DOCUMENT RESUME

ED 380 663 CE 068 630

AUTHOR Pettitt, Lisa M.; And Others
TITLE Middle School Students' Perceptions of Math and Science Abilities and Related Careers.
SPONS AGENCY National Inst. of Child Health and Human Development (NIH), Bethesda, MD.
PUB DATE 95
NOTE 21p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (61st, Indianapolis, IN, March 30-April 2, 1995). Funding also received from Girls Count.
AVAILABLE FROM Lisa M. Pettitt, Dept. of Psychology, University of Denver, 2155 South Race St., Denver, CO 80208.
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Career Development; Career Education; Family Work Relationship; Intermediate Grades; Junior High Schools; *Junior High School Students; Mathematics Anxiety; *Middle Schools; Nontraditional Occupations; *Occupational Aspiration; Occupational Information; Science Careers; *Science Interests; *Sex Differences; Sex Stereotypes; Student Attitudes; Tables (Data); Work Attitudes
IDENTIFIERS *Mathematics Interests; *Middle School Students

ABSTRACT

A total of 162 students from a suburban Denver middle school were surveyed to determine the following: their career aspirations, whether they perceive differences in society's acceptance of certain career choices for women versus men, the relationship between their perceptions of their abilities and their desire for certain jobs, and possible relationships between jobs they would not like to hold and their endorsement of reasons for not wanting certain jobs and/or their concerns about balancing career and family. The survey revealed that, although girls and boys believe society accepts multiple career options for women and men, their own career aspirations remain fairly sex stereotyped. Girls considered themselves capable of succeeding in doctor/veterinary jobs but not science-related jobs, whereas boys showed the reverse pattern. Neither girls nor boys saw a relationship between science abilities and ability to succeed at doctor/veterinarian careers. They did, however, see some relationship between science ability and success in science-related careers. It was concluded that both girls and boys need more information about the requirements of particular career options and additional encouragement to consider the rewards of a variety of types of work. (Seventeen figures/tables are included.) (MN)

Middle School Students' Perceptions of Math and Science Abilities and Related Careers

Lisa M. Pettitt,
Judith A. Patrick,
and Mary Ellen Sternitzke

S.R.C.D. Poster Presentation
Indianapolis, Indiana
March/April 1995

This research was supported by Girls Count, a nationally recognized non-profit organization working to ensure that all of today's girls become economically secure women in the future, and by an NICHD grant awarded to Susan Harter. Please send requests for reprints to Lisa M. Pettitt, Department of Psychology, University of Denver, 2155 South Race Street, Denver, CO 80208. (email: lpettitt@du.edu)

ABSTRACT

During the past several years, much concern and attention has been focussed on research findings indicating a decline in the interest and participation in math and science shown by adolescents--particularly adolescent girls (American Association of University Women, 1992; Eccles, 1989; Sadker & Sadker, 1994). The current study was designed to explore what some of the reasons are for this decline, particularly in regard to middle school students' career aspirations. Over 160 students responded to items measuring perceived competence, goals and attitudes regarding careers, and reasons for not wanting certain jobs.

Results indicated that although girls and boys believe society accepts multiple career options for women and men, their own career aspirations remain fairly sex-typed. In addition, several findings pertain to a distinction made by students between Doctor/Veterinarian careers and other Science-related careers, despite the fact that both types of careers require extensive skills and training in math and science. Overall, it is clear that there is still much work to be done to support girls' pursuit of non-traditional career options. Moreover, both girls and boys appear to need more information about the requirements of particular career options, as well as additional encouragement to consider the rewards of a variety of types of work.

RESEARCH QUESTIONS

1. What are middle school students' career aspirations? Are there gender differences in career goals, particularly in regard to occupations which require math and science skills?
2. Do middle school students perceive differences in society's acceptance of certain career choices for women versus men?
3. Are middle school students' perceptions of their abilities related to how much they want certain jobs?
4. Are middle school students' choices of jobs they would not like to have related to (a) their endorsement of reasons for not wanting certain jobs and (b) how much they think about balancing career and family?

METHOD

Participants were 162 students (84 females and 77 males) from a suburban Denver middle school. There were 46 sixth graders, 25 seventh graders, and 91 eighth graders. Participants represented a variety of racial and ethnic groups. Table 1 contains the related proportions.

Data used to address the research questions were obtained from self-report questionnaires. Table 2 contains sample items used to measure perceived competence. Table 3 contains sample items used to measure attitudes regarding careers. In addition, using both intuitive-based constructs as well as factor analytic structures, we developed career clusters and clusters of reasons for not wanting certain jobs. Tables 4 and 5 contain individual elements from those clusters.

All variables are on a four-point scale, with scores ranging from 1 to 4. Greater values represent more positive self-perceptions or ratings that are more self-representative or more "true."

RESULTS

1. **What are students' career goals, particularly regarding math- and science-related careers?**

Middle school students showed a general lack of interest in the 25 career options with which we provided them. Only a minority of careers obtained mean ratings greater than the 2.50 midpoint of the scale (9 for girls and 7 for boys). The two most highly rated occupations for girls were artist/musician/actor and lawyer (*M*s = 3.19, 3.02), and for boys were professional athlete and artist/musician/actor (*M*s = 3.39, 2.97).

We also investigated career preference and perceptions of ability to be successful at certain jobs using our five career clusters. See Figures 1 - 5. Of particular note are the different patterns of results for the Doctor/Veterinarian and Science-related clusters. Although boys' indicated a similar level of interest in both of these job clusters, girls greatly preferred the Doctor/Veterinarian careers over the Science-related careers ($t = 7.69$, $p < .001$). Moreover, girls were more confident that they would have the ability to be successful at Doctor/Veterinarian careers ($t =$

5.96, $p < .001$), while boys were more confident that they could succeed at Science-related careers, as opposed to Doctor/Veterinarian careers ($t = 3.47$, $p = .001$), and compared to girls ($t = 5.22$, $p < .001$).

2. **What are students' perceptions of what society thinks are appropriate careers for women and men?**

Overall, results indicate that students think society approves of a variety of career options for both females and males. However, in some instances students perceived differences in societal acceptance of career options. Figures 6 and 7 illustrate one example. Here girls and boys view society as equally accepting of Doctor/Veterinarian careers for females and males ($ts = 1.94$; .49, ns, respectively), but they rate society as less accepting of Science-related jobs for women than for men ($ts = 7.36$; 4.68, $ps < .001$).

3. **Are students' perceptions of their abilities related to their career goals?**

For all five career clusters, mean ratings for wanting jobs and for perceived ability to be successful at those jobs were highly related for both girls and boys. Table 6 contains the relevant correlations. In addition, Figure 8 illustrates the general relationship between these two variables for the Doctor/Veterinarian career cluster.

Relatedly, we analyzed whether or not participants' current perceptions of their science abilities were related to how much they wanted and their ability to be successful at certain jobs. Table 7 contains the relevant correlations for the Doctor/Veterinarian and Science-related career clusters. Interestingly, no relationship was found between the target variables for the Doctor/Veterinarian cluster. Indeed, girls' correlations were negative, although not statistically significant. However, for the Science-related cluster, both girls' and boys' perceived science ability was positively related to how much they wanted Science-related careers and how likely they thought it would be that they would have the requisite skills to succeed at those jobs. Even here, though, girls' correlations were small, suggesting somewhat weak relationships between variables.

4. **Are rejected career options related to (a) particular reasons for <u>not</u> wanting certain jobs or (b) preoccupation with balancing career and family?**

Means for reason clusters were obtained for students who wrote in at least <u>one</u>

of the careers from a particular career cluster on a list of three jobs they would least like to have. Girls rejecting Science-related and Male Sex-typed careers endorsed the Negative Consequences for Gender cluster more highly than did girls rejecting Doctor/Veterinarian and Female Sex-typed careers. Boys, on the other hand, did not greatly differentiate between the Doctor/Veterinarian and Science-related career clusters in regard to Negative Consequences for Gender. See Figure 9.

Finally, girls who highly endorsed items indicating how much they think or worry about balancing career and family were also more likely to highly endorse reasons for not wanting jobs in the Family and Negative Consequences for Gender clusters than were girls who were not preoccupied with thoughts of balancing career and family (t_{Family} = 1.76, p = .085; t_{Gender} = 2.97, p = .004). See Figure 10. No relationships were found between reason clusters and balancing job and family items for boys.

CONCLUSIONS

Results clearly indicate that although girls and boys believe society accepts multiple career options for women and men, their own career aspirations remain fairly sex-typed. Of particular interest are the results associated with the two career clusters that require math and science training, Doctor/Veterinarian and Science-related Jobs. First of all, girls definitely prefer the former careers over the latter, for themselves. Second, girls see themselves as having the ability to succeed at Doctor/Veterinarian jobs but not Science-related jobs, while boys show the reverse pattern. Third, neither girls nor boys see a relationship between their science abilities and their ability to succeed at Doctor/Veterinarian careers, although they do see some relationship between these variables for Science-related careers.

Taken together, the findings discussed here suggest that girls and boys may not be aware of the math and science skills necessary for being either a Doctor or Veterinarian. Instead, it may be the case that girls and boys associate these occupations primarily with nurturing and caretaking skills. Thus, on the one hand, girls may see these careers as more self-relevant than careers like Engineering and Computer Science, for which they may think they do not have the needed skills. On

the other hand, boys may not think that they have the requisite nurturing skills to be successful as Doctors or Veterinarians, but think that they do have the necessary skills to succeed at other Science-related occupations.

The Doctor/Veterinarian and Science-related Jobs distinction was also relevant for understanding why girls do not want certain jobs. We have already speculated on reasons related to ability. In addition, girls indicated that they anticipate negative consequences related to their gender if they choose to pursue Science-related but not Doctor/Veterinarian careers.

Finally, girls' data, but not boys', indicate a relationship between how much girls worry and think about balancing career and family and reasons why they do not want certain jobs, particularly reasons having to do with family pressures and negative consequences for their gender. Thus girls' concern about balancing multiple adult roles appears to be impacting their career planning by limiting what career options they consider. Relatedly, career- and family-related roles do not seem as compatible for girls as they do for boys. Furthermore, it seems that career plans may be a lower priority than family plans for girls, especially if they see potential conflicts between particular job options and their family role requirements.

This research suggests that there is still much work to be done to support girls' pursuit of non-traditional career options, particularly those that they seem to view as more "purely" science-oriented. In addition, both girls and boys appear to need more information about the requirements of particular career options as well as additional encouragement to consider the rewards of a variety of types of work. Given that these young people represent a significant portion of our future work force, it seems that these issues deserve increased attention from researchers, educators, politicians, and others.

REFERENCES

American Association of University Women (1992). How schools shortchange girls. Washington, DC: Author and National Education Association.

Eccles, J. S. (1989). Bringing young women to math and science. In M. Crawford & M. Gentry (Eds.), Gender and thought: Psychological perspectives (pp. 36-58). New York: Springer-Verlag.

Sadker, M., & Sadker, D. (1994). Failing at fairness: How America's schools cheat girls. New York: Charles Scribner's Sons.

Table 1
Ethnic Distribution of Sample

ETHNICITY	PROPORTION
European American	.40
African American	.26
Multiracial/Multiethnic	.15
Mexican American/Hispanic	.10
Asian American	.07
American Indian	.02

Table 2
Items used to Measure Perceived Competence

Very True For Me	Sort of True For Me				Sort of True For Me	Very True For Me
☐	☐	Some kids are good at science	BUT	Other kids have a *hard time* with science	☐	☐
☐	☐	Some kids have *trouble* doing science assignments	BUT	Other kids do *well* on their science assignments.	☐	☐

Table 3
Items used to Measure Attitudes Regarding Careers

1. If you could be anything you wanted to be, how much would you <u>like</u> to have each of these occupations?

I would REALLY LIKE to be a ____ .	I would KIND OF LIKE to be a ____ .	I would NOT LIKE being a ____ .	I would HATE being a ____ .

2. Do you feel that you have the <u>skills</u> and <u>abilities</u> needed to be successful at these occupations?

I'm VERY SURE I WILL have abilities.	I'm PRETTY SURE I WILL have abilities.	I'm NOT THAT SURE I WILL have abilities.	I'm SURE I WON'T have abilities.

3/4. What occupations does society think are OK for <u>women/men</u> to be?

In our society it's PERFECTLY FINE for a woman/man to be a _____ .	In our society it's SORT OF OK for a woman/man to be a _____ .	In our society it's NOT OK for a woman/man to be a _____ .	In our society a woman/man really should NOT be a _____ .

Table 4
Career Clusters

FEMALE SEX-TYPED
α = .75
Child care worker
Hair stylist
Nurse
Social worker
Teacher

DOCTOR/VETERINARIAN
α = .37
Doctor
Veterinarian

NON-SEX-TYPED
α = .63
Artist/musician/actor
Business manager
Lawyer
Writer/journalist

MALE SEX-TYPED
α = .56
Airline pilot
Construction worker
Professional athlete
Professor

SCIENCE RELATED
α = .72
Chemist/physicist
Computer scientist
Engineer
Natural scientist/
environmentalist/biologist

Table 5
Clusters of Reasons for NOT Wanting Certain Jobs

ABILITY
α = .71
* I don't think I have the abilities it takes for these jobs.
* The work is too hard and the hours are too long.
* I would feel like a phony, pretending to be good at something, and they might find out.
* I'd worry about looking stupid on the job.

NEGATIVE CONSEQUENCES FOR GENDER
α = .93 (women); α = .88 (men)
* I would feel less feminine (masculine) in these jobs.
* Other people on the job might not accept or support me, as a woman (man).
* It would be hard to get to the top in these jobs as a woman (man).
* I would feel like I wasn't as good as the men (women) on these jobs.

FAMILY
α = .76
* I wouldn't be able to have a family too.
* If I did have a family, I would feel guilty that I wasn't spending enough time with them.
* Having a job and family would be too stressful.
* I would feel selfish, like I don't deserve to do something that I really want to do.

BORED
α = .72
* I would be bored doing these jobs.
* Doing this job wouldn't be exciting or adventurous enough for me.
* I couldn't be as creative or artistic as I'd like to be.
* I wouldn't be making a contribution to society.

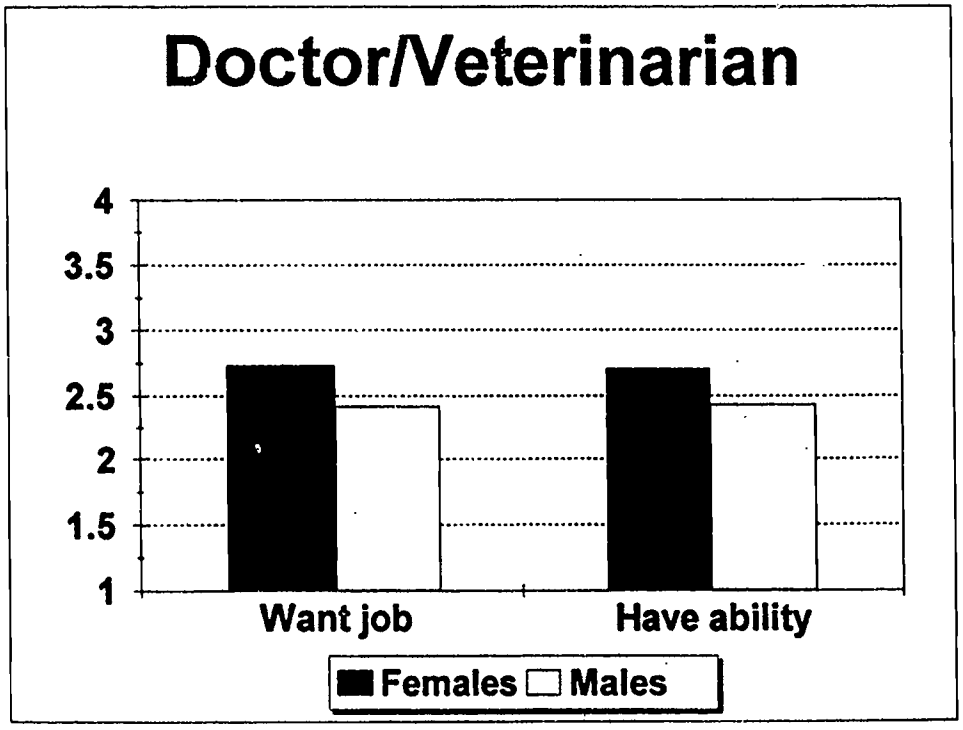
Table 6
Relationship between Wanting Jobs and Perceived Ability to be Successful at those Jobs

CAREER CLUSTER	FEMALES	MALES
Female sex-typed	.56	.50
Male sex-typed	.57	.66
Doctor/Veterinarian	.70	.61
Science related	.59	.62
Non-sex-typed	.78	.70

Table 7
Current Perceptions of Science Abilities an Wanting Jobs, and Ability to be Successful at those Jobs

	FEMALES	MALES
DOCTOR/VETERINARIAN		
r: Science and Want job	-.17 (ns)	.22 (ns)
r: Science and Ability	-.09 (ns)	.22 (ns)
SCIENCE RELATED		
r: Science and Want job	.24	.36
r: Science and Ability	.25	.46

Figure 1



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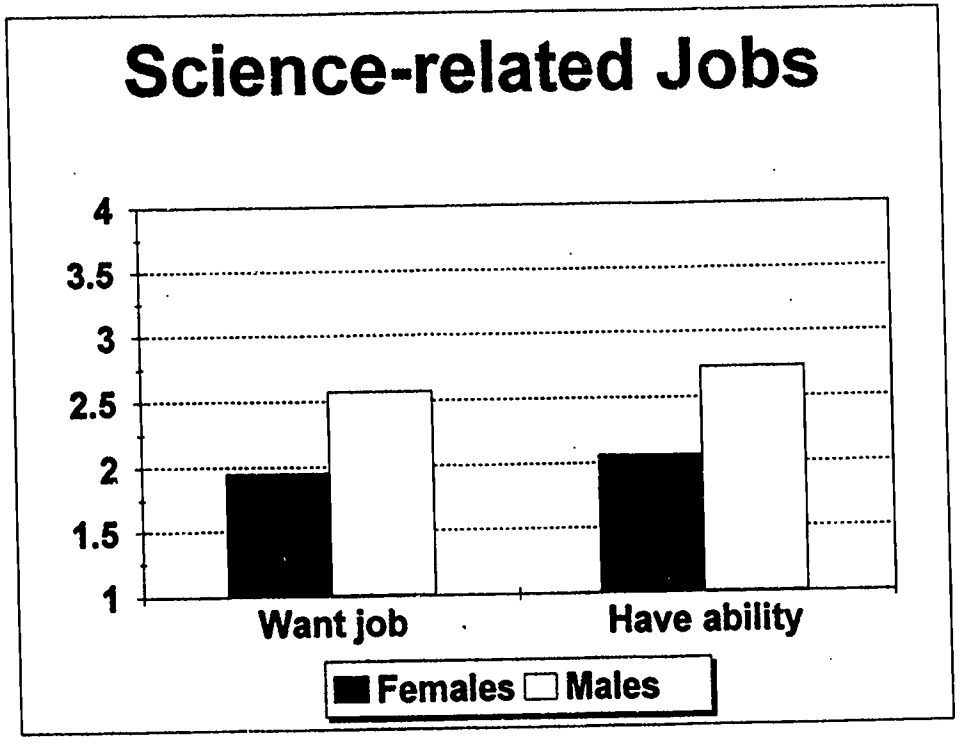

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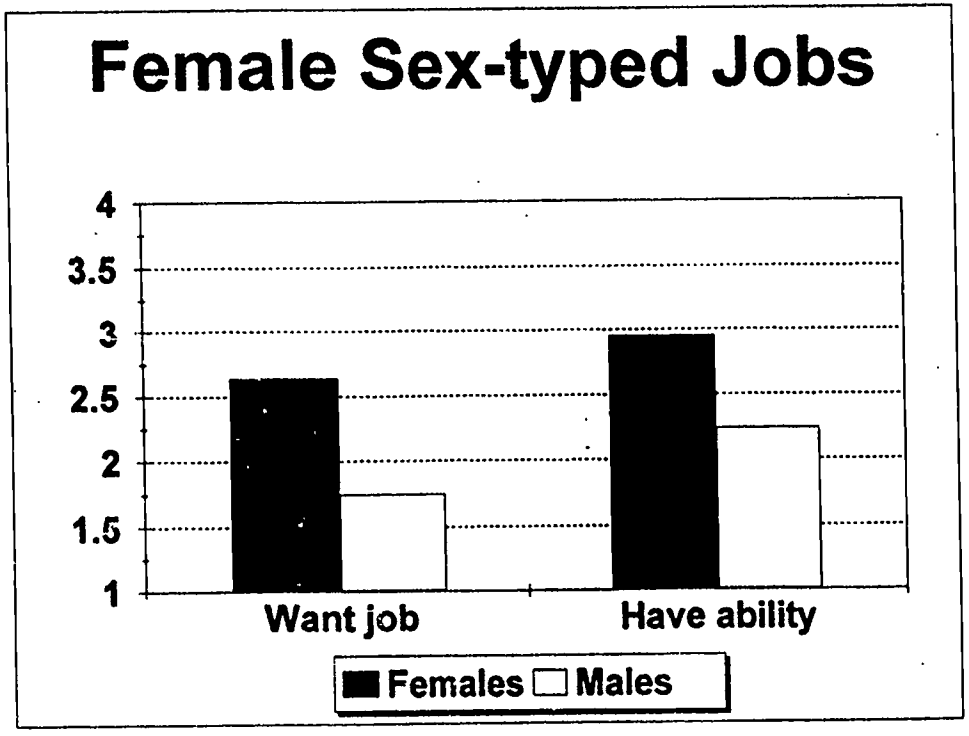

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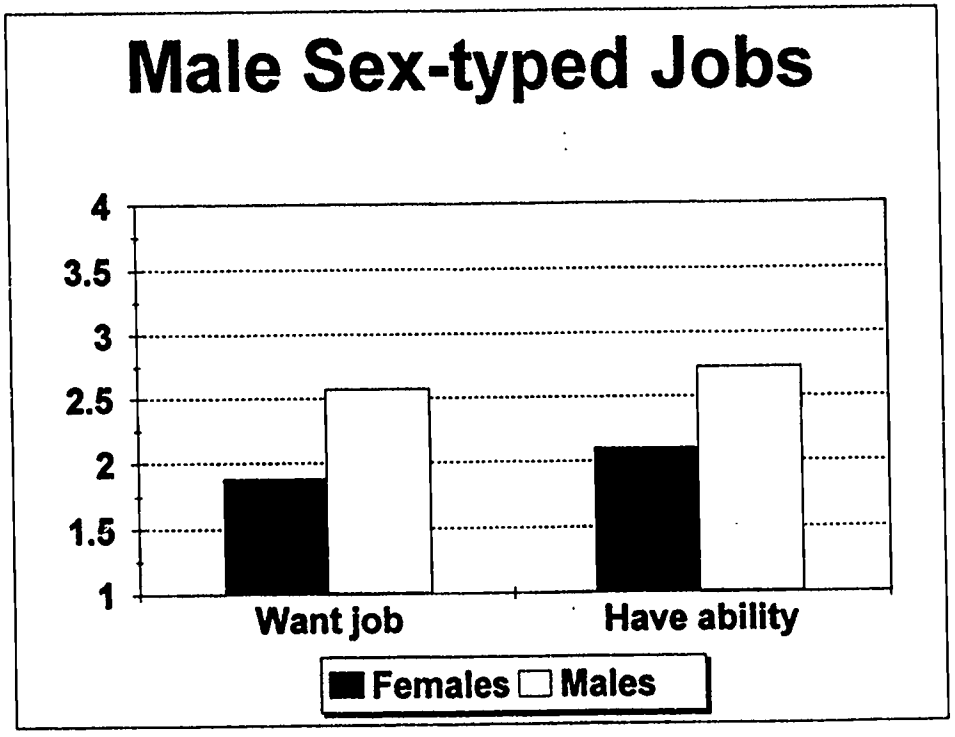

Figure 5

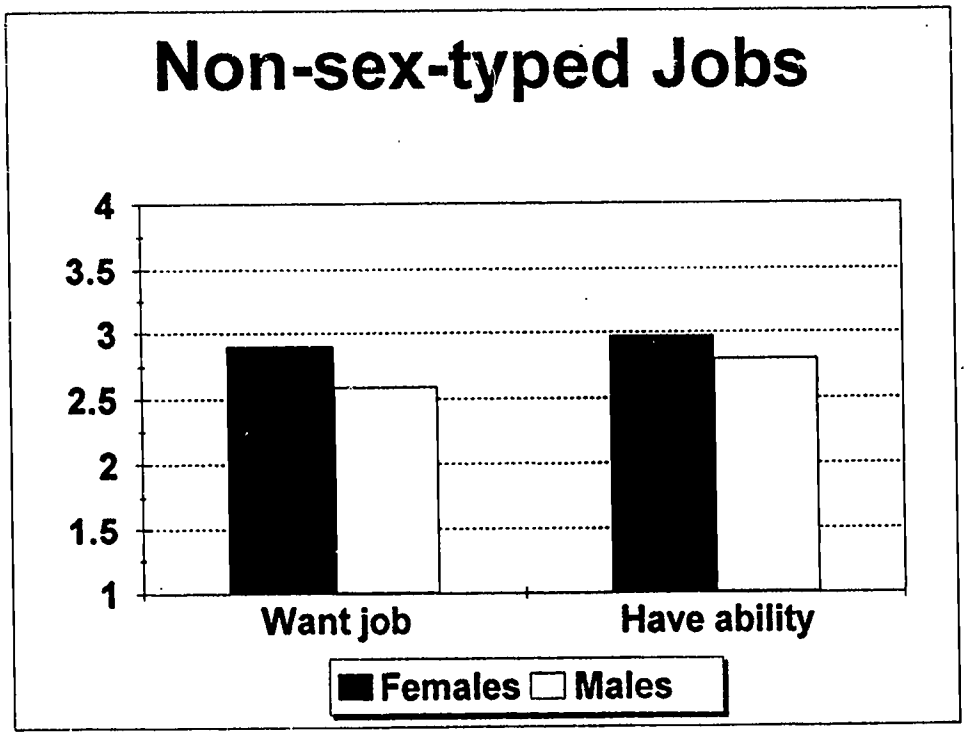

Figure 6

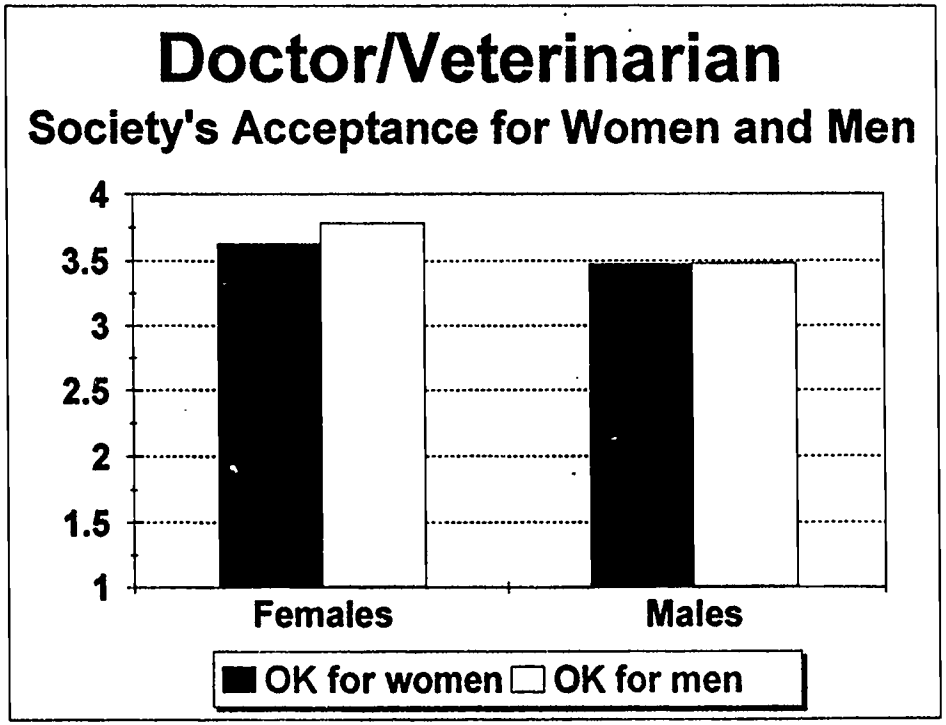

Figure 7

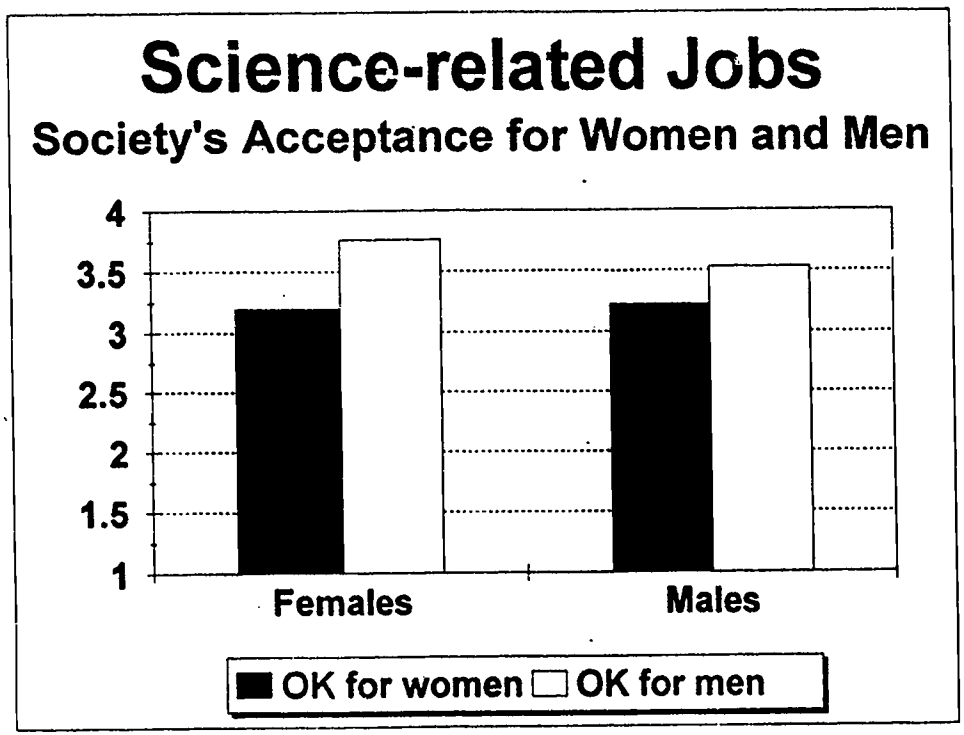

Figure 8

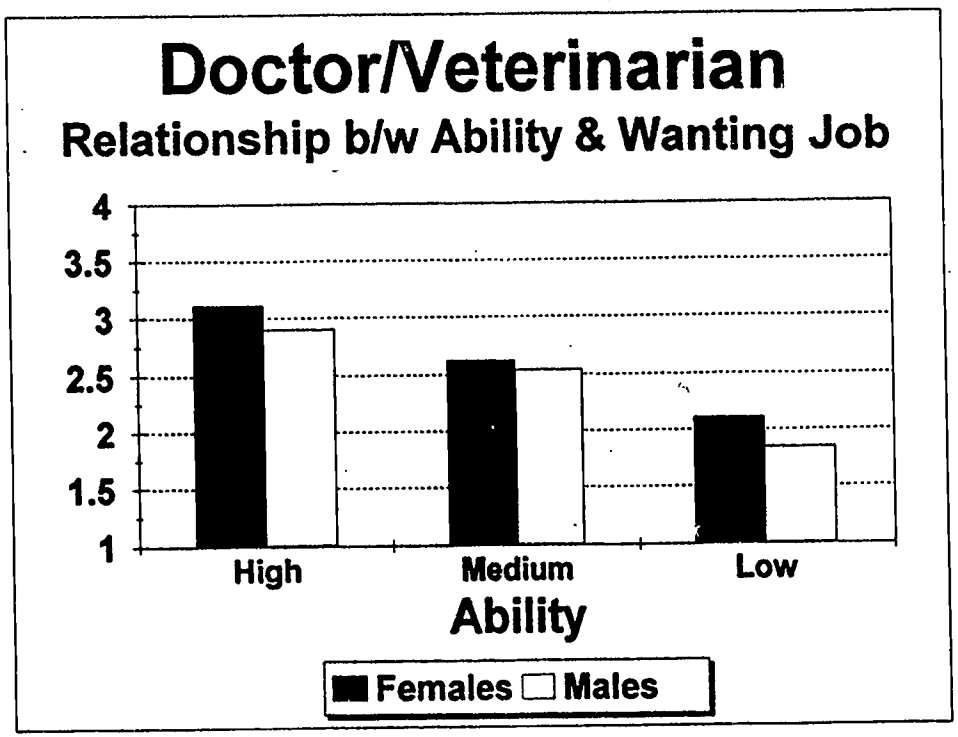

Figure 9

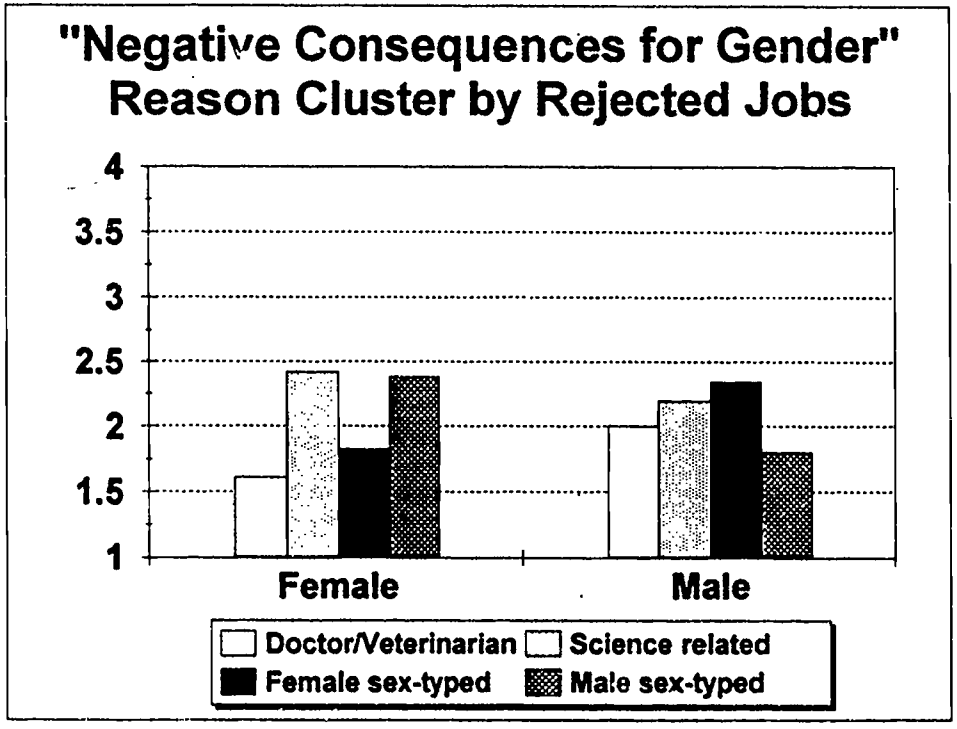

Figure 10