The Dearth of women in Science: natural difference or gender bias and societal pressure?

Hannah Schultz
Department of Psychology
University of Cape Town

Supervisor: Lauren Wild

Abstract

It is well established that there are unequal numbers of men and women in the hard sciences. Some argue that this is due to innate differences in male and female ways of thinking. Men tend to view problems in terms of systems, and therefore have higher Systemizing Quotient scores than women. Women tend to view problems in terms of other people and therefore have higher Empathising Quotient scores than men. Other researchers argue that this view ignores the huge role that society plays in prejudicing women against Science. The role that women are expected to play in raising children and looking after families clashes with the demands of a scientific career. This study sort to examine why mathematically competent women choose not to do science. Twenty three female participants who were mathematically competent but who had chosen not to do hard science were selected. An Empathising/ Systemising Quotient test was administered, as was a career interest questionnaire. It was found that humanities students who are mathematically competent do not have a higher than average EQ or lower than average SQ to explain their study choice. There was a significant difference between the EQ scores of those who had a family and friends orientation in future career decisions and those who had a success orientation. EQ was correlated with family orientation and there was a significant difference in the EQ scores of those with a family and friends orientation and those with a success orientation. This suggests that the long hours involved in building a scientific career may out off women who plan to have children. Further research should be run using a sample of female students who are in the "hard" sciences.

List of keywords: SQ, EQ, gender-schemas, gender, science, discrimination, careers.

Introduction

As women become well represented in most fields of academia, it has become clear that they are not well represented in the "hard" sciences such as physics and mathematics and in applied sciences such as engineering. This study explored some of the reasons why the numbers of women and men are not equal in science. One explanation for this trend is that men and women think in different ways and so have different abilities and interests, and that this is biologically based. The biological basis for the gender composition in the sciences makes it misguided to think that an equal representation of men and women in science is possible. Another explanation is that the gender ratio in science is a result of societal pressures rather than biological causes. Those who study gender biases argues that society shapes female interest in science as a career, and the roles that women are expected to play in society clash with the role of the scientist. This research specifically focuses on the sciences of maths, physics and chemistry and the applied science of engineering.

Career choice data suggest that women are less interested in science than men. Women who do well on maths measures in adolescence are more likely than their male counterparts to study and pursue a career in something other than a hard science (Kimura, 2007). In a longitudinal (20-year) study of the top one% of mathematically gifted 11-14 year olds of the 1980 year, both the male and female cohorts were likely to get a degree and then a postgraduate degree. The difference was that men were more likely to get a degree in organic sciences and engineering, whereas female participants chose medicine, organic sciences and the humanities. Men valued careers more than females did, were willing to work longer hours and received higher salaries. Women considered friendships, family relationships and having children more important than males (Benbow, Lubinski, & Eftekhari-Sanjani, 2002).

Male and female ways of thinking

There is evidence that male and female brains differ on a number of counts. Male brains are bigger than female brains(Solms & Turnball, 2006). This difference is found in monkeys (Franklin, Kraemer, Shelton, Baker, Kalin, & Uno, 2000), but does not cause differences in cognitive functioning (Solms & Turnball, 2006). More important to differences in cognitive functioning is the hemispheric asymmetry between the female brain and the male brain. The two hemispheres work closer together in the female brain than the male brain. Thus the female brain is less laterally specialized (Solms & Turnball, 2006). This difference is cited as the reason women perform better on language proficiency tests than men (Solms & Turnball, 2006). Women show better performance in verbal fluency, perceptual efficiency, delayed verbal memory and computation than men do (Zilmer, Spiers, & Culbertson, 2001). Men are better at visio-spatial tasks (Solms & Turnball, 2006)

such as mental rotation, spatial perception, mathematical aptitude, map reading and geographical knowledge than women. Sex differences in visio-spatial skills emerge after participants are 13 years, and grow larger as the age of the participants increase (Zilmer, Spiers, & Culbertson, 2001). The sex difference in performance on visio-spatial tasks is established and generally accepted (Rilea, 2008).

Baron-Cohen (2003) uses the established differences in the male and female brain to argue that gendered styles of thinking provide a rationale for the difference between the representation of men and women in the sciences. He argues that women tend to be *empathizers* (trying to understand the thoughts and affect of others and to respond to them appropriately) and men tend to be *systemizers* (analyzing, trying to discover rules governing processes), and that this tendency is genetically based. Empathizers make sense of the world in a social way and systemisers make sense of the world in terms of seeing input, process and output. (Billington, Baron-Cohen, & Wheelwright, 2007). Evidence for the women as *empathizers* theory can be found in the fact that women tend to have higher EQ (Empathizing Quotient) scores than men (Wakabayashi et al 2007) and value cooperation, communication and emotional involvement more than men do. In laboratory tests, girls get significantly higher empathy, emotional expressiveness, and insight scores than boys do (Roberts & Strayer, 1996), although Spelke (2005) critiques the methodology of some of these studies. Female medical students also get higher empathy scores than male medical students (Hajat et al, 2002). Evidence for the male as systemizer theory can be found in the fact that boys tend to engage in mechanical play and the maths and science professions are dominated by men, who are better able to judge, build and copy systems, than women are. Men also score higher on the Systemizing Quotient than women do (Baron-Cohen, 2003; Wakabayashi et al 2007).

According to Baron-Cohen's (2003) theory, we cannot expect sex ratios in "hard sciences" to be equal. Fewer women than men will be drawn to such studies, because there is very little room for empathizing in the sciences, and they require high systemizing skills (Baron-Cohen, 2007). A study of 351 students from Belgium confirmed that males show high systemizing scores and females high empathizing scores and that these scores were correlated with study choice. A large proportion of humanities students were female, and a large proportion of students in science were male (Focquaert, Steven, Wolford, Colden, & Gazzaniga, 2007). The trend for humanities students to be empathizers and science students to be systemizers has been confirmed in other studies (Billington, Baron-Cohen, Wheelwright, 2007). If students are encouraged to choose a career on the basis of expressed preferences, there will be a male students will choose maths and science (Lubinski & Benbow, 1992), while female students will choose the life sciences and medicine, (Lubinski & Benbow, 2007).

The male tendency to systemize may mean that men simply do better than women on tasks

related to science. Men do better than women on mental rotation, spatial and mechanical reasoning tasks, which are important elements to success in science. At the top tail of the maths reasoning tests, men tend to outperform women. These cognitive sex differences are influenced by fluctuation of hormones, are found early in life, are consistent across cultures, are uninfluenced by systematic training, have not changed over the last 30 years and are parallel to differences in non-humans (Males also do better than females on the Scholastic Aptitude test)(Kimura, 2007). The key argument is that these differences are innate and related to study choice (Kimura, 2007).Spatial ability has been found to be an indicator of promise in maths and science (Webb, Lubinsk,i & Benbow, 2007).

This view of cognitive sex difference does not stand unopposed in the field. Newcombe (2007) analyzed sex differences and performance in spatial reasoning and showed that female poor performance is not innate since spatial reasoning ability can be vastly and easily improved. This shows that spatial ability need not be a barrier for women in science (Newcombe, 2007). Spelke (2005) argues that most infant studies do not show that male infants are more attracted to objects than female infants, and female infants are more attracted to people. She argues that the cognitive differences between men and women are small, and are centred on different strategies to solve problems. Men and women have the same ratings on tests of core scientific competencies (Spelke, 2005). The gender similarities hypothesis states that men and women are quite similar in most areas, with the exception of gross motor skills, aggression and attitudes about sexuality. None of these areas of difference affect ability to become scientists. Claims about gender differences have been over-inflated (Hyde, 2005).

Gender bias and societal pressure in science

Many authors argue that the social pressure is a more serious barrier to women entering science than their innate abilities. They argue that women are socialized to prefer to prefer gender-appropriate professions. Valian (2007) argues that women are affected by negative gender schemas. She defines schemas as: "hypotheses used to interpret social events" (Valian, 2007, p32). Gender schemas are commonly accepted ideas about what it means to be a man or a woman, which may have a basis in reality. In the scientific field, gender schemas become problematic, because they cause us to rate men and women differently. Men are seen as being more competent and women as less competent. The standards by which people are judged change according to preconceived biases (Valian, 2007). Fields such as engineering have been constructed as part of the masculine identity but not as part of the feminine identity (Stonyer, 2001).Men are more likely to identify with mathematical and scientific fields than women. Women are more likely to identify maths as being male and therefore foreign to them (Nosek, Banaji, &Greenwald, 2002).

Spelke and Grace (2007) argue that the socialization of women against science starts at a very young age. Parents are more likely to think that their sons are mathematically gifted than their daughters. This theory has been strengthened in a study on family influence on academic achievement (Tenenbaum & Leaper, 2003). Even though the teenagers obtained the same marks, parents of girls believed their children found science difficult and were less secure in the subject than did the parents of boys. Moreover, parental beliefs about their children's scientific abilities were positively correlated with the views of their children. This is evidence that parental beliefs about ability affects girls' performance in science and parental beliefs are in turn affected by gender schemas, or society's idea of how women should be (Tenenbaum & Leaper, 2003). In a study of 914 grade nine students, it was found that parent's perception of the abilities of their children influenced the students (Frome & Eccles, 1998). A Botswanian survey of engineering students confirmed that community and parental expectations had a major influence on the study choice of the students (Baryeh, Squire, & Mogotsi, 2001).

When a female student manages to enter undergraduate science, Spencer, Steele and Quinn (1999) argue that she is aware of gender stereotypes and so is at risk from stereotype threat (being in a situation where one may be negatively judged on the basis of group membership) . If a test is reported as being sensitive to gender difference, women do worse on it than they do if gender is not mentioned. Thus gender stereotype is a significant threat to maths performance, especially if the task challenges the participant's ability (Spencer, Steele ,& Quinn, 1999).). One of the reasons that girls and women perform badly in mathematics is because they are negatively effected by stereotypes held by society about women's mathematical performance (Good, Aronson, & Harder, 2008) Female students who believe that their ability is a gift (rather than something malleable to be developed) are more vulnerable to negative stereotypes at a university level (Dweck, 2007). In a study of a calculus class, all the female students felt the presence of negative stereotypes. Those who dropped out or did badly were the ones who saw their ability as fixed (Dweck, 2007). Stereotype threat has been shown to influence female interest in science related tasks (Smith, Sansone, & White, 2007). Female students have been shown to perform badly on science-related tasks when they are in a minority, and this effects public and private performance (Inzlich &, Ben-Zeev, 2003). Reducing stereotype threat has been shown to improve student's performance (Good, Aronson, & Harder, 2008). In addition, self-efficacy is linked to persistence (Schaeffers, Epperson, & Nauta, 1997) and has been shown to correlate with performance in maths subjects in university (Nauta, Epperson, & Kahn, 1998).

The sciences are still regarded by the general public as being masculine, while the liberal arts are thought of as being feminine (Nosek, Banaji, & Greenwald, 2000). Tasks which society regards as typically female, such as raising a family, may also clash with determination to succeed

in science. This may deter girls from a career in science. Women may not have the time to work the hours required to succeed in a scientific career. Halpern (2007) argues that female students might foresee child-care duties and so choose careers that are more flexible than academia. Academics typically have to work very hard during childbearing years to become established (Halpern, 2007). In a longitudinal study, it was found that in a group people who had high achievement in high school, men spent more time on the careers and less time with their families than women did (Webb, Lubinski, & Benbow, 2002). High achieving graduate students typically had a 50 hour week (independent of class work) (Lubinski et al 2001). In addition, the determination to succeed and find opportunities in postgraduate scientific studies is at once both very important and seen as unfeminine (Lubinski, Pesson-Benbow, Shea, Eftekhari-Sanjani, Halvorson, 2001). In a study of expert performance, it was found that experts in the field devote a great deal of their lives to improving performance in a specific domain (Ericsson, Krampe, & Tesch-Romer, 1993). Female role-tasks clash with this deliberate practice. Belief in female role tasks may also help to explain the gender difference in earnings (Judge & Livingston, 2008).

Even if a woman decides to make science a career path, Spelke and Grace (2007) argue that they face bias. This bias was examined in a study with 238 academic members of the American Psychological Association, who were asked to judge the job qualification of male and female applicants. These applicants were given identical Curriculum Vitae. Both male and female respondents were more likely to offer male junior lecturer a job than the female junior lecturer and thought that he was better qualified (in terms of teaching and research). (Steinpreis, Anders, & Ritzke, 1999). In another study, it was found that female interns rated their research experience as worse than male interns did (Kardash, 2000).It is thus possible to argue that at the beginning of a science career, gender helps to predict future success.

The career path of women in science is affected by being in a stereotypically male job. In a series of three studies, Heilman, Wallen, Fuchs, and Tamkins (2004) investigated reactions of other academics to women in jobs that are stereotypically male. When there was ambiguity about a women's ability, she was viewed as being less competent than men, but equally likeable and less hostile. When she was clearly more competent, she was viewed as being equally competent but less likeable and more hostile. This hostility was limited to women who were in fields perceived to be masculine and being disliked was harmful to performance evaluation and chances of getting a raise or a promotion. It is interesting that female respondents reacted in the same way that male respondents did (Heilman, Wallen, Fuchs, &Tamkins, 2004). This study reinforces the idea that gender biases may affect the careers of women in science.

Many women choose not to do maths and science. One explanation for this is that, because men and women think in different ways, it is unrealistic to expect an equal representation of women

in the scientific endeavour. This is due to innate talent and interest differences between men and women. However even the most radical proponents of the difference in ability between men and women would hardly argue that there are no women who would be good at science. Numerous writers have shown that gender biases operate against women who have the ability and the interest to do science. This gender bias operates all through a scientific career. Perceptions about life pressures and the rigorous demands of a scientific career may scare many women away from science. There is place in the literature for further studies which examine how SQ and EQ, gender biases and career interest interact. None of the studies mentioned above have combined hypotheses of nature and nurture. The purpose of this study was to study a group of mathematically gifted girls who have chosen to study humanities and see how closely they are matched with the typical female empathizing profile. At the same time, the study will examine what they prioritize in terms of life choices.

Method

Specific Aims and Hypotheses

The study aimed to clarify why female students enrolled in humanities and degrees (and who are eligible to study science) did not enrol in a science degree. Some Commerce students studying Human Resources and science students studying biological sciences were included in the sample.

The study examined three hypotheses.

1. Humanities students who are mathematically competent have higher Empathising Quotients and lower Systemisng Quotients than the general female population, causing them to study humanities rather than the sciences.

2. There is a difference between the EQ and the SQ of students who prioritise friends and family in future career plans and students who prioritise success in future career plans. Students with high EQ scores are likely to prioritise friends and family than students with low EQ scores.

3. There is a correlation between EQ and SQ scores, faculty choice and what students prioritise in future career plans.

The study filled a gap in the literature because it combines two measures from two different theoretical points of view. It also studies female students with mathematical ability who choose not

to do science, when the opposite (female students who do science) are more often studied.

Design and Methodology

Participants.

Twenty Three undergraduate psychology students were selected as participants. In the initial sample, two students were excluded because their matric mathematics marks were not high enough to meet the criteria for selection. Three female undergraduate psychology students were subsequently recruited as participants. Criteria for selection were: Participants had to be female and have obtained the mathematics marks to have enabled them to enter the science faculty at UCT (a higher grade C or a standard grade A for maths and science). The surveys were administered over the internet using Zoomerang. Administration happened at UCT. This study was apart of the SPPS programme, and so it will one of many studies in which psychology students will have the option of participating. A C grade in Higher Grade Mathematics is a requirement for majoring in psychology, and so it was hypothesed that a number of students had the mathematics and science marks to enable them to major in science. The age of the students was between 18 and 25 years of age. More than half of the students were white. Seventeen of the students were registered in the humanities faculty. The rest were registered in the science faulty, doing biological sciences (not the "hard" sciences of physics or applied maths) and in the commerce faculty, studying Human Resources.

Materials

Revised Cambridge Personality Questionnaire.

The Revised Cambridge Personality Questionnaire measures a systemizing quotient and empathizing quotient. The Empathising Quotient measures how well participants relate to other people. The systemising Quotient measures the extent to which they perceive the world in terms of systems (Baron-Cohen, 2007).Validity has been shown by correlation with social behavior and interests(Nettle, 2007). Reliability has also been shown(Nettle, 2007) The empathizing and systemizing quotient test is easy to complete and score, has a forced choice format and is designed to avoid a response set. Each test has a maximum score of 80. The questions are randomized with 40 questions assessing EQ or SQ and twenty filler questions (See Appendix A). For the SQ, females have been found to have a mean of 24.1, (SD = 9.5) For the EQ, females have been found to have a mean of 47.7 (s.d.11) in a British population (Cohen, Richler, Bisarya, Gurunathan, & Wheelwright, 2003). It was administered as a web-based test. Other studies using the SQ-EQ include Lawrence, Shaw, Baker, Baron-Cohen and David (2004). No studies have been found using the SQ-EQ in a South African population.

Career interest.

For the purpose of this study a short questionnaire asking students about their career interests was developed. It focuses on the hypothesized career and family conflict and the career and other interest conflict that turns female students away from a career in science. The questionnaire is quantitative and consists of forced choice questions. The questions were based on the findings of the study by Benbow, Lubinski and Eftekhari-Sanjani (2002), specifically around the hypothesized female interest in family, marriage and friends rather than career. Participants could either show a friendship and family orientation in their future career ambitions or a success orienttion.

Procedure

Candidates signed up as part of the UCT psychology department's SRPP (Student research participation) programme (for the information sheet, see Appendix B). Students were required to go to s specific web address and complete the test in computer labs or from home. Participants were informed about the purpose of the study and given an informed consent form. They then did the 2 questionnaires, being instructed to complete them as quickly as possible (Baron-Coehn et al, 2004). They had a choice as to whether they participated in the study, and they were informed that any time they wished to stop they could. They were asked whether they wanted to give personal contact details for further participation in the study. Data was confidential, with only the researcher and her supervisor having access to personal information. Participants were recruited through an information board in the department of psychology. A short description of the study and a link to the study were put up on the first year psychology website (which first years are required to use fairly frequently), and the study was advertised in first year tutorials. In addition, the social networking site Facebook was used to inform potential participants about the study and ask them to participate in the study.

Results

Descriptive Statistics

An interesting result, was that far more of the students (16) thought it was important to include friends and family in their career goals than who had a success orientation (7). Another interesting observation is that there is a great deal of variation in the SQ scores, far more than in the EQ scores. Descriptive statistics are included in tables one and two.

Table 1:

Mean SQ and EQ by future career plans

	Success orientation	**SD**	**Friend and family orientation**	**SD**
Number	7.00		16.00	
Mean SQ	67.56	23.43	58.43	13.89
Mean EQ	51.13	9.23	43.86	13.89

Table 2:

Mean SQ and EQ by faulty

	Humanities	**SD**	**Sciences**	**SD**
Number	17		6	
Mean SQ	67.23529412	22.02705556	57.83333333	18.12640799
Mean EQ	47.88235294	10.06778497	51.83333333	9.453394452

Table 3:

Frequency of career choices and decisions

Variable	*Count*	*Cumulative*	*Percent*	*Cumulative*
1Friend and family orientation	16	16	69.56522	69.5652
2 Success orientation	7	23	30.43478	100.0000

T-test

Using at-test for a single mean, it was found that the mean SQ of the humanities (67.235) students were significantly greater than the established population mean (55.6), p=0.04. Using a t-test for a single mean, it was found that the average EQ of these humanities students (47.88) was not significantly higher than the established population mean (44.3). This finding contradicts the expected hypothesis.

An Analysis of Variance (ANOVA) test was carried out using the null hypothesis that there is no difference between the SQ and EQ scores of students who had a family and friends orientation (students who said that in their ideal job they would either have time for family and friends or be raising their children) and the EQ and SQ scores of 20 students who had a success orientation (who in their ideal job said that they would want to be absorbed in a fascinating career or would work hard to make it to the top). The assumptions were met, with a Levene's test for homogeneity of variance finding a p greater than 0.05. Both groups were also normally distributed. This test found a p smaller than 0.05 (p=0.042) and effect size (using Wilks test) of 0.73 for EQ. Thus the mean

EQ score of students who regarded family and friendship as important in future career was significantly higher than the mean EQ score of students who regarded success as important in future career plans. It is worth noting that most of the students (73 %) had a family and friends orientation.

Table 4:

ANOVA table testing the difference between EQ and SQ scores of students with family and friends orientated career goals and those with success orientated career goal, with a sample of 20.

	Degr. of – Freedom	***EQ - SS***	***EQ - MS***	***EQ - F***	***EQ – p***	***SQ - SS***	***SQ – MS***	***SQ - F***	***SQ – p***
Career	1	432.02	432.02	4.77	*0.04	256.27	256.27	0.5085	.484912
Error	18	1630.93	90.61			9070.53	503.92		
Total	19	2062.95				9326.8			

* $p \leq 0.05$

When the sample was enlarged by three students, an ANOVA test found an insignificant result (p smaller than 0.05). Thus this relationship can not yet be claimed to be stable.

Table 5:

ANOVA table testing the difference between the SQ and EQ of students with Family and friends orientated career goals and success orientated career goals, with sample of 23

	Degr. Of - Freedom	***EQ - SS***	***EQ – MS***	***EQ – F***	***EQ – p***	***SQ – SS***	***SQ - MS***	***SQ - F***	***SQ – p***
Career	1	257.219	257.29	2.87	.10	406.26	406.26	0.91	035
Error	21	1880.6	89.55			9391.65	447.22		
Total	22	2137.83				9797.91			

Correlation

The correlation between a high EQ score and a success orientation was r2= -0.45. This meant that there was a moderate correlation between scoring high on the EQ scale and wishing to have time for friends and family in a future career. Interestingly, the correlations between SQ scores and maths marks (r^2=-0.06), faculty choice (r^2=-0.2) and success orientation in future career (r2=-0.17) were low. Interestingly, the correlation between faculty choice and career orientation was not significant (r^2=.13)Friends and family orientation was scored as 1 and success orientation was scored as 2.

Table 6

Correlation between variables.

	Maths mark	***Faculty***	***EQ***	***SQ***	***ideal career***
Maths mark	1.00	.09	.09	-.06	.62
Faculty		1.00	.22	-.20	.13
EQ			1.00	-.15	-.46
SQ				1.00	-.17

Discussion

This sample of female humanities, commerce and students in the biological sciences students did not have higher than average Empathising Quotients or lower than average Systemising Quotients. Thus this is not an adequate explanation for why this mathematically competent group of students chose not to follow a career in science. Interestingly, a large proportion of the female students (69.5%) chose to prioritise family and friends in their careers rather than success. The relationship between the Empathising Quotient and having a friends and family orientation seems to be quite strong. The ANOVA test performed on the sample of twenty had a significant result (see table 4) . There was also a good correlation between EQ and friends and family orientation in future career (0.45). Thus EQ does seem to be an indicator of whether students are planning on choosing a career that can incorporate time for friends and family. EQ and Maths marks together seem to be strongly correlated to whether a student will prioritise friends and family or success in her career. Perhaps female students with high matric maths marks have already shown themselves to be robust in the face of social pressure that persuades women not to do maths (Spelke & Grace, 2007).

The main limitation in this study were the restricted sample size, thus all findings in this study would have to be confirmed by a larger study.. Thus for a bigger study, a different method of recruitment should be used (for instance targeting the first year maths class). It would also be interesting to examine whether such a sample is aware of stereotype threat (Spencer et al, 2007), and to obtain a more detailed understanding of their future career plans. A useful further study would be to give the same tests to a sample of female students who are in the hard sciences (i.e. physics or pure maths), and compare their results to this sample. This would the remove the confounding variable of mathematical ability and examine female students as opposed to students of both genders. Other studies have examined science and humanities students and so have suffered from the traditional gender biases in the two faculties (Focquaert et al, 2007).

The results of this study suggest that the concept of the Systemizing Quotient does not help to explain faculty choice or career priorities amongst mathematically competent female students. The argument that women are underrepresented in science, because they are not happy with systems (Baron-Cohen, 2007), is not born out by the data. This means that other explanations for why

mathematically competent women choose not to do science may be more correct. It may be that it is not inherent ability but the way women are socialised that causes them to move away from science. The concept of the Empathising Quotient may help to explain career choices. Mathematically gifted women may move away from careers in the hard sciences or applied mathematics because such careers are not easy to combine with friends and family. Perhaps it would be wise to take the blame away from women and ask why careers in science should not be compatible with raising a family.

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APPENDIX A

THE CAMBRIDGE BEHAVIOUR SCALE

Please fill in this information and then read the instructions below.

ALL INFORMATION REMAINS STRICTLY CONFIDENTIAL

Name:..... Sex:.....

Date of birth:..... Today's date:.....

How to fill out the questionnaire

Below are a list of statements. Please read each statement very carefully and rate how strongly you agree or disagree with it by ticking your answer. There are no right or wrong answers, or trick questions. **IN ORDER FOR THE SCALE TO BE VALID, YOU MUST ANSWER EVERY QUESTION.**

Examples

E1. I would be very upset if I couldn't listen to music every day.	strongly agree	(slightly agree)	slightly disagree	strongly disagree
E2. I prefer to speak to my friends on the phone rather than write letters to them.	strongly agree	slightly agree	slightly disagree	(strongly disagree)
E3. I have no desire to travel to different parts of the world.	(strongly agree)	slightly agree	slightly disagree	strongly disagree
E4. I prefer to read than to dance.	strongly agree	slightly agree	(slightly disagree)	strongly disagree

Strongly Agree

Slightly Agree

Slightly disagree

Strongly disagree

1. I can easily tell if someone else wants to enter a conversation.	strongly agree	slightly agree	slightly disagree	strongly disagree
2. I find it difficult to explain to others things that I understand easily, when they don't understand it first time.	strongly agree	slightly agree	slightly disagree	strongly disagree
3. I really enjoy caring for other people.	strongly agree	slightly agree	slightly disagree	strongly disagree
4. I find it hard to know what to do in a social situation.	strongly agree	slightly agree	slightly disagree	strongly disagree
5. People often tell me that I went too far in driving my point home in a discussion.	strongly agree	slightly agree	slightly disagree	strongly disagree
6. It doesn't bother me too much if I am late meeting a friend.	strongly agree	slightly agree	slightly disagree	strongly disagree
7. Friendships and relationships are just too difficult, so I tend not to bother with them.	strongly agree	slightly agree	slightly disagree	strongly disagree
8. I often find it difficult to judge if something is rude or polite.	strongly agree	slightly agree	slightly disagree	strongly disagree
9. In a conversation, I tend to focus on my own thoughts rather than on what my listener might be thinking.	strongly agree	slightly agree	slightly disagree	strongly disagree
10. When I was a child, I enjoyed cutting up worms to see what would happen.	strongly agree	slightly agree	slightly disagree	strongly disagree
11. I can pick up quickly if someone says one thing but means another.	strongly agree	slightly agree	slightly disagree	strongly disagree
12. It is hard for me to see why some things upset people so much.	strongly agree	slightly agree	slightly disagree	strongly disagree
13. I find it easy to put myself in somebody else's shoes.	strongly agree	slightly agree	slightly disagree	strongly disagree
14. I am good at predicting how someone will feel.	strongly agree	slightly agree	slightly disagree	strongly disagree

15. I am quick to spot when someone in a group is feeling awkward or uncomfortable.	strongly agree	slightly agree	slightly disagree	strongly disagree
16. If I say something that someone else is offended by, I think that that's their problem, not mine.	strongly agree	slightly agree	slightly disagree	strongly disagree
17. If anyone asked me if I liked their haircut, I would reply truthfully, even if I didn't like it.	strongly agree	slightly agree	slightly disagree	strongly disagree
18. I can't always see why someone should have felt offended by a remark.	strongly agree	slightly agree	slightly disagree	strongly disagree
19. Seeing people cry doesn't really upset me.	strongly agree	slightly agree	slightly disagree	strongly disagree
20. I am very blunt, which some people take to be rudeness, even though this is unintentional.	strongly agree	slightly agree	slightly disagree	strongly disagree
21. I don’t tend to find social situations confusing.	strongly agree	slightly agree	slightly disagree	strongly disagree
22. Other people tell me I am good at understanding how they are feeling and what they are thinking.	strongly agree	slightly agree	slightly disagree	strongly disagree
23. When I talk to people, I tend to talk about their experiences rather than my own.	strongly agree	slightly agree	slightly disagree	strongly disagree
24. It upsets me to see an animal in pain.	strongly agree	slightly agree	slightly disagree	strongly disagree
25. I am able to make decisions without being influenced by people's feelings.	strongly agree	slightly agree	slightly disagree	strongly disagree
26. I can easily tell if someone else is interested or bored with what I am saying.	strongly agree	slightly agree	slightly disagree	strongly disagree
27. I get upset if I see people suffering on news programmes.	strongly agree	slightly agree	slightly disagree	strongly disagree
28. Friends usually talk to me about their problems as they say that I am very understanding.	strongly agree	slightly agree	slightly disagree	strongly disagree
29. I can sense if I am intruding, even if the other person doesn't tell me.	strongly agree	slightly agree	slightly disagree	strongly disagree
30. People sometimes tell me that I have gone too far with teasing.	strongly agree	slightly agree	slightly disagree	strongly disagree

31. Other people often say that I am insensitive, though I don't always see why.	strongly agree	slightly agree	slightly disagree	strongly disagree
32. If I see a stranger in a group, I think that it is up to them to make an effort to join in.	strongly agree	slightly agree	slightly disagree	strongly disagree
33. I usually stay emotionally detached when watching a film.	strongly agree	slightly agree	slightly disagree	strongly disagree
34. I can tune into how someone else feels rapidly and intuitively.	strongly agree	slightly agree	slightly disagree	strongly disagree
35. I can easily work out what another person might want to talk about.	strongly agree	slightly agree	slightly disagree	strongly disagree
36. I can tell if someone is masking their true emotion.	strongly agree	slightly agree	slightly disagree	strongly disagree
37. I don't consciously work out the rules of social situations.	strongly agree	slightly agree	slightly disagree	strongly disagree
38. I am good at predicting what someone will do.	strongly agree	slightly agree	slightly disagree	strongly disagree
39. I tend to get emotionally involved with a friend's problems.	strongly agree	slightly agree	slightly disagree	strongly disagree
40. I can usually appreciate the other person's viewpoint, even if I don't agree with it.	strongly agree	slightly agree	slightly disagree	strongly disagree

Thank you for filling this questionnaire in.

Systemising Quotient

		strongly agree	slightly agree	slightly disagree	strongly disagree
1.	I find it very easy to use train timetables, even if this involves several connections.				
2.	I like music or book shops because they are clearly organised.				
3.	I would not enjoy organising events e.g. fundraising evenings, fetes, conferences.				
4.	When I read something, I always notice whether it is grammatically correct.				
5.	*I find myself categorising people into types (in my own mind).*				
6.	*I find it difficult to read and understand maps.*				
7.	When I look at a mountain, I think about how precisely it was formed.				
8.	I am not interested in the details of exchange rates, interest rates, stocks and shares.				
9.	If I were buying a car, I would want to obtain specific information about its engine capacity.				
10.	I find it difficult to learn how to programme video recorders.				
11.	When I like something I like to collect a lot of different examples of that type of object, so I can see how they differ from each other.				
12.	When I learn a language, I become intrigued by its grammatical rules.				
13.	I like to know how committees are structured in terms of who the different committee members represent or what their functions are.				
14.	If I had a collection (e.g. CDs, coins, stamps), it would be highly organised.				
15.	I find it difficult to understand instruction manuals for putting appliances together.				
16.	When I look at a building, I am curious about the precise way it was constructed.				

		strongly agree	slightly agree	slightly disagree	strongly disagree
17.	I am not interested in understanding how wireless communication works (e.g. mobile phones).				
18.	When travelling by train, I often wonder exactly how the rail networks are coordinated.				
19.	I enjoy looking through catalogues of products to see the details of each product and how it compares to others.				
20.	Whenever I run out of something at home, I always add it to a shopping list.				
21.	I know, with reasonable accuracy, how much money has come in and gone out of my bank account this month.				
22.	When I was young I did not enjoy collecting sets of things e.g. stickers, football cards etc.				
23.	I am interested in my family tree and in understanding how everyone is related to each other in the family.				
24.	When I learn about historical events, I do not focus on exact dates.				
25.	I find it easy to grasp exactly how odds work in betting.				
26.	I do not enjoy games that involve a high degree of strategy (e.g. chess, Risk, Games Workshop).				
27.	When I learn about a new category I like to go into detail to understand the small differences between different members of that category.				
28.	I do not find it distressing if people who live with me upset my routines.				
29.	When I look at an animal, I like to know the precise species it belongs to.				
30.	I can remember large amounts of information about a topic that interests me e.g. flags of the world, airline logos.				
31.	At home, I do not carefully file all important documents e.g. guarantees, insurance policies				
32.	I am fascinated by how machines work.				
33.	When I look at a piece of furniture, I do not notice the details of how it was constructed.				

		strongly agree	slightly agree	slightly disagree	strongly disagree
34.	I know very little about the different stages of the legislation process in my country.				
35.	I do not tend to watch science documentaries on television or read articles about science and nature.				
36.	If someone stops to ask me the way, I'd be able to give directions to any part of my home town.				
37.	When I look at a painting, I do not usually think about the technique involved in making it.				
38.	I prefer social interactions that are structured around a clear activity, e.g. a hobby.				
39.	I do not always check off receipts etc. against my bank statement.				
40.	I am not interested in how the government is organised into different ministries and departments.				
41.	I am interested in knowing the path a river takes from its source to the sea.				
42.	I have a large collection e.g. of books, CDs, videos etc.				
43.	If there was a problem with the electrical wiring in my home, I'd be able to fix it myself.				
44.	My clothes are not carefully organised into different types in my wardrobe.				
45.	I rarely read articles or webpages about new technology.				
46.	I can easily visualise how the motorways in my region link up.				
47.	When an election is being held, I am not interested in the results for each constituency.				
48.	I do not particularly enjoy learning about facts and figures in history.				
49.	I do not tend to remember people's birthdays (in terms of which day and month this falls).				
50.	When I am walking in the country, I am curious about how the various kinds of trees differ.				
51.	I find it difficult to understand information the bank sends me on different investment and saving systems.				
52.	If I were buying a camera, I would not look carefully into the quality of the lens.				

		strongly agree	slightly agree	slightly disagree	strongly disagree
53.	If I were buying a computer, I would want to know exact details about its hard drive capacity and processor speed.				
54.	I do not read legal documents very carefully.				
55.	When I get to the checkout at a supermarket I pack different categories of goods into separate bags.				
56.	I do not follow any particular system when I'm cleaning at home.				
57.	I do not enjoy in-depth political discussions.				
58.	I am not very meticulous when I carry out D.I.Y or home improvements.				
59.	I would not enjoy planning a business from scratch to completion.				
60.	If I were buying a stereo, I would want to know about its precise technical features.				
61.	I tend to keep things that other people might throw away, in case they might be useful for something in the future.				
62.	I avoid situations which I can not control.				
63.	I do not care to know the names of the plants I see.				
64.	When I hear the weather forecast, I am not very interested in the meteorological patterns.				
65.	It does not bother me if things in the house are not in their proper place.				
66.	In maths, I am intrigued by the rules and patterns governing numbers.				
67.	I find it difficult to learn my way around a new city.				
68.	I could list my favourite 10 books, recalling titles and authors' names from memory.				
69.	When I read the newspaper, I am drawn to tables of information, such as football league scores or stock market indices.				
70.	When I'm in a plane, I do not think about the aerodynamics.				
71.	I do not keep careful records of my household bills.				
72.	When I have a lot of shopping to do, I like to plan which shops I am going to visit and in what order.				

		strongly agree	slightly agree	slightly disagree	strongly disagree
73.	When I cook, I do not think about exactly how different methods and ingredients contribute to the final product.				
74.	When I listen to a piece of music, I always notice the way it's structured.				
75.	I could generate a list of my favourite 10 songs from memory, including the title and the artist's name who performed each song.				

Appendix B

Career Interest Section

After completing my studies I want to

a) Settle down and have a family
b) Travel for a bit, develop a career and then have a family
c) After traveling, develop a career and work and raise a family
d) Travel and then concentrate on my career

I chose the course I did because…

a) I am really interested in it and I thought that it could develop into a rewarding career that can be combined with raising a family
b) I thought it would become a lucrative and prestigious career
c) I am fascinated by the subject matter and I thought that I could develop a career as an academic
d) I wasn't really sure what I wanted to do

In my ideal job I would

a) have time for friends and family
b) work damn hard to make it to the top
c) be completely absorbed in a fascinating career
d) be raising my children

If you had to choose one thing that was most important to you in your future career it would it be…

a) friends and family
b) earning a lot of money in a prestigious career
c) becoming a renown academic
d) interacting with people on a meaningful level

While I'm at University I'm concentrating on…

a) my academics- I want to do brilliantly
b) my academics and my friends
c) doing part time work which will hopefully help me in the corporate world
d) Meeting new people and having an amazing time.