demographic questionnaire that asked about their grade level, age, ethnicity, their talent area, and open-ended questions also listed above.

Data Analysis

First, descriptive statistics were run to assess similarities or differences from the original study to the current follow-up study on various subscales (see Table 1 for Time 1 and Time 2 mean scores). A repeated-measures analysis of variance (ANOVA) was employed to assess whether the findings were significant by addressing three questions: (a) is there a difference between pre- and post-data or (b) between countries (United States and Germany), and (c) is there any interaction between pre- and post-data and the country of origin? Correlations were run on the mothers' gender role attitudes and their impact on the daughters' OCL scores including the educational and prestige levels.

Additionally, as only a few of the questions for both mothers and daughters were open-ended in nature, these answers were first

Table 1

American and German Means and Standard Deviations at Time 1 and Time 2

Variable	American mean (SD)	German mean (SD)
OCL: Sex Type Score—T1	1.98 (.17)	2.13 (.23)
OCL: Sex Type Score—T2	1.91 (.16)	2.13 (.24)
Traditional—T1	8.10 (5.6)	5.59 (4.60)
Traditional—T2	7.42 (4.75)	4.77 (4.49)
Neutral—T1	10.29 (3.96)	9.05 (4.09)
Neutral—T2	8.90 (2.32)	8.82 (3.51)
Nontraditional—T1	6.47 (3.19)	7.32 (3.98)
Nontraditional—T2	5.10 (3.21)	6.64 (3.63)
Total OCL Selected—T1	24.86 (11.15)	21.95 (10.96)
Total OCL Selected—T2	21.43 (8.14)	20.23 (9.53)
Education Level—T1	2.75 (.19)	1.78 (.26)
Education Level—T2	1.77 (.24)	1.83 (.26)
Prestige Level—T1	53.05 (5.60)	52.84 (8.46)
Prestige Level—T2	52.45 (7.50)	55.50 (7.50)

Note. T1 = Time 1; T2 = Time 2; OCL = Occupational Check List.

typed verbatim and then coded manually by the authors. Any differences in coded responses were discussed and corrections were made accordingly.

American population. The girls ranged in age from 16 to 18 years old ($M = 16.86$, $SD = .91$), with 12 from grade 11, 8 from grade 12, and one who did not reveal her grade. The mothers' ages ranged from 39 to 56 ($M = 48.12$, $SD = 3.42$). Eighteen of the mothers and 19 of the daughters were Caucasian, and one daughter and mother were Hispanic. The remaining two mothers classified themselves as "other," and one daughter did not declare.

As assessed by Fiebig (2003), the modal education for all of the mothers in the original study was a bachelor's degree, but ranged from 8 to 21 years of education ($M = 15.68$, $SD = 2.47$). All mothers had worked at some point in their adult life and more than half were currently working.

German population. The daughters ranged in age from 15 to 18 years old ($M = 16.91$, $SD = .97$). There were 12 in grade 12 and 8 in grade 11 (2 daughters did not declare). The mothers ranged in age from 40 to 57 ($M = 47.62$, $SD = 4.79$). The participants were predominantly German in ancestry (22 daughters, 20 mothers).

The German educational system is complex because it contains three different educational tracks allowing adolescents to finish school with as little as 9 years of education or up to a maximum of 13 years. As stated by Fiebig (2003), all but two of the mothers continued their education in spite of the various educational tracks and had studied between 10 to 21 years ($M = 16.2$, $SD = 2.87$). The mother's modal educational attainment would be roughly equivalent to a bachelor's degree in the American system. Like American mothers, all German mothers had worked at some point in their adult life and more than half were currently working.

Results

Occupational Check List (OCL)

Analyzing the results of the total combined OCL scores, the girls showed no significant pre- and posttest score differences, $F(1, 41) = .73$, $p > .05$. A comparison of pre- and posttest scores while combining the population in both countries also did not reveal a significant interaction, $F(1, 41) = .92$, $p > .05$. However, there was a significant difference between the American and German girls, $F(1, 41) = 14.92$, $p < .001$.

Traditional Subscale of the OCL

Much like the trends found in the OCL, the girls displayed no significant difference in their selection of traditional female careers, $F(1, 41) = 1.07$, $p > .05$, nor were significant differences found when analyzing both scores and the country of origin, $F(1, 41) = .01$, $p > .05$. Yet, American girls selected more traditional careers than their German counterparts, $F(1, 41) = 3.95$, $p < .05$.

Neutral Subscale of the OCL

No significant differences were found. These girls remained constant in their selection of neutral careers over the 4-year period, $F(1, 41) = 1.50, p > .05$. No significant differences emerged when looking at these scores and countries, $F(1, 41) = .78, p > .05$, nor when looking at American versus German girls, $F(1, 41) = .59, p > .05$.

Nontraditional Subscale of the OCL

As seen with the neutral subscale, no significant differences were found. The selection of nontraditional careers over time did not significantly differ, $F(1, 41) = 2.54, p > .05$. A slight trend, although not significant, was seen among German girls selecting more nontraditional choices than their American counterparts, $F(1, 41) = 1.96, p = .17$, and differences between pre- and posttest scores combined with the country were not significant, $F(1, 41) = .28, p > .05$.

Educational Level

Based on the careers selected on the OCL, a significant difference was seen in pre- and posttest scores regarding the amount of education required for these careers, $F(1, 41) = 174.27, p < .001$. In addition, the American girls' educational levels have decreased significantly more as they selected careers that require less education than 4 years ago, while their German counterparts remained constant, $F(1, 41) = 211.99, p < .001$. Finally, the significant differences continued when addressing only country of origin, $F(1, 41) = 48.07, p < .001$.

Prestige level. No significant differences were found between pre- and posttest scores, $F(1, 41) = 1.02, p > .05$. Over time, American and German girls did not significantly differ in the amount of change seen in their levels of career prestige scores, $F(1, 41) = 2.53, p > .05$, and this held true when only looking at the country of origin, $F(1, 41) = .51, p > .05$.

Maternal Gender Role Attitudes

A significant correlation was observed with the mothers' AWSA impacting the daughters' OCL Sex Type score. Thus, the higher the mothers' AWSA (the more nontraditional in her beliefs), the higher the daughters' OCL scores, $r(41) = .421, p = .005$. Also significant was the mothers' AWSA scores correlating with the level of prestige in the daughters' careers, $r(41) = .352, p = .02$. The same trend was seen in the impact of the mothers' gender role attitudes toward the educational level of the daughters' careers, although with marginal significance, $r(41) = .264, p = .09$.

Mothers

Mothers were asked questions about their current employment and if they had obtained more education during the last 4 years. Specifically, mothers were asked if they were working or not and, if they were working, was it part-time (20 hours or less), full-time (21 hours or more), or other? Of American mothers, 91% were presently working (part-time, 43%; full-time, 48%) compared to the 71% of working German mothers (part-time, 14%; full-time, 57%). Maternal careers in both groups varied substantially and were moderately prestigious. The most common career families tended to be in the medical professions or business. Twenty-nine percent of American mothers and 23% of German mothers completed additional education during the 4 years between studies. Most completed a certificate program, obtained additional training for their job, or entered a graduate program. One mother (German) finished her bachelor's degree. One hundred percent of American mothers and 86% of German mothers hoped their daughters continued with their education after high school. This comparison is skewed because the German *gymnasium* encompasses 13 years (compared to 12 years in the American school system) and is slightly more advanced than American high schools.

Daughters

Daughters answered questions regarding their plans to continue their education after high school and, if they planned to have a career, what

type? As seen with the American mothers, 100% of the American daughters planned to continue their education compared to 68% of German daughters. Regardless of their education path, the daughters seem overwhelmingly certain that they would ultimately have a career (95% American; 91% German). When asked about their ultimate career choice, 41% of German girls were not yet certain compared to 14% of their American counterparts. For American girls, top career choices were business/law (33%) and medical professions (29%), followed by creative endeavors (24%). The German girls selected creative endeavors (18%), medical professions (14%), and business/law (10%).

Discussion

The results of this study shed light on how gifted girls mature during the 4 years from middle school to high school and provide a cross-cultural perspective. It emerged that both American and German girls remained consistent in their career interests over time. Addressing the overall career choice values, culturally German girls, as compared to American, selected less traditionally female occupations and as a result were open to careers that require more educational training. Both sets of girls selected jobs that are moderately prestigious, but prestige seems to be slightly more important for German girls. This finding is consistent with previous research by Mendez and Crawford (2002) indicating that gifted girls who were internally motivated and committed to working hard were more likely to select prestigious or nontraditional female careers. Specific findings are discussed below.

Daughters' Career Orientations

These gifted girls selected slightly fewer careers than they had 4 years ago, although this career narrowing was not significant. In fact, the German girls had the exact same Sex Type mean score (their desire for traditional, neutral, or nontraditional female careers) in high school as they did in middle school. The temporal change of the American scores was minimal and nonsignificant. These findings confirm our initial hypothesis that gifted girls would remain consistent in their career/interest patterns. Our results verify meta-analysis research

(Low et al., 2005) and longitudinal research with gifted females (8th grade and again in the 12th grade) that found that as time went by, there was a crystallization and consistency in vocational interests and perhaps a more realistic assessment of interests at the end of high school (Tracey et al., 2005). Our results show this trend as well when examining the open-ended questions. Of those who wanted to have a career, 86% of American girls (59% German) could state their future career specifically. These careers also tended to be creative in nature (oftentimes altruistic) and matched their interests. For example, a German girl said she hopes to be a “social worker in a third world country as she wants to be fulfilled, have a sense of purpose, and have fun.” This result is consistent with a study on college women whose ultimate careers after graduation matched their interests despite tending to underutilize their abilities (O’Brien et al., 2000).

In our study, while the career selection remained constant for each set of gifted girls, there were significant differences between the countries. Overall, German girls continue to be more apt to select more traditionally masculine careers than their American counterparts. This fact confirmed our initial hypothesis that cultural differences would persist and that German girls would continue to have more masculine pursuits. This observation highlights the subtle differences between two Western cultures. Fiebig (2008) stated that attention should be brought to the cultural values that are placed on gender roles and defining acceptable careers for females. In Germany it appears to be more “en vogue” for females to pursue nontraditional careers. This is supported by the fact that even though 41% of the German sample were not certain about their future career, there were still more Germans stating that their aspired jobs would be in physics or chemistry than in the American group. This finding could also be related to the different school systems. German *gymnasiums* (advanced-level high schools) require students to select two major subjects (e.g., physics and history)—“Leistungskurse”—in addition to the general high school curriculum.

Cultural differences are also prevalent when the specific types of careers that interest these gifted girls are examined. The American girls selected significantly more traditional female careers than the German girls. Fiebig (2008) highlighted one case of a German gifted daughter whose mother “thinks that if you go to *gymnasium*, you

should definitely go on to university and become something, not just a kindergarten teacher.” Clearly, family pressures, along with cultural expectations, can impact the type of careers these girls select.

Additionally, if we address the level of education required for the types of careers that these girls selected, we notice perhaps some of the most unique and significant findings. The amount of education to obtain the selected jobs significantly dropped in the four years for the American population. Whereas American girls in middle school were willing to select careers that require considerably more educational training than a bachelor’s degree, the drop was so significant that the mean educational level in this study was below that of an undergraduate degree. The German girls remained constant in the education levels needed during this period of time. This cultural difference continues to highlight that German gifted girls, unlike their American counterparts, are open to careers that require a higher level of education.

Maternal Gender Role Attitudes

As seen 4 years ago, the career choices of these girls were directly impacted by their mothers’ gender role attitudes. Specifically, the more nontraditional the mother was regarding her views of the rights and roles of women in society, the more likely her daughter was to express an interest in nontraditional female occupations. This impact extends to the daughter’s willingness to select prestigious careers and, to a lesser extent, careers requiring higher educational levels. These results confirmed part of our original hypothesis and corroborate longitudinal research (Bleeker & Jacobs, 2004) that the gender role attitudes of the mothers would continue to influence their daughters’ career selection process.

Maternal Influence

Based on previous research (e.g., Hartung et al., 2005; Watson & McMahon, 2005; Whiston & Keller, 2004), we anticipated that mothers working at least part-time and/or in nontraditional female occupations would have daughters more apt to aspire to male-dominated careers. However, this was not the case, even though 91% of American (71% of German) mothers were working either part-time

or full-time. There was no correlation between the mother's employment and the types of careers the girls selected, their desire for prestigious careers, or the educational levels required for each job. Again, when looking at the career or educational level of the mother, no correlations were found. Therefore, based on our findings, we can only confirm that the mother's gender role beliefs are significantly more important and more likely to directly impact her daughter than are the mother's educational level and current career. We do not discount the importance of the mother's influence, but suggest that perhaps our sample of gifted girls are even more unique than the general population, as all of these mothers had worked at some point in her adult life, all of the current careers were of a professional nature, and the modal educational level was that of a college graduate. Furthermore, because approximately a quarter of these mothers had returned to school within the last 4 years to start and/or finish certificate or degree programs, the education attainment and desire for prestigious jobs on the daughter's part are perhaps seen as the norm for women in these households and do not stand out as overtly impacting their life choices. We can even extrapolate based on our findings that these gifted girls will have a good chance of realizing their occupational desires at age 26. This prediction is in agreement with longitudinal research by Schoon and Parsons (2002), which shows that teenage students of parents who have high aspirations (as these mothers have) tend to have children who also have high aspirations. Therefore, chances of realizing their ultimate career goals increase significantly when the child is strong academically and comes from a professional family background.

One of the unique findings of this current study is that, as these girls matured from middle school through the end of high school, their overall selection of careers remained unchanged, although differences did persist between the two countries. Specifically, American girls selected more traditionally female careers than Germans. Perhaps as Fiebig (2003) suggested and as discussed here, differences could arise from cultural expectations and, more importantly, the influence of the mother. German mothers were more strongly in favor of gender equity than the American mothers. These family and cultural differences could be the reason for this difference.

Additionally, one must not forget that the de-facto free German university system enables German high school students to keep their future career options open versus the American system that strongly encourages the American girls to choose an educational path early in their academic career. Perhaps the American girls are selecting careers/college majors that they know they can succeed in even though they will underutilize their abilities (see O'Brien et al., 2000).

An aspect that was not studied here was a comparison to boys during this period. However, we can postulate, based on a study of talented girls and boys in the 11th grade (Leung, Conoley, & Scheel, 1994), that while there would be no gender difference in the prestige levels selected for careers, girls would be more open to considering careers on either side of the gender divide. Additionally, we would anticipate no significant gender differences with regards to career aspirations even across intellectual ability levels from 6th through 12th grade (Watson, Quatman, & Edler, 2002). Watson et al. (2002) also compared gifted girls to their nongifted peers and found a surprising outcome. They observed that moderately high-achieving girls (76th–90th percentile in ability) surpassed gifted (superior achieving) girls and the highest/superior achieving boys in their career aspirations. This reflects the notion of the hardest working student (not necessarily highest in ability) being the highest achieving. Watson et al. (2002) also noted that gifted students seemed more willing to express their talents creatively and in less prestigious occupations. As aforementioned, this trend was observed as our population of gifted girls was also selecting more creative endeavors, thus bringing their prestige levels down. Our results confirm that these American and German gifted girls are indeed different in both their career selection and aspirations than their nongifted peers.

Cultural Implications

In the following paragraph, we attempt to discuss our obtained results in light of the different social and historical backgrounds that mark the academic systems in America and Germany. Given the unique historical evolution of the German academic system cited in the introduction, one may argue that the results here reflect the new societal positions of gender equality. In the United States, advanced female educational

pathways have a long tradition (e.g., at Smith College, Wellesley College, and Bryn Mawr College), and science has historically been less segregated than in Germany. Thus, as was seen with our gifted American girls, there does not appear to be a great social need or affirmation for these adolescents to select nontraditionally female occupations, whereas German girls are strongly encouraged to pursue nontraditional female academic subjects and ultimately career choices.

Limitations. Although the current findings add an important longitudinal component to the literature on giftedness, there are limitations. First, given the longitudinal nature of the study, there were retention issues and participants were lost, adversely affecting the sample size. As previously discussed, cross-cultural differences or similarities must be interpreted with caution as it is difficult to assess cultural influences (e.g., differences in educational systems, societal trends that foster unique expectations/pressures). In addition, the OCL scale is limited by quantizing the assigned point values to only three distinct categories (traditional, neutral, or nontraditional female careers). For example, a nontraditional or masculine career such as a lawyer (25.7% females; U.S. Census Bureau, 2004) or an electrician (2.2% females) are both assigned the point value of three. Thus, career choice differences should be viewed with these arbitrary categories in mind. Finally, these girls were not tested again to reestablish and measure giftedness. It is possible that some of these girls foreclosed on their talents over time and are now more like their nongifted peers (however, several mothers happily provided success stories highlighting their daughters' outstanding talents).

Attempting to understand career development is complicated by the large number of different variables, scales, and measurements available to researchers. As O'Brien et al. (2000) pointed out, assessment tools often fail to measure jobs that are prestigious and more traditionally female as they are unable to capture the complex nature of career development. For example, they mischaracterize the goals of a talented female who wants to be a nurse, but has the long-term goal of ultimately being the director of nursing or conducting research. Thus, the interpretation of some data tends to be more one dimensional versus being able to capture these multifaceted aspects.

More longitudinal research is needed in gifted education. Much like Blecker and Jacobs' (2004) work, it would be beneficial to evaluate

these same gifted adolescents at age 24 or later to see if any of their earlier career desires were predictors for their ultimate career path. Finally, as we only studied gifted girls and their mothers, it would be valuable to compare longitudinal patterns to gifted boys and their parents (fathers) to evaluate similarities with these gifted females.

Conclusion

Although this research has provided valuable information about gifted adolescent girls and how they form career choices, there remains much to be learned. Parents, counselors, and educators need to be aware that a gifted girl's self-efficacy is still malleable in high school and can impact her choice of nontraditional (science, mathematics, and engineering) interests/majors through the college years (Nauta & Epperson, 2003). When adolescents have an intensely focused ability and their preference patterns lie in a specific criterion group, they should be encouraged wholeheartedly. As seen in our study, these career preference patterns can be extremely divergent as one girl anticipates pursuing musical theatre and hopes to be a soloist, but plans to study physics if that career path does not come to fruition. This example showcases the diverse interests of gifted girls and the need to better understand the career development patterns of gifted adolescents. It is through this understanding that we can foster the aspirations of gifted girls and help them to attain a career that matches both their early interests and intellectual abilities.

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