Psychological Androgyny and Non-stereotypical Educational Choice

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Abstract

This study was an investigation into the concept of psychological androgyny; its measurement, its antecedents, correlates and outcomes. The primary focus was on the hypothesised links between both androgyny and opposite sex role typing with non-stereotypical choice and achievement in higher education. The study considered whether there might be similar factors that influenced language choices by boys and science choices by girls.

Data on family background, personality, past educational experience and attainment and ability was collected from a sample of 158 undergraduates at a college of London university. This was collected via questionnaires, the androgyny questionnaire being adapted for the purpose. A small sub group took some ability tests.

A survey of past examination results at both 'O' and 'A' level was undertaken to examine the trend over time with regard to stereotypical and non-stereotypical choice and achievement. This established that girls were as capable of achieving in science subjects as boys, and likewise, boys were capable of achieving in languages. The problem was one of school subjects being part of a male or female stereotype, and the non take up of choice early on in the

educational system, and consequently there being progressively fewer entries at all stages.

The main statistical analyses of the data found there were gender differences in both the antecedents of and the outcomes of being androgynous. Significant factors were the occupation of the father, the influence of the mother on upbringing, and whether she was in paid employment or not, and perceived control over outcomes. For this sample, school type also had an effect. No link was found between androgyny and achievement.

There were no significant gender differences in achievement. Associations were found between masculinity and position in family and achievement. Grammar school education followed by comprehensive schooling at sixth form level predicted well for this sample.

There were no links found between androgyny and non-stereotypical choice, although masculinity and femininity independently had small effects. There were some similarities between male non-stereotypical choice and female non-stereotypical choice, these being a non conforming personality, support from the school, and delay in occupational decision making. Parental roles need further investigation.

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I. Introduction

Are sex differences in educational choices and achievement due to biological differences in ability, cultural conditioning, interaction between the two, or some other factor? It is still a fact, that in spite of some improvement, girls are still under represented in higher education in general and in science in particular. Much concern has been expressed about this, partly because there has been a shortage of scientists and technologists and an obvious neglected resource are those women who are either unemployed or wasting their talents in other occupations, and partly because of the influence of the women's movement.

The research in this area, however, addresses itself to the question of 'why do women not choose science?' The literature deals exhaustively with possible explanations starting with the premise of sex differences. The bulk of the evidence seems to suggest that any differences that do exist are small and insignificant, (Maccoby E.E & Jacklin C.N.,1975). These have formed the basis for a 'myth' that is absorbed into the cultural stereotype of men and women, which, either as Social Learning theorists believe, has

become magnified and reinforced through a process of shaping, modelling, and identification, or, as exponents of Cognitive-developmental theory suggest, (Kohlberg, 1966), more active sense is made of the environment, and "..imitation and reinforcement of sex-typed behaviour is actually **guided** by some form of internalised sex-role identity", (Hargreaves,D.J.,1986). The result is the same. Subjects such as science in general, physics in particular, have become part of the male stereotype and internalised.

It would seem therefore that any girl choosing to take science has enormous obstacles to overcome. Because of he Equal Opportunities and Sex Discrimination acts, (1976), these obstacles are less but they still exist. It is therefore an interesting question to consider whether there is anything special in the personality or experience of those few girls who do dare to be different and do choose science.

At one time male and female sex roles were seen as opposite poles of the same continuum. Now, the current thought is that they are separate and independent dimensions;one is not the antithesis of the other, (Constantinople, 1973). Any person of either biological sex can behave in a 'male' or a 'female' way. It has been

suggested that the person who has both sets of behaviours in his or her repertoire, is able to choose the behaviour that is most appropriate in a given situation, and is consequently a more flexible person, (Bem,S.L., 1975). Thus this concept, of psychological androgyny, seemed an appropriate one to consider in relation to educational choice and achievement in non-stereotypical areas.

This leads onto another interesting issue that seems to have been neglected during the lengthy debate about girls and science. There is evidence to show that not only are some subjects stereotypically 'masculine', but others are very much 'feminine'. Modern languages, particularly French and German, fall into this category.

With the approach of 1992, public interest and concern about deficiencies in European language skills of business people has grown. There has, however, been little concern about, and consequently very little research into the imbalance between the sexes of foreign language choice. The work of Powell and Littlewood, at Bath university is one of the exceptions.

Perhaps this is because there has been no general shortage of linguists until recently, or maybe careers related to modern languages are not so valued as scientific ones. It

could be that the idea of a man choosing what is seen as a feminine field is less socially desirable than a girl trespassing in a masculine domain. Brewer and Blum, (1979), suggested that no field was really 'feminine' because noone had suggested that boys could not achieve in those areas. On the basis of numbers however, it is clear that modern languages are 'feminine'. In any event,it seems useful to investigate whether there are similar or different reasons affecting choices in both these stereotypical fields.

What I intend to do in this research, therefore, is:

1. Briefly examine the data about sex differences in choice and achievement over a period of time at four levels of education, with particular reference to physics and French.

2. Survey the literature and attempt to form some conclusions as to why such sex differences do exist with the emphasis on non-stereotypical as opposed to stereotypical behaviour.

My primary interest is in the concept of psychological androgyny, its measurement, antecedents, and correlates,

both self reported traits and measured behaviour. I shall therefore:

3. Critically review existing measures of androgyny and adapt one of them for the purposes of this research.

4. Investigate, using a sample of undergraduate students, as choices are more polarised at that level than at school, the reasons for non-stereotypical choices and the relation if any to psychological androgyny.

As Eccles, 1986, remarked, "It is essential to understand the psychological meaning of the roads taken, as well as the roads not taken, if we are to understand men's and women's achievement related choices". This investigation is about that issue and the role played by psychological androgyny.

II. Gender Differences in Educational Choice and Achievement

I. Introduction

This chapter presents the problem to be explored in this thesis. It is not a new issue. In recent years it has received much attention, being one of the concerns taken up, not only by the Women's Movement, but by eminent educational researchers such as Eileen Byrne, (1978), Alison Kelly, (1984) and Helen Weinreich-Haste,(1979, 1981), to name a few who seem to be particularly concerned with two aspects of the debate:

(1) the poor representation of women in higher education and top jobs in general, and
(2) the reasons why girls do not choose science subjects at school, university and vocationally.

This second concern has given rise to views that school subjects have a gender; that is, some are seen as 'masculine', (mathematics, physics, chemistry), others as feminine, (French, English, religious studies), while others such as geography appear to be neutral, (Ormerod, 1975, Archer et al 1989, 1991)

My own interest, and this is part of the focus of this research, is not just the question of girls and science, but also the other side of the coin, boys and languages. It is possibly not of great national importance that fewer men are now choosing to study French at university than ten or even twenty years ago, although 1992 may bring a change. On the other hand, the shortage of scientists is vital not only to the country's economy, but also to defence. For this reason, attention has focussed here and the women who do not opt for science are an obvious target for recruitment.

Moreover, with the demographic changes that are leading to a preponderance of women in the working population, this issue will become even more important. From an academic point of view, however, the issue of boys and languages is just as interesting as that of girls and science, and it seems not unreasonable to assume that the same conditions might be producing the two trends.

What I propose to do in this chapter is examine the data that is available on gender differences in educational choice and attainment. I shall first take a brief look at the destinations of school leavers, both male and female, and see how these have changed in relative importance over the last 75 years. It will be interesting to note how

great an effect the pressure groups for change and legislation such as the Sex Discrimination and Equal Opportunities Acts have had.

Secondly, I will present in more detail the picture at 'O'level, 'A'level and at entry to university in both a general sense and as far as some selected subjects are concerned. I will then try and form some conclusions about what has been happening and why.

II. Destinations of School Leavers, 1911-1987

There are several difficulties when comparing trends over time, primarily because the data come from different sources and there are variations in the way the raw data are combined. There are also changes in the meanings of certain categories. Social changes such as making education compulsory, variations in the school leaving age, and differences in the content and style of examinations also make comparisons difficult. As 1987 was the last year before the introduction of GCSE, and subsequently the style of reporting examination results changed, this study looks only at choice and achievement upto 1987.

For example in Table 2.1, the figures for 1911, 1951 and 1981 are for England and Wales, while those for 1981 and 1987 are for England only. 'Employment' in 1911 appears to be everyone who did not continue with some kind of education. The 'Leavers' category, in most of the tables in this chapter, is a heterogeneous group of all school leavers, all ages, with varying qualifications.

Nevertheless, it is possible to pick out some trends:

1. Girls are better represented at university than they used to be. In 1987 the ratio of men to women was 1.4 to 1, compared with two to one in 1911.

2. In 1987, nearly 40% of female leavers who had at least 1 'A' level, compared with 48% of male leavers, intended going onto a degree course. To some extent this reflects the fact that the B.Ed has replaced the Certificate in Education. The ratio of men to women intending to study on degree courses in all institutions in 1987 was 1.3 to 1.

3. Women are still over-represented on Teaching courses, even more so than in 1911, though as a proportion of leavers, the numbers have fallen considerably. This is

true for men also, presumably because of the cut back in places at Colleges of Education.

4. Women have always been better represented in Further Education, and this is still the case, on both degree and non-degree courses. Moreover the relative proportion of women leavers choosing this option has increased considerably.

5. Compared with men, the relative proportion of women leavers choosing employment has also increased over the period from 38% of the total leavers in 1911 to 63% in 1988. As a percentage of female leavers, however, this was relatively fewer than in 1911, other options being preferred. We must bear in mind, however, that the 1911 employment figures were probably over-stated.

6. The entry to Higher Education usually depends on possessing the correct qualifications and the drop out rate at various points along the way determines who eventually gets there.

In 1987, 63460, that is 17% of all male leavers had 1 or more 'A' level passes, and 58,450, that is 17%, was the equivalent figure for female leavers. 48% of the male leavers with any 'A' levels at all intended to take a

degree course compared with only 40% of the female leavers. A greater percentage of male leavers with 'A' levels, (62%) obtained good 'A' levels, at least 3 at grade C or above, compared with 55% of females.

These figures would appear to indicate that women do still drop out of education at a higher rate than men. They also suggest that unless women have achieved well already, they are either less ambitious than men, or the people making the selection decisions are more favourably disposed towards men with lower grades than women.

Notes to Table 2.1: (see the following page)

1. 1911: Secondary Schools on the grant list, England and Wales. Employment includes apprentices, those at home, those who left for illness, and destinations unknown. Upto 1961, those who died or went abroad.

2. 1951: Maintained Secondary Schools, England and Wales, and Direct Grant Schools.

3. 1981 and 1987: Sample Survey figures, England only.

4 1981 and 1987*, degree courses

Table 2.1

Destinations of School Leavers 1911-1987

Destination		1911	1951	1981	1987
University	M	710	6640	26650 *	22480 *
degrees	F	360	2940	17750	16580
Poly/ F.E.	M			8190	7840
degrees	F			6380	6630
Teacher	M	1310	690	580	310
Training	F	3720	5260	2610	1590
Other F.E.	M	1250	5170	47620	62020
	F	1630	12410	88190	91620
Employment	M	20010	236080	291370	272590
/not known	F	12590	217910	244610	234330
Total all	M	23280	248580	374410	365240
leavers	F	18300	238510	359540	350750

F.E. = Further Education Poly = Polytechnic

Sources

Ministry of Education Reports,1956, 1961
University Grants Committee reports, 1951-52, 1961-62
Statistics of Education, vols. 2 and 6, 1971
Statistics of Education, School Leavers, 1981, 1987
University Statistics, volume 1, 1981-2, 1987-8

III. Interpreting the Data

Statistics about sex differences in educational choice and achievement can be presented in a variety of ways, some of them misleading, as shown below.

Achievement

This term is often used to denote success in obtaining a place on a course, (I prefer to use the term Choice, see below) rather than success in completing a course or passing an examination. The usual way a gender difference in such "achievement", or attainment, is presented is to give a simple ratio. For example, as we have already noted, in 1987, the proportion of men to women on degree courses was approximately 1.4 to 1. In my opinion, a more appropriate way of making comparisons, if one is concerned about 'achievement' in the sense of 'obtaining a place', is to take into account the size of the 'pool'. (see below)

The "Pool"

This is the number of males and females available at a given time to make a particular educational choice. This is usually the total number of leavers of either sex from the previous level or stage of education. Ideally, we should also take into account, as in (6) above, the

numbers who were actually qualified, but this information is not always easy to extract from the published statistics.

Preference

I shall use this term to denote the proportion of Entrants to Leavers (Pool) in any one year. The ratio of Male Preference to Female Preference is, I believe, a more accurate comparison than the simple ratios of achievement referred to above, particularly when the numbers of males and females available are very unequal. The figures for 1911 illustrate this point quite well. The ratio of men to women at university was approximately 2 to 1. If we take into account the number of school leavers of each sex who theoretically were qualified to go to university (an overstatement because not all would have matriculated), we find that male 'preference' is .03, and female 'preference' is .02. The ratio of these two figures is 1.5 to 1, probably a truer reflection of the position. This method of comparison also illustrates and takes into account the cumulative effect of "dropping out" at various stages.

Pass Rate

When 'Achievement' is used to denote success in passing a course, total male passing entries are often compared to

total female passing entries. This may also be misleading. A more appropriate statistic is the **'pass rate'** where passes are related to entries.

Choice

I shall use this term to denote either the total number of subject **entries**, or **entrants**, male or female, to a course or level of education, in any one year.

The importance of getting the definitions right becomes clearer if we consider one subject, as illustrated in table 2.2.

Table 2.2

'O' Level Latin, Summer 1981

	Male	Female
The pool:		
all 'O'level entries	1497459	1564162
Choice :		
total entries for Latin	12440	13125
Preference	.8	.8

Source:
Statistics of Education, School leavers, 1981.

We can see that although in that year there were more female entries in absolute terms, preference for Latin compared with other subjects was equal. Similarly, comparison of total passes for each sex would tell us only that more girls than boys passed. Knowing that the female pass-rate was 77.17 compared with the male rate of 74.35 is more informative.

Table 2.3 which follows on the next page, summarises the different ways of interpreting the data that will be used in this chapter.

Table 2.3

Choice and Achievement in Education

Terminology for interpreting the data

	Overall Choice	Subject Choice	Achievement
Pool: total available M & F	a) leavers in any one year	a) entrants	a) entrants M & F
	or	or	or
	b) leavers qualified for next stage	b) entries	b) entries M & F
Choice: who does what	a) no. M & F entrants/ entries and relative proportions	a) all entries for subject	
Preference	b)entrants M & F relative to pool M & F	b) entries relative to pool	
Achievement	a) all passing entries M & F proportions or	a) all passing entries per subject proportions M& F or	
	b)total M & F passing entries related to pool (pass rate) or	b) pass rates for subject or	
	c) M & F entrants with 1/2/3 passes or particular grades	c) no.M & F entrants with passes in subject	

M = males F = females no = number

IV. Gender Differences in Choice and Achievement at 'O' Level

The General Certificate of Education was introduced in 1951, and replaced by GCSE in 1988, so it seems appropriate to look at trends from 1951 until 1987. From table 2.4 it will be seen that ;

1.Throughout the period there were more male than female leavers, so the pool of boys was larger.

2. Until 1971, there was a larger number of male entries. Since 1981 there have been more female entries.

3. Female Preference has been greater than male preference since 1971, but has been increasing for both. In other words more boys and girls in relative terms want to take 'O' levels or other examinations, such as CSE, but the drop out rate for girls in 1987 was less than for the boys. In 1987, 28.1% of male leavers and 24.1% of female leavers did not attempt any 'O' level. 90.2% of boys and 92.6% of girls attempted some examination at this level.

4. The pass rate for girls was higher throughout the period, but the gap is narrowing. In 1987, 36.7% of the boys who attempted 'O' level obtained 4 or more passes grades A-C, compared with 36.2% of the girls.

5. What the figures conceal is that more girls obtained a smaller number of passes at 'O' level,(1-5), and slightly more boys obtained 6 or more passes. This meant therefore, that the pool for 'A' levels was marginally better for the boys.

Table 2.4

Choice and Achievement at 'O' level

Summer examinations, England & Wales

		1951	1961	1971	1981	1987
Pool	M	243455	312148	315330	374410	365240
Leavers	F	232972	300569	298090	359540	350750
(15-18)						
% not	M		69.6	57.9	44.0	28.1
entrg.	F		71.3	57.5	38.3	24.1
Total	M	398489	928197	1169011	1497459	*
Entries		(54)	(56)	(53)	(49)	
%	F	340228	719929	1054815	1564162	
		(46)	(44)	(47)	(51)	
Pass	M	54.8	55.6	57.8	57.8	56.8**
(A-C)	F	61.4	60.6	63.4	58.1	62.5

entrg. = entering M. = males F. = females

Notes to Table 2.4:
1. 1951 figures do not include Direct Grant Schools
2. 1981 and 1984, England only
3. * no figures for entries available
4. ** not strictly a pass rate for 1987, but the number of entrants, as a percentage of all entrants, who obtained a CSE grade 1 or any 'O' level grade A-C.

Sources:
Ministry of Education Reports,1956, 1961
University Grants Committee reports, 1951-52, 1961-62
Statistics of Education, vols. 2 and 6, 1971
Statistics of Education, School Leavers, 1981, 1988
University Statistics, volume 1, 1981-2, 1988-9

V. Gender Differences in Choice and Achievement at'A' level

Theoretically, the pool of people available to take a specific 'A' level, or course of 'A' levels are those who 2 years previously either obtained 4 or more 'O' levels - the average requirement for an 'A' level course- or obtained an 'O' level pass in a specific 'A' level, particularly in the case of sciences and languages. This information is not easy to obtain, therefore, the calculations that follow are based on total leavers for the academic year.

It will be seen from table 2.5 that:

1. There were more male than female entries throughout the period, but the female share increased from 31% in 1951 to 46% in 1981. In 1987 only figures for entrants were available.

2. In 1981, 19% of male leavers chose to take 'A'levels compared with 18% of female leavers. The comparable figures for 1987 were 19% for both.

3. The pass rate for girls was marginally better until 1971, but since then it has been slightly worse. In 1984 it was 70.59 for the boys, and 68.99 for the girls. The 1987 figures show the same trend, but are not strictly comparable. (see note 2 below)

4. More girls than boys obtained one or two 'A'levels, more boys than girls obtained three or more. This meant that the pool of candidates for higher education was likely to be biassed in favour of boys.

Table 2.5

Choice and Achievement at 'A' level

Summer Examinations, England and Wales

		1951	1961	1971	1981	1987
Pool	M	243455	312150	315330	374410	365240
Leavers	F	232972	300570	298090	359540	350750
Leavers	M		58930	85910	92940	96440
4+'0'1s	F		54080	83200	90660	96400
Total	M	71480	167959	275612	318646	
Entries		(69)	(79)	(60)	(54)	
(Rel.%)	F	32323	75816	181384	269603	
		(31)	(31)	(40)	(46)	
Leavers not entered (%)	M				303710 (81)	295400 (81)
	F				294710 (82)	285980 (81)
P. Rate (A-E)	M	73.3	67.8	67.3	68.2	90.9%*
	F	74.0	71.4	71.5	67.9	90.2%*
Entrants 1 pass	M		5180	11160	10410	10580
	F		5450	10670	11640	11090
2	M		7730	14830	14830	13500
	F		6140	14530	15810	15230
3	M		13210	23080	25720	25410
	F		7470	17720	22190	23200
4 or more	M		4300	7320	13220	13960
	F		1050	3280	7460	8930

Rel. = relative M. = males F. = females

Notes to table 2.5

1. 1981 and 1987, England only.
2. * 1987 pass rate calculated on entrants not entries, and reflects the % of entrants who obtained any 'A' levels

Source
Ministry of Education Reports,1956, 1961
University Grants Committee reports, 1951-52, 1961-62
Statistics of Education, vols. 2 and 6, 1971
Statistics of Education, School Leavers, 1981, 1987
University Statistics, volume 1, 1981-2, 1987-8

VI. Gender Differences in Choice and Achievement in Higher Education

At the beginning of this chapter we learned that women are better represented on degree courses than they used to be, and a higher proportion of female leavers carry on to higher education.

Table 2.6 shows the new entrants to undergraduate courses at U.K. universities over the period. In 1987, the share of new female entrants was 41%, a definite increase compared with the 26% in 1951. The figures for the share of women in the total university undergraduate population were very similar, being 44% and 23% for 1987 and 1951 respectively. There were no appropriate figures available to calculate preferences.

Table 2.6

New Undergraduate entrants to University

U.K. Domiciled

	1951[1]	1961[2]	1971[2]	1981[3]	1987[3]
M	15129	22150	45438	45233	32260
F	5348	8322	21907	30993	22795
M%	74	73	67	59	59
F%	26	27	33	44	41

Notes to table 2.6:
1. 1951 UK domiciled students going to universities in Great Britain.
2. 1961 and 1971 Students from home and overseas at UK universities
3. 1981 and 1987, UK domiciled students

Information about the achievement of men and women separately is not available for 1981 and 1987. Table 2.7, however, shows the situation in 1971. The figures for that year show that a greater percentage of male entrants were awarded first class degrees and a greater percentage of the female entrants were awarded lower seconds.

As the statistics on Universities are published separately from those on Schools, and as recently there have been changes in the publisher and the presentation, it has not been possible to do quite the same detailed analysis of the data.

Table 2.7
University Achievement UK 1971

			% Pool
Pool	M	36571	69
Total First Degrees	F	16118	31
Class 1	M	2769	7.6
	F	679	4.2
2.1	M	8194	22.4
	F	3946	24.5
2.2	M	10582	28.9
	F	5723	35.5
Class 2 not divided	M	2091	5.7
	F	539	3.3
Other hons.	M	4627	12.6
	F	1558	9.7
Pass/Ord.	M	8308	22.7
	F	3673	22.8

hons. = honours ord. = ordinary degree
Source
Statistics of Education, volume 6, Universities, 1971.

We noted at the beginning of this chapter (refer table 2.1), that in terms of absolute numbers, boys in 1987 were better represented at university, and in employment than girls. Girls dominated Teaching Courses, Polytechnics and Colleges of Further Education. Even when the numbers were adjusted to take into account 'preference' based on the number of school leavers, the picture still showed marked gender differences in the type of higher education chosen.

Table 2.8

Gender Differences in Choice of Higher Education

Intended destinations of leavers

		1911		1987	
		%	Pref.	%	Pref
Degrees	M	66	3.0	57	8.3
	F	34	2.0	43	6.6
Teacher	M	26	5.6	16	0.1
Training	F	74	20.0	84	0.4
Other	M	43	5.1	43	2.7
F.E.	F	57	8.9	57	3.8

F.E. = Further Education M. = males F. = females

Notes to table 2.8:

1. Preference is the number intending to make the choice as a percentage of all school leavers for the year.
2. In 1911, degrees meant university. In 1987, the figures included degrees at polytechnics and other institutions.

VII. Gender Differences in Specific Subject Choices

So far we have looked only at gender differences in the take up of education at different levels, and preferences for type of institution. There are also very marked gender

differences in patterns of subject choice, which is the primary focus of this study.

As already noted, school subjects can be said to have a gender. There are two ways of ascribing gender;(i) on the basis of preference (ii) on the basis of attitude or perception. Ormerod, (1975), used both methods and compared the perceptions of the boys and girls in his sample with preference figures based on male/female entries to the summer examinations in 1972. He found fair agreement between the two sets of results. Table 2.9 reproduces Ormerod's figures for 1972 together with those for 1984 and 1987.

Very little seems to have changed with regard to position on the spectrum although some preferences, notably chemistry and mathematics are weaker, and geography is slightly less neutral. English also appears to be less 'feminine', and French more 'feminine'. (n.b: all the figures in this table are based on simple proportions of male to female entries and do not take the size of the pool into account. Later more detailed examination of some specific subjects where this is taken into account will show that there are changes taking place.) The research of Archer et al,(1989, 1991), referred to later also confirms that perceptions are changing.

Table 2.9

Gender Spectrum of School Subjects

Subject	*Critical Ratio	1972	1984	1987	
			Gender		
Chemistry	9.3	70	58	57	Male
Physics	8.2	79	73	72	
Maths.	4.5	61	53	50	
Geography	0.6	55	57	58	Neutral
Music	0.4	36	32	45	
Biology	0.5	37	36	36	
History	1.0	48	49	50	
2nd F.L.	1.1	41	37	39	
Latin	1.5	49.7	49	46	
Art	2.5	43	43		
French	6.8	46	40	40	
English	7.1	43	45	50	Female

F.L. = foreign language

Note:
1. Figures for each year show the percentage of boys making the choice relative to the girls.

2. * critical ratio was that obtained in the Mann-Whitney U test and was used by Ormerod as an index of the magnitude of the difference in preference between the two sexes.

3. 1987: the figures include CSE attempts as well as 'O' level. Art is not reported separately, but included with music, drama and other visual arts. Latin means classics.
Source: Ormerod, M.B. (1975)

Kelly and Weinreich-Haste (1979), in "Science is for Girls", refer to two studies, one with a sample of undergraduates, the other with third and fourth year pupils from the A and B streams of single sex comprehensives, where they try to assess the 'image' of different subjects. They found that at school level, both boys and girls regarded physics, chemistry and maths as masculine. history and biology were regarded as masculine by the boys, but neutral by the girls, and French and English were seen as neutral by the boys and feminine by the girls. There were no significant differences in male/female perception at undergraduate level, scientific disciplines being seen as 'hard, intellect based, complex and masculine'.

A more recent study, Archer and Freedman (1989), confirmed the gender stereotypic perceptions of 'A' level subjects by students 16-20 years old. Ten subjects were regarded as significantly 'masculine' or 'feminine'. Among these, French was regarded as feminine and physics as masculine. A further study by Archer et al (1991), found that 10 year old children were less pronounced in their gender stereotyping of school subjects, but they too regarded physics as masculine. French was regarded as feminine, but not significantly so.

There does, therefore, seem to be general agreement that however assessed, sciences are "masculine" and languages are "feminine". I have chosen two subjects, French and physics, as representative of a feminine and masculine subject respectively, to illustrate gender differences in specific subject choice and achievement at different levels of education and over time.

VIII. Gender Differences at 'O' Level

Table 2.10 illustrates the position with respect to choice and achievement of French at 'O' Level. It can be seen that:

1. Until 1971 there were more male entries. Since then there have been more female entries. This trend appears to be continuing.

2. Preference for French was roughly equal in 1951, by 1961 had increased considerably for girls to 14.6% of the female entry, and then started to decline. The trend has been the same for the boys, but French continues to be less important. In 1984 (not shown) French was 3.9% of the male entry compared with the girls' 5.8%. The figures for 1987 are based on entrants and not entries, and include CSE. They are therefore distorted and make comparisons

with previous years difficult. They still, however, indicated a female preference for French.

3. The pass rate for girls has been consistently higher throughout the period, although the gap is narrowing.

Table 2.10
French 'O' level, Choice and Achievement
1951- 1987 England and Wales

		1951	1961	1971	1981	1987*
Pool 'O' entries	M	398489	928197	1169011	1497459	329310
	F	340228	719929	1054815	1564162	324860
French rel. %	M	41826 (53)	72569 (53)	66484 (46)	65945 (41)	95950 (40)
rel. %	F	36585 (47)	64104 (47)	76507 (54)	92620 (59)	146610 (60)
Preference: entries % pool	M	10.4	7.8	5.6	4.4	29.1
	F	10.7	14.6	7.2	6.1	45.1
P. Rate (A-C)	M	52.5	52.3	54.7	59.16	41.4
	F	64.5	63.2	64.8	61.85	43.5

rel. = relative M. = males F. = females

Notes: to table 2.10

1. 1981 and 1987, figures for England only.

2. *1987 figures are for entrants, not entries, and show the position with regard to 'O' level plus CSE. The pass rate is grade A-C or CSE 1.

Source:

Statistics of Education, School leavers, 1987.

The position with regard to physics at 'O' level is illustrated in table 2.11

Table 2.11
Physics 'O' Level, Choice and Achievement
1951-1987, England and Wales

		1951	1961	1971	1981	1987
Pool 'O' entries	M	398489	928197	1169011	1497459	329310
	F	340228	719929	1054815	1564162	324860
Physics rel. %	M	18819 (87)	60895 (85)	88429 (79)	131230 (74)	180390 (72)
rel. %	F	2729 (13)	10262 (15)	22553 (21)	45005 (26)	69630 (28)
Preference: entries % pool	M	4.7	6.5	7.5	8.7	54.8
	F	.8	2.3	3.3	2.8	21.4
P. Rate (A-C)	M	56.4	57.1	57.5	59.0	44.2
	F	56.1	55.9	61.4	61.7	46.3

rel. = relative M. = males F. = females

Notes: to table 2.11

1. 1981 and 1987, figures for England only.

2. *1987 figures are for entrants, not entries, and show the position with regard to 'O' level plus CSE. The pass rate is grade A-C or CSE 1.

Source:
Statistics of Education, School leavers, 1987.

We can see from the figures that:

1. There was a very marked bias towards a male entry, 87% in 1951, with some improvement by 1987 in that the girls share was then 28% of the total.

2. Over the period male preference had increased from 4.7 to 8.8% in 1984. Female preference had also increased from .8 to 3.2% in 1984. The 1987 figures for preference were not strictly comparable because of the inclusion of the CSE entries.

3. In 1971 and 1981 the female pass rate was better than the male pass rate. By 1987, the girls had overtaken the boys.

IX. Gender Differences in Subject Choice at 'A' level

At 'A' level there are even greater differences in subject choice than at 'O' level. In 1984 Science and Technological subjects accounted for 52% of all male entries and only 29% of female entries. Modern Languages accounted for 3.1% of male entries compared with 9.1% of female entries.

This pattern is not necessarily because girls or boys are dropping out of some subjects at a faster rate than at 'O'level, but because the pool of entrants who could take a particular subject has already been reduced-that is the effects are cumulative. In the case of girls and science, Weinreich-Haste, (1978) maintains that the drop out rate is no greater than the overall drop out rate from all education. It would seem from the data on boys and languages, however, that there is a higher male drop out rate after 'O'level than before. I will return to this point later.

French 'A' level

Table 2.12 shows the position with regard to French. We can see that:

1. There were more male entries until 1961. Female entries have steadily increased, and in 1987 they were 72% of the total.

2. Both male and female preference declined until 1981. Since then, both have increased, but female preference so much so that by 1987 it was nearly three times as strong as male preference, 18.3% of female entrants choosing French, compared with 6.5% of male entrants.

3. Until and including 1971, the female pass rate was better. Although it is still improving, the pass rate for the boys has overtaken it, the figures for boys and girls in 1987 being 82.3% and 82.2% respectively.

Table 2.12

French 'A' level, Choice and Achievement

1951-1987, England and Wales

		1951	1961	1971	1981	1987*
Pool 'A' entries	M	71480	167959	275612	318646	69840
	F	32323	75816	181384	269603	64770
French rel. %	M	5115 (52)	7658 (47)	9361 (36)	6911 (28)	4570 (28)
rel. %	F	4636 (48)	8572 (53)	16382 (64)	17936 (72)	11850 (72)
Preference: entries % pool	M	7.16	4.56	3.4	2.2	6.5
	F	14.34	11.31	9.0	6.6	18.3
P. Rate (A-E)	M	71.4	67.4	66.1	74.2	82.3
	F	75.8	72.5	72.7	72.0	82.2

Notes: to table 2.12
1. 1981 and 1987, figures for England only.

2. * all 1987 figures are based on entrants rather than entries

Source:
Ministry of Education Reports, 1956, 1961
Statistics of Education, volume 2, School leavers, England and Wales, 1971
Statistics of Education, School Leavers, CSE and GCE,1981, 1984, 1987.

Physics 'A' level
The situation with regard to 'A' level physics is detailed in table 2.13, where it can be seen that:

1. There are many more male than female entries although the male share is declining. In 1987 it was 78% compared with 88% in 1951.

2. Male preference which was very strong in 1951, 16.71%, declined to 12.66% in 1971, but had increased again to 13.32% in 1981. The very high figure of 37.3% in 1987 is exaggerated because it is based on entrants rather than entries.

Female preference increased over the period to 1961, then fell back and now seems steady. The 1981 figure of 3.8%, a decrease compared with the 1951 figure of 5.13%, is probably a better comparison than the 1987 figure of 11.5% for the reason explained above, although undoubtedly more girls are choosing physics at this level.

The 1987 figures, based on entrants, do indicate, however, that male preference for physics is still three times stronger than female preference.

3. The female pass rate had become better than the male rate by 1971. Although it was still improving, the male pass rate had overtaken it by 1987

Table 2.13

Physics 'A' level, Choice and Achievement

1951-1987, England and Wales

		1951	1961	1971	1981	1987*
Pool 'A' entries	M	71480	167959	275612	318646	69840
	F	32323	75816	181384	269603	64770
Physics rel. %	M	11943 (88)	29757 (86)	34885 (83)	42433 (81)	26650 (78)
rel. %	F	1659 (12)	4767 (14)	6906 (17)	10266 (19)	7480 (22)
Preference: entries % pool	M	16.71	17.71	12.66	13.32	38.2
	F	5.13	6.29	3.81	3.81	11.5
P. Rate (A-E)	M	72.8	68.2	66.6	69.7	78.6
	F	63.7	62.6	71.6	74.0	75.5

rel. = relative M. = males F. = females

Notes: to table 2.13

1. 1981 and 1987, figures for England only.

Source:

Ministry of Education Reports, 1956, 1961

Statistics of Education, volume 2, School leavers, England and Wales, 1971

Statistics of Education, School Leavers, CSE and GCE, 1981, 1984, 1987

The pattern that emerges at 'A' level is therefore very similar to that which we noted at 'O' level. As long as the overall entry is strongly male, the selected subjects have a larger male entry. Preference for French, however, (as well as German, Latin and biology), was stronger for women than men throughout the period, and this is shown in higher total entries for these subjects as more women continue with their education.

Male preference for both physics and chemistry is consistently higher than female preference, although for both boys and girls preference is declining in the two subjects, perhaps as newer non-school subjects become available. From 1951 to 1961, there was an exception to this trend; female preference for physics and chemistry did increase. In both subjects, however, the situation in 1987 compared with 1951 was worse for girls as far as preference was concerned, but better in terms of absolute numbers and therefore relative position vis a vis boys.

The change in the way the official figures for 1987 were reported has made some comparisons difficult.

X. Gender Differences in Subject Choice at Degree Level

The same patterns of subject specialisation already observed at 'O' and 'A' level exist, and of course are partly determined by the qualifications already obtained at those levels. The figures in table 2.14 relating to subject choices, have been derived from several sources. Where figures for individual subjects were not available, faculty information has been given instead. These figures, unlike those for school leavers, show all undergraduates who are domiciled in the U.K.

We can see that:

1. The women's share in the undergraduate population rose steadily from 23% in 1951 to 41% in 1987, maintaining the share they had in 1981, even though the total undergraduate population had fallen.

2. From 1971 women out-numbered men by more than 3 to 1 in French, although by 1987, there was some improvement in the relative position of men. Female preference, however, was still more than 3 times as strong as male preference.

Table 2.14
Full-time University Under-graduates

1951-1987, G.B.,UK domiciled

		1951	1961	1971	1981	1987
Pool	M	63970	84422	129121	139657	117737
rel. %		(77)	(75	(68)	(59)	(59)
	F	19488	28718	60193	95302	82914
rel. %		(23)	(25)	(32)	(41)	(41)
Pool	M					32260
						(59)
	F					22795
						(41)
French		Arts	Arts	Entering for First Time		
	M	23587	21024	297	885	2225
		(66)	(58)	(23)	(21)	(31)
	F	12349	15134	1010	3402	4930
		(34)	(42)	(77)	(79)	(69)
Pref:	M					6.9%
	F					21.6%
Physics		Pure Science				
	M	13749	22243	2048	6364	3996
		(81)	(78)	(86)	(86)	(75)
	F	3304	6433	329	1050	1357
		(19)	(22)	(14)	(14)	(25)
Pref:	M					12.4%
	F					5.9%

rel. = relative pref. = preference

Sources: Table 2.14
University Grants Committee reports, 1951-52, 1961-62
University Grants Committee, Statistics of Education, volume 6 Universities, 1971
University Statistics, 1981-2, 1984-5, 1987-88

3. In 1971 and 1981, there were more than 5 times as many men as women choosing to study physics. (In Engineering and Technology, women were barely represented at all, there being 9 men to every woman. That was, however an improvement over the 1951 situation when only 2% of the undergraduate population in Engineering and Technology were women.). By 1987, there were signs of improvement, the female share having risen to 25% of the total, and female preference having risen to 5.9% compared with male preference of 12.4%

These figures do seem to suggest that at least since 1961, modern languages have become "feminine" both in terms of choice and achievement, but the polarisation is not as marked as it is in sciences. Moreover, as they become less preferred subjects for boys, probably only the more able choose to be entered, hence the narrowing of the gap in the pass rates.

Sciences, excluding biology, are strongly "masculine" in terms of choice and continue to be important for boys, but female preference is increasing, particularly for chemistry. It is interesting to note that when only a small percentage of the entry was female, the pass rate in physics was better for girls, presumably because only the very able made that choice- a parallel situation to that

in French.

XI. 1981: Male/female ratios at different levels of education.

In an article written in 1979, Weinreich-Haste compared entries of men and women for physics at 4 levels of education in 1976; 'O' level, 'A' level, degree level, and post-graduate. She demonstrated that physics is clearly 'masculine'. The further up the educational ladder one goes, the worse the situation is for women, there being 9.3 men for every woman at the post-graduate level. She suggested that for physics, and other sciences, this reflected the drop out of women from education in general and not science in particular. She demonstrated this by relating the male/female ratios for physics at each stage to the male/female ratios of all entrants to all subjects at each stage. In 1976, there was a progressive decline in the representation of women from 'O' level where the ratio was 1/1 to postgraduate level where it was 4/1. When the ratio of physics entries was divided by the ratio of all entrants, although the position of women in physics was poor vis a vis men, there was stability until postgraduate level when there was a worsening of the position. This would suggest that the female drop out from physics

occurred before 'O' level, and again at post-graduate level.

In table 2.15, I report my own findings for 1981 for both French and physics.

Table 2.15
Ratios of Male/Female entries for Physics and French, 1981

		'O' Level	'A' Level	Degree	PGR
1.All Entries					
Ratio M/F		.96	1.18	1.47	1.80
F/M		1.04	.85	.68	.56
2.Physics					
a.Ratio M/F entries		2.92	4.13	6.06	9.30
b. Preference	M	8.76	13.32	4.56	5.90
c.	F	2.88	3.81	1.10	1.14
d. Ratio M/F pref.		3.04	3.50	4.14	5.17
e. (a)/all entrants		3.04	3.5	4.12	5.17
3. French					
a.Ratio F/M entries		1.46	2.60	3.84	1.26
b. Preference	M	4.4	2.17	.63	.29
c.	F	6.15	6.65	3.57	.66
e. Ratio F/M pref.		1.4	3.06	5.67	2.28
e. (a)/all entrants		1.4	3.06	5.65	2.25

M. = males F. = females
Source:
DES, Statistics of Education, School Leavers, CSE and GCE,England and Wales, 1981.

Notes to table 2.15

1. This is the male/female and female/male ratio of all entries at each level of education, the figures which are normally used to indicate gender bias. They do not take into account the total males and females who are able to consider each level of education - the pool. All the figures for degree and post-graduate courses are total

numbers at G.B institutions, (as opposed to entrants) who are domiciled in the U.K.

2a and 3a. Proportions entering, as in (1) but for specific subjects of French and Physics.

2b/c and 3b/c. Male and Female Preference for each subject at each level: number entering as a percentage of all entries at that level.

2d and 3d. Ratio of b/c, the relative male/female preferences for the subject

2e and 3e. The ratio of entries to a subject at any level (2a and 3a) related to the ratio of all entries at each level (1). Weinreich-Haste's method for determining whether male or female drop out from a subject is greater or less than drop out from that level of education in general. This should be equivalent to the ratios obtained in 2d and 3d if entrants and entries are more or less equal.

Comments on table 2.15

1. For all subjects taken together, there are slightly more female entries at 'O' level, after which

the female entry declines relative to the male entry. There are nearly twice as many men as women on post-graduate courses.

2. As far as absolute numbers of entries to physics are concerned, there is a progressive decline at each stage in the representation of women. (By 1987, there is still a continuing decline but the ratios are better)

3. Male preference for physics (relative to other subjects) increases considerably from 8.76 to 13.32% of total entries at 'A' level, and then falls off.

4. Female preference for physics is already much less than that of the boys before '0' level, (1:3, in agreement with Weinreich-Haste). At 'A' level it increases slightly, but declines again at degree and post-graduate level.

5. Male preference divided by female preference, produces an index of male willingness to take physics compared with female. These figures for 1981 suggests to me that the major female drop out is before '0' level, but also after 'A' level. Moreover, the other major influence on the data is the very large shift of boys towards physics, and away from other subjects. The implications for equal opportunities policy seem to be

that in order to make a subject less masculine and more feminine, it isn't enough to encourage more girls to enter. One also has to encourage boys to move in other directions.

If we consider French, we find a similar pattern in reverse that favours the girls.

6. At every stage female entries outnumber male entries, although the differences are small when compared to Physics particularly at 'O' level and post-graduate level.

7. Female preference for French is high at 'O' level, increases slightly at 'A' level, and then declines.

8. At 'O' level, male preference is fairly strong, 4.4, halves at 'A' level and continues to decline sharply at the next two stages.

9. French is still a 'feminine' subject. Any female drop out generally, as in the case of post-graduate study, will understate the bias of women towards that subject unless so corrected.

XII. Conclusions

1. Girls do drop out of the system progressively, but it is much less marked than it used to be. The 1981 figures, table 2.15, show that even at post-graduate level there are .6 females for every 1 male. It is debatable whether the ratio of 1.5 males to every female on degree courses in 1981 (1987 figures for university undergraduates 1.3 to 1) is as much of an improvement as there should be in days of equal opportunity. The 1911 ratio was 1.9 to 1.

2. Girls do as well as boys overall, although they obtain fewer 'O' and 'A' levels per person, and not so many high grades at 'A' level. There are some slight differences also in the class of degree obtained.

3. There are still differences in the type of further and higher education chosen. Boys still go for the more prestigious. (Although French is 'feminine', there are more men than women reading French at Cambridge University)

4. There are marked gender differences in subject choice, at every stage, the effects of which are cumulative. Physics is still a 'masculine' subject, and French is

'feminine'. After eliminating the effects of any overall drop out from education, it is apparent that:

(a) even though girls do drop out of physics before 'O' level, there is a continuing trend after 'O' level for boys to be better represented. This seems to be because female preference, which increases slightly at 'A' level, then declines, whereas male preference continues to remain at a much higher level.

(b) there is a continuing trend after 'O' level for girls to be better represented in French. In this case it seems to be because male preference declines sharply at 'A' level and continues to decline. Female preference increases at 'A' level and then declines, but is still greater than male preference.

5. There are marked gender differences in subject achievement, not always in the anticipated direction. This may be because only the brightest boys and girls enter for subjects in non-stereotypical areas.

Finally, it should be noted that these patterns of choice are typical of Western Europe, but are not replicated in other regions of the world. (Kelly,1981)

III. Explanations for Non-Stereotypical Choices in Education

A. Introduction

When we use the term 'Sex' we are making a distinction based on biological differences. The term 'Gender' is used when we observe differences in behaviour even though biological sex is thought to contribute to those differences.

As we saw in chapter II, in spite of equal opportunities legislation and increased awareness and concern. gender differences in educational choice and achievement still persist at all levels. These are the end result of a cumulative process that becomes apparent in 'O'level/ GCSE choices, but appears to be linked to attitudes that are formed very early on in life.

Although the focus of this research is on non-traditional educational choices, understanding some of the processes that lead to traditional choices could be beneficial in formulating hypotheses about why some girls do choose science and some boys do choose languages.

Many alternative explanations have been offered. The simplest one is that there are inate differences between the sexes in physical characteristics, cognitive functioning, attitudes and temperament. Hence some activities are more 'natural' for boys, and others for girls. We shall see later that the small differences that do in fact exist cannot explain the enormous variance in behaviour.

An alternative view is that culture determines stereotypes for gender roles. These are reinforced by a variety of external influences, primarily the home and school in overt and covert, sometimes unconscious ways. The cognitive/developmental views are that the child both through modelling, and through identification with a parent, internalises a masculine or feminine role image. Behaviour is usually consistent with sex and gender roles.

The general view is that no one factor is responsible, but a number of influences which interact. Some biological differences do exist, but are too small to explain the large variance in behaviour. Deaux (1985), in her review of current gender research and theory, states that the emphasis now is less on measurable differences per se. She says they "cannot be considered as simply indices of capability but rather must be interpreted in terms of

individual choice, situational pressures, and structural factors"

Such differences that do exist are exaggerated, a mythology grows up around them which becomes incorporated into existing cultural stereotypes of masculinity and femininity. These help to define a set of appropriate behaviours, both socially desirable and undesirable for each sex, (Weinreich-Haste, 1981). Therefore, as boys and girls develop, greater differences emerge as a result of external conditioning and internalisation of the values that reflect the cultural stereotypes.

If as a consequence, some school subjects have a masculine image, and others a feminine image, because they have become part of the stereotype, then subject choices will be made which are congruent with sex and therefore gender roles. It is assumed to be difficult to make a contrary choice. It could lead to conflict over identity, unless one had either a contrary image, for reasons which will be postulated later, or something special in ones personality that enabled stereotypes to be defied.

B. Biological Explanations

I. Introduction

Biological determinism, at its simplest level, states that there are inate differences between the sexes, and these account for the observed differences in a whole range of behaviours. Sociobiologists maintain that there is thus a 'natural' way of behaving for both men and women. It is put forward as being 'common sense' that if there are physical differences between the sexes which are obvious and observable, then there are also mental differences. It is in fact a psychoanalytical view that men and women **must** be different in terms of attitudes, temperament and behaviour. This is based on the perhaps false assumption that there is " a direct equation between anatomy and psychology", (Samuels, A, 1985). Man must be "an assertive, penetrative creature, a women is more likely to be receptive to the needs of others"

The differences which are particularly relevant to this research, because of the suggested links with educational and career choices are; physical attributes, (height, weight, strength), cognitive processes, (general intelligence, verbal ability, spatial ability), personality (aggression, dominance) and attitudes (towards

self, success, academic achievement). Just as physical differences between the sexes are presumed to be genetically determined, so too it is maintained, are cognitive and personality differences. Genes are responsible for hormone differences at either birth or puberty, and for differences in the development and lateralisation of the brain. "The sex hormones, acting via the brain, determine to a very great extent the male-female differences that we think of as 'traditional' or 'stereotypical' " (Wilson, 1989).

II. Physical Differences

There is little disagreement over the existence of the more obvious physical differences. These are small at birth, and become much more pronounced due to the massive increase in sex hormone production before puberty. An 'untrained' male adult is 30% stronger than a female and has more stamina. Experts believe, however, that this difference is exaggerated due to men and women leading different lives and having different attitudes toward physical exercise, (Nicholson, 1984). Physical differences could rule out the possibility of some men and some women being suitable for some jobs, but a direct correlation is doubtful.

III. Cognitive Ability

It is has been claimed that men are superior to women in terms of general intelligence, they have superior spatial skills (leading to superiority in mathematics and science), but women have stronger verbal skills hence their superiority in languages.

Hutt, (1979), maintained that the sex chromosome which carried the sex linked genes and which was responsible for the physical differences between males and females also determined other non-sex characteristics such as mathematics and science ability.

It has also been claimed that there is a difference in brain structure between the sexes, and that men have larger brains (true, it is related to weight) and therefore higher intelligence.

It is now generally accepted that certain cognitive functions are asymmetrically represented in the cortex of the two hemispheres of the brain. For most right handed individuals the left hemisphere is specialised for language functions and logical thinking, and the right for non-verbal perception and visuo-spatial functions. Much normal behaviour is the result of the two hemispheres acting independently.

The extent of specialisation of function, or lateralisation, varies with individuals, from no lateralisation at all (all functions equally developed on both sides, or one hemisphere removed in infancy and the other taking over all functions) to complete lateralisation (the left is purely verbal, the right non verbal). Most people have an intermediate degree of lateralisation, with some functions existing in both hemispheres, while others are only present in one.

To some degree, brain organisation is genetically determined, but adapts to the influence of the environment. At birth the neural connections between left and right are incomplete, the maturational process taking about six years. Before this age, either hemisphere can develop language capability, but the left has a slight inborn tendency to respond to speech sounds, and tends to gain control, leaving the right brain more able to dominate non verbal functions.

Waber's experiments, (1977) demonstrated that the degree of brain lateralisation and pattern of cognitive functioning were related to the timing of puberty. Girls have less capacity for spatial tasks because they mature earlier. Boys mature later and are superior on visual spatial skills. Late maturers of both sexes are

significantly better than early developers on spatial tasks, but no better on verbal, because of greater brain lateralisation.

Buffery and Gray, 1972, had also suggested that owing to the more advanced development of the brain of the female at the time of language acquisition, verbal skills became more completely localised in the dominant hemisphere of young girls. Blakeslee, (1980), suggests that this earlier maturation of women (and less specialisation of brain function) means they are more likely to be generalists, whereas men are more likely to be specialists. Therefore, whilst women are equal to men within normal levels of achievement, women geniuses are rare.

Other researchers, (e.g. Petersen, 1976,) have proposed another sex linked genetic explanation for spatial differences linked to hormones. She found an association between spatial ability and high masculinity in females and low masculinity in males, which implies a 'masculine' pattern of cognitive functioning in a physically androgynous individual. The evidence cited is the development in adolescence and decline in middle age, of both sex hormones and spatial ability. The decrease in female spatial ability after puberty is linked to oestrogen.

In 1974, Maccoby and Jacklin, in a very comprehensive study of sex differences did find significant differences in the areas of; verbal ability, mathematical ability, visual-spatial ability, and aggression. More recent research, summarised by Deaux (1985) has shown that the differences are perhaps less important than previously maintained and some can be explained by differential experience.

1. Mathematical Ability

Maccoby and Jacklin found a difference in performance, boys were better than girls, primarily from adolescence onwards. Hyde, (1981), however, in a meta analysis suggested only 1% of variance was due to the sex difference. Benbow and Stanley, (1980,1983), found differences in mathematical aptitude before adolescence. Becker, (1983) in a subsequent analysis of the same data, found the difference existed primarily on algebraic items.

2. Spatial Ability

This has been described as "the ability to visually manipulate images without the aid of verbal mediation" (Petersen, 1976). This difference emerges prior to adolescence, but is limited to specific types of skills. Males are superior to females in measures of mental rotation and in tests of horizontality-verticality, such

as the rod and frame test. There are no apparent differences in spatial visualisation tasks that require a more analytic sequential strategy, and which are closer to the demands of mathematical and scientific reasoning (Linn and Petersen, 1983).

Smail and Kelly, (1983), however, found that 11 year old boys were markedly better than the girls on tests of spatial visualisation and mechanical reasoning. The spatial test included subscales where there were significant sex differences on all except the embedded figures test. Their results suggested the emergence of differences earlier than puberty, but mainly they felt these arose from differential experiences at home and school, and were not entirely due to biological reasons.

3. Verbal Ability or Fluency

This is "the rapid and accurate production of symbolic codes or names" (Petersen, 1976). Females were reported as superior (Maccoby and Jacklin, 1974). More recent research has only found a small difference. (Sherman 1978, Hyde 1981, Benbow and Stanley 1983). Girls apparently develop language ability faster than boys, (Maccoby and Jacklin 1980). Upto age ten, their average reading score is higher. Although the differences disappear with age,

differences in the material read (girls fiction, boys fact) persist. (Fogelman and Goldstein, 1976)

IV. Personality and Attitudes

It is extremely difficult when considering attitudinal differences to separate out the 'inate' from the culturally determined. For example, Tavris (1973) found 8 personality traits on which men were perceived by 80% of the sample to differ significantly from women for, it was believed, both biological and cultural reasons.

It has been suggested, (Udry 1974), that women's lack of androgens may account for their lack of aggression and drive for achievement. Hyde, (1982),re-analysed the Maccoby and Jacklin data and found that sex differences in aggression accounted for 5% of the variance. Some researchers found the differences only apparent in certain situations.

Negative attitudes towards achievement have been used to explain women's failure to enter 'masculine' occupational fields, in particular, and to 'achieve' generally (O'Leary, 1974). He maintains that women have lower self esteem, fear failure, fear success, and experience role conflict.

Alper (1973) suggests that some women may accept success as 'female appropriate', and some may not. She suggests that the need to achieve is related to sex role orientation. Pasquella et al, (1981), found a relationship between sex, and causal attributions for success. Women more than men rated themselves as having lower ability both when they failed and when they succeeded, and they believed success was due to increased effort. She did not find any extra information when sex role, as measured by the Personality Attributes Questionnaire (PAQ), and causal attributions were investigated.

Dweck (1986) suggests a motivational explanation for sex differences in mathematical and verbal achievement. She found that differences in mathematics were greatest amongst the brightest students where there were also the greatest sex differences in motivational patterns and associated behaviour.

As Dweck understands it, achievement motivation depends on two classes of goal; learning (increasing competence) and performance (seeking favourable judgements from others). Failure to establish and maintain reasonable goals has negative consequences for achievement. Focussing on performance can work against the pursuit of challenge as it requires that perception of ability be high and remain

high. She found that bright girls compared with boys, have: shakier expectancies, low preference for novel and challenging tasks, more frequent failure attributions to lack of ability, and more frequent debilitation in the face of failure or confusion.

Dweck therefore suggested that girls are less inclined to choose mathematics or science because "some characteristics of mathematical versus verbal areas are precisely those that would work against individuals with this pattern, but would favour individuals with the more confident challenge seeking pattern". This is because she believes that in mathematical areas, there are new skills and concepts being introduced, whereas in verbal subjects, "increments in difficulty appear to be more gradual".

Parsons et al, 1982, found significant sex differences in expectancies for future mathematics courses, even when females and males were equivalent in their perceptions of their present mathematical ability, and in their expectancies for their present mathematics course. In mathematics, they were more likely to experience failure or confusion at the beginning of a new unit.

Horner, (1972), first suggested "Fear of Success" as a reason for women dropping out of education in the United

States. Monahan et al (1974), found that "Fear of Success" was a "negative stereotype of the female shared by both sexes". Weinreich-Haste (1978) did not find that the conflict between academic success and the normal feminine role was a reason for women dropping out of higher education in this country. It was she felt more complex; "studies of the relationship between competitive behaviour and the motive to avoid success indicate there is a complex interaction between the sex of the competitors, the extent to which the area of competition is regarded as male specific, and the degree of traditional sex role orientation of the subjects."

V. Criticisms which apply to most sex differences research

1. The use of animal models to predict human behaviour.

Many of the experiments that have investigated the effect of different hormones on behaviour have only been carried out on animals. It is questionable whether "an oil magnate exhibiting leadership in the business world" is comparable to "a lab rat fighting with its cage mate"

2. The distinction made between genetic and environmental determinants of behaviour.

"From the time of conception, genes do not act in isolation from their environment, and even fairly stereotypical behaviour in animals, with few exceptions, represent interactions between experience or learning and biological mechanisms. What has evolved in response to environmental challenge, is the brain and its capacities for learning and culture, not behaviours themselves" (Bleier, 1984). For example, she cites the present capacity of the brain for symbolization, language and conceptualisation, which she says are the results of adaptation to the environment over a long period of time. For example, without exposure to a socio/linguistic environment, language does not develop

3. Most psychological research into sex differences looks for differences between the groups and ignores the range of variation within them.

Tresemer, (1975), suggests one should look at the overlap between the sexes, the % of one sex that exceeds the mean of the other, and the % of one sex that overlaps the other. Even though on average men may score better than women on tests of spatial ability, 25% of the women score better than the mean for the men.

4. Although a 'significant' sex difference may be found, this is a measure of reliability not magnitude.

A very significant result merely suggests that the probability of it occurring by chance is slight. The statistic is not an indication of the size of the sex difference. On the other hand, research where no significant differences are found, is often not reported at all.

5. Many of the reported differences are actually small, accounting for very little variance in behaviour. Meta analytic studies suggest 5% or less (Deaux, 1985)

6. Deaux comments on the difference between laboratory and field studies. "Observed differences between women and men.. cannot be considered as simply indices of capability, but rather must be interpreted in terms of individual choice, situational pressures, and structural factors"

7. The reported differences are not necessarily constant over time (Rosenthal and Ruben, 1982). In the three areas of mathematical, verbal and spatial skills, the size of the difference is related to the year of study. Over a period of 20 years, females show significant gains.

The differences in ability which have been highlighted have been singled out because of the supposed link with ability to achieve in science, mathematics and languages. Spatial ability is supposed to be positively related to performance in science and mathematics and negatively related to performance in language courses, (Stafford 1972). More recent research suggests these links are weak.

VI. Conclusion

Any differences which do exist are too small to explain the enormous divergence in behaviour. The magnitude of the effects of the cognitive factors varies considerably between the factors, between cultures and over time. It is impossible to separate the effect of genes from interaction with the environment. Tittle,(1986),says individual differences and the search for biological explanations are now less important, and "the effort to understand the effect of gender status now focusses on the dynamic interaction of the individual with an external environment". What is perhaps more important than abilities are attitudes, motivation and expectations. These do affect performance differentially between the sexes, but as is probably true of the cognitive factors, are mediated by the environment.

C. The Process of Gender Stereotyping

Kessler and McKenna, (1982), claim the process of gender attribution is universal. Deaux, (1985), in her review of the subject, suggests there has been a move away from viewing such stereotypes as negative, towards a view of them as neutral categories. Current research focusses not only on content but also on structure and the process by which they operate. The 'new look' not only relies on trait characteristics to define gender stereotypes, but also includes role behaviours, physical characteristics and occupation.

Williams and Best (1982) in a study of 30 nations, found some generality - 'the association of instrumental traits with males and expressive traits with females', but religion and national work-related values led to variations. Men and women are still viewed in terms of opposites. What is male is not female, and vice versa. (Deaux and Lewis, 1984)

The processes that affect gender roles work externally and internally. First there is the effect of the socialisation process, reinforcement from the environment generally, home and school in particular, and imitation of role models, that is parents or other significant people.

Second, internal processes work in the individual as they develop in response to these environmental influences and adapt their beliefs about themselves and their behaviour. This is a process of identification and internal restructuring.

"Assumed differences have their beginning in observed differences, but then are seen as much greater. More importantly, as they are progressively institutionalised by society, the assumed differences influence the observed differences, King (1975).

It is the opinion of many researchers that actual observable and measured differences between men and women are non existent or so small as to be insignificant. Beliefs however become part of the mythology and over time become exaggerated, and absorbed into the cultural stereotypes which then becomes self fulfilling because of continuing reinforcement from home, school and peer group. (Weinreich-Haste, 1978).

The research of Broverman et al, 1975, showed clearly defined sex role stereotypes contrary to the unisex media image. Women were perceived as less competent, less independent, less objective, and less logical. Men were seen as lacking interpersonal sensitivity, warmth and

expressiveness. The stereotypical masculine traits were perceived as more desirable than the stereotypical feminine characteristics, particularly in the adult, (Rosenkrantz 1968, Broverman, 1970). Both stereotypes were however a mixture of both positive and negative traits.

Stereotypes do vary, however, over time and with different social groups and education level. Mischel, (1974), researching a group of feminists and a group of professionally successful women, found they both differed from the traditional in a number of respects; being more intelligent, career oriented, assertive, and high on self esteem. Vogel et al, (1975) found that rejection of the stereotypical self concept was associated with continuation of study by women. Significant factors in their history were working mothers who encouraged independence, and fathers who supported and rewarded achievement.

Gender role behaviour may be maturational, (ie components are completely biological), or environmental factors may interact with the biological and lead to the acquisition of (1) gender identity - 'I am a boy', (2) gender role - boys' behaviour, and (3) gender attribution processes - 'I see myself as female' (Kessler and McKenna, 1982). There is disagreement over whether internal processes (the

psychoanalytic view) or reinforcement from the environment (social learning theory) are the most important in leading to gender role behaviour. A third view, (Cognitive/ developmental theory, Kohlberg 1966), explains gender behaviour as the result of the child structuring the world around them and labelling things according to the categories they have available. The way the child sees the world changes in discrete stages, until as young adults their perception of reality is similar to that of other adults.

More recently, Bem's Gender Schema Theory (1981), stated that individuals will differ in their tendency to use gender as an organising principle. Only those who are highly sex-typed, masculine or feminine on the Bem Sex Role Inventory (BSRI), are likely to process information and make distinctions on the basis of gender in this way. The implication being that the androgynous person is more able to defy a stereotype.

Many researchers incline towards the role of the environment in shaping stereotypes. It is the opinion of Prather, (1971), that society reinforces women for being dependent passive and non assertive and discourages girls from higher education and from competing equally in the

world of work with men. In the home boys and girls are exposed to appropriately sex-typed activities and toys.

Smail and Kelly, (1983), believe that the sex difference in ability at age 11 with regard to spatial ability and mechanical reasoning, "probably reflects sex differences in the children's hobbies, household tasks and interests which develop boys' technical skills more than girls". Much of the shaping of behaviour is covert and subtle, (Weinreich Haste,1978). At school, the organisation, the timetable, teacher behaviour, and peer interactions all reinforce the same stereotypes.

At an inner level, boys and girls internalise stereotypes through identification with and modelling of the same sex parent. It is this process that leads to the sex differences in attitudes toward self and achievement that were referred to earlier. Tittle (1986) says sex itself is not a direct predictor of different behaviours, but interests, attitudes, values and expectancies are. Differences in these, she maintains, are apparent as early as age 13, and are firmly established by age 16. People thus make choices in life which are congruent with their image of their own identity and how they feel a man/women 'should' behave.

Much of the research about college women and their career choices reflects this idea. Vogel et al, 1970, found that 50% of women in a sample of 50 at a catholic college intended to stop work when their first child was born. Angrist and Almquist, 1975, found that 50% of female students who went to college with career ambitions changed their minds subsequently.

D. Choice of School and College Subjects

1. The Image of Science and Languages

As we saw in chapter II, there are very specific gender divisions with regard to subject areas, at all levels of education.

The argument that is proposed by many researchers is that school subjects have an image - they are seen as either masculine or feminine, or neutral, and choices are made that are compatible with one's own self-image and accompanying stereotypical behaviour. For adolescents who are seeking to establish gender identity, self image is important. (Kelly and Smail, 1978).

Kelly and Weinreich-Haste (1979) suggest that girls reject science because it has a masculine image. Weinreich-Haste's two surveys of school children and undergraduates (1979), showed that disciplines perceived as scientific were also 'hard, intellect based, complex and masculine". Interestingly, although the schoolgirls saw French and English as feminine, the boys saw these subjects as neutral. The low achievement of girls in science is thus seen as an aspect of the feminine sex role. This behaviour is reinforced by parents and through modelling.

Kelly, (1982), uses cognitive developmental theory to further elaborate: " If science achievement has a masculine image in any society, then boys will be motivated to achieve competence in science as part of their developing masculinity; conversely girls will see success in science as incompatible with their developing femininity and so avoid it. The overall impression of science as masculine ... is more important than how strongly this impression is reinforced in any particular culture".

Although there has not been the same degree of concern about languages, and therefore the research is limited, one can hypothesise that on the basis of numbers alone, languages are feminine and that boys reject languages partly because the choice would not be compatible with the masculine image. There are other considerations that will be dealt with later, as will the other reasons suggested for the opting out of science by girls.

II. Gender of Subjects as reflected in Choice

In chapter II, there is a very detailed description of boys' and girls' subject choices and achievement in some specific subjects. In terms of ascribing gender to a subject, one can either look at the difference in popularity with the sexes or whether it is chosen more

often by one sex than the other, (Ormerod, 1975). When pass rates are considered, the gender differences tend to disappear.

As early as 1935, Pritchard in a survey of 14 year old children, found that boys had a greater liking for chemistry and physics, whereas there was a slight female preference for languages.

In 1971, Hornsby-Smith and Newberry, reported the results of a postal survey of 200 students who had received awards from the County Council to study higher education. The questionnaire, completed some years later, investigated reasons for subject choices at 'O' level. Their conclusions were that "there are major differences in subject choices before 'O' level of boys and girls. These differences appear to be culturally defined and can be clearly seen in the trend away from physical sciences for girls and away from biological sciences and social sciences for boys".

They also found that many more women than men wished they had continued with physical sciences, and more men than women wished they had studied modern languages. Half the respondents considered their choices before 'O'level had

been involuntary. This suggests that researchers should treat voluntary and forced choices separately.

Ormerod's study investigated preferences and subject choices of over 1000 pupils in 19 secondary schools. He found there were more marked differences in co-educational than single sexed schools. The liking for the teacher influenced preference,but not choice. He assigned a gender to each subject on the basis of preferences, using the Mann Whitney U test to gain an index of the magnitude of the difference in preference between the two sexes. He found agreement between his results and the 1972 GCE entries. He suggested that university entrance requirements probably made choices of some subjects (French, English, Latin) more 'male' than preferences really are, and for the same reason, biology is probably more 'female' than it appears.

A later study, (Keys and Ormerod 1977), found that perceived subject difficulty influenced the subject preference of girls more than it did boys. Masculine subjects were considered difficult, and feminine subjects easy. Ormerod composed a gender hierarchy based on the preferences of the subjects in this sample of 348 pupils, and found that it correlated well ($r_s = 0.77$, $p>0.01$) with the gender spectrum of the previous study.

More recently, (Harvey, 1984), in a study of over 2000 pupils in 13 comprehensive schools, looked at sex differences in preference for school subjects and also perceived importance. He found physics and physical science were rated as more important by the boys, girls considered languages more important, but there was broad agreement about most other subjects. Physics was more 'masculine' than physical science and chemistry, and biology and modern languages were still 'feminine'. These differences in preference were more marked in co-educational schools.

The study of Archer et al, (1991), referred to in chapter II, found that there was less pronounced gender stereotyping of school subjects by 10-11 year old children than in the previous studies.

Table 3.1

Gender Hierarchy of School Subjects

Subject	Difficulty Rank	Gender spectrum Rank	
Physics	1	1	M.
Second FL	2	9	
Chemistry	3	2	
Maths	4	3	
Geography	5	4	
Latin	6	5	
Biology	7	10	
French	8	7	
History	9	6	
English	10	11	
Art	11	8	
Music	12	12	
R.I.	13	13	F.

Source:

Keys and Ormerod, 1977

As reported in chapter II, the latest DES figures for 'O' level/ GCSE entries show that although there is a slight trend towards more equality, physical science subjects still stand out as being 'masculine' and biology and

modern languages as 'feminine', as measured by choice. This continues at 'A' level and into further and higher education. As far as girls and science is concerned, the drop out rate does not increase, after 'O'level but is merely maintained, with a smaller and smaller pool for each continuing stage thus magnifying the differences.

III. Other reasons why girls reject Science

It has been suggested that girls are likely to find a choice that is incompatible with a stereotype difficult because of other factors that influence their behaviour.

O'Leary, 1974, has suggested that women lack self esteem and therefore do not attempt high level academic work or seek high status and demanding jobs. Maccoby and Jacklin, (1975), however, found that there were no reliable differences in the self esteem of men and women. It could be that differences are situational, and individuals who do defy stereotypes have higher levels of self esteem. This will be discussed later.

Factors mentioned earlier such as "Fear of Success", "Fear of Failure" and different attributions for success and failure and which seem to be more the result of

interaction with the environment than genetically determined do seem to prevent some people from choosing atypical courses and careers.

IV. Language Choice

There is less research in this area. Many of the statistics are a by product of the concern about girls and science. Powell and Littlewood (1982), expressed concern that an earlier HMI report that had led to Education Survey 21, had not been very widely read. This report looked at "the extent to which curricula differences and customs contributed to inequality of opportunity for boys and girls". They felt that due to "some resolute women researchers", it contributed something to the debate about girls and science, but "it did little at the time to contribute to an awareness of the other dimension of inequality of opportunity, that is, boys learning, or rather not learning, a language". More recent research, (Eardley 1984), seems less concerned about the sex difference in language choice than the general decline in interest in modern languages. With 1992 approaching, this trend may reverse.

Powell and Littlewood suggest a number of factors that may influence boys to opt out of language study and girls to opt in.

1. Science is more relevant for careers. Girls are still seen as wives and mothers. They therefore choose traditional training such as clerical, commercial, or secretarial, and a second language is an extra that may be a useful adjunct.

2. In his 1977 study, Powell states that research into modern language achievement enables researchers to state that "second language learning is easily categorisable as a 'feminine' activity in terms of number and attitude" In the 1982 study, however, he says that boys opting out has nothing to do with their perception of a language as 'feminine'. "There is little evidence to suggest that boys attitudes to French, for example, are limited to notions of the gender of the subject"

3. He says there are factors 'intrinsic' to the subject which make it an easier choice for girls; difficult oral work, needing a cumulative memory, the feminine content of the syllabus.

4. They also refer to 'extrinsic' factors. Because girls have an early advantage in reading, they gain more confidence. In the 1979 study Powell referred to sex differences in ability that gave girls an advantage; higher scores on verbal tests, short term memory, speed,

deftness. He referred to research that suggested that any differences were to do with the visual presentation of material rather than auditory.

5. Some further research, Powell and Littlewood, (1983), found that girls had a more positive attitude to French and the country, and had more confidence in their ability to do well. Boys could not see themselves using a language, and chose it if they needed it.

There appear to be some similarities with girls and science. Small differences in ability early on give confidence, and school organisation, and teachers reinforce beliefs. There is a suggestion that a stereotype is at work. Possibly there are more similarities when it comes to opting in to a non-stereotypical subject.

V. The Typical Scientist/ Arts Student

Looking at the differences in profiles of those people, both men and women who do choose science or languages/arts, may give some further insight, particularly if there are differences between boys and girls in each category.

Bamber et al (1983) summarised the main findings of previous research with regard to Art and Sciences

differences in the sixth form. It is at this level that British students' educational choices become more polarised. Hudson, (1966,68), who first drew attention to the concept of bias of ability and the differences in the personalities of Arts and Science students, described the typical scientist in a way since confirmed by others including Smithers and Collings, (1981). Their portrait of boys and girls who chose science was "reserved, intelligent, emotionally stable, less assertive, sober, shy, conscientious, tough-minded, trusting, practical, self assured, self-sufficient and, (for boys only) controlled and relaxed". Bradley. (1981), found a similar profile for girls " controlled, self-sufficient and dominant"

It is more difficult to characterise arts students as the group is more heterogeneous. Smithers and Collings, (1981), found arts sixth formers rated by peers as "exciting, imaginative, feminine and attractive".

Bamber et al, (1983), in a study of sixth form differences amongst 'A' level specialists in Northern Ireland found the science students were highest on all cognitive measures used, and on the science sub score of a culture test. On a values test, the scientists were more theoretical and more interested in economic affairs. They

confirmed earlier research that scientists score significantly higher on spatial or diagrammatic ability and the arts specialists did better on verbal ability tests. (Hudson 68, Childs and Smithers 71, Entwistle and Wilson 77, Bradley 81). "It is intriguing to note that variation in total cultural knowledge differentiates scientists more so than arts specialists... and ...in the case of scientists, the culture measure outstrips that of intelligence in predicting 'A' level success", (Bamber et al 1983).

Bamber also found that whereas arts specialists had higher scores than scientists on tests of aesthetic and social values, male arts specialists scored higher than male scientists on social values, and female scientists scored higher than male arts specialists. On aesthetic values, female arts specialists did better than female scientists, but female scientists scored the same as male arts specialists.

Both male and female science students were significantly lower than arts students on the neuroticism scale of the Eysenck Personality Questionnaire (EPQ), but the female scientists were not significantly different from male arts students. Bradley, (1981), found that girls studying arts in the sixth form had higher scores on the Insecure

Personality Trait of the High School Personality Questionnaire (HSPQ).

Bamber et al also found a significant difference on the psychoticism scale of the EPQ. "Scientists in general and female scientists in particular have significantly higher mean scores than their arts counterparts." The female scientists also had a larger mean score than female arts specialists. Eysenck, (1975), had shown that psychoticism correlated with being tough-minded, immaturity, irresponsibility and anti-authority. "Could it be that to study science at sixth form a girl is swimming against the normal tide of her age/sex peers and to do so requires something extra in her personality makeup."

Smithers and Collins, (1981), found that girls studying science in the sixth form de-emphasized their femininity and social attractiveness, reported social difficulty, were not concerned with career considerations, and were influenced by their fathers. Bamber feels that the research evidence suggests " a conflict between an overt curriculum of achievement and a hidden curriculum which presents 'appropriate' characteristics and qualities for womanhood" To overcome this needs strong motivation. So far, psychoticism has not been found to relate to science 'A' level success.

E. Non Traditional Choices

1. Much of the evidence suggests that choices in education follow stereotypical lines, although there is some evidence from studies of choices at sixth form level, that these stereotypical choices are often regretted at a later date.

To do something contrary could produce conflict, (Bamber, 1983). Therefore one could come to the conclusion that those who do must have something special or extraordinary in their personality.

2. A link has been established between psychoticism, as measured on the EPQ and non traditional choices for girls, (Ormerod 1981). Eysenck, (1975), suggested that psychoticism was correlated with tough-mindedness.

3. Different models of parenting also seem to be important. Girls whose mothers are at work (Tangri 1972, Peterson 1958), or whose fathers give encouragement for academic achievement, or with whom one identifies (Hoffman 1972) are more likely to choose non-stereotypical courses. Williams and McCullers, (1983), also suggest that when there is less coercion to fit the stereotype, choices are more flexible. Almquist and Angrist, (1970), suggest that additional and/or enriching experiences are important, and

the readiness to question accepted roles. It also appears to be related to time. The later career and educational decisions are made, the greater the chance of choices being non traditional. We shall see later that some of these behaviours are the antecedents of psychological androgyny.

4. Greater ego strength and self esteem are considered important by Helson (1972) in the choice of non feminine careers by girls.

5. Williams and McCullers (1983) found that women choosing atypical careers scored higher on various cognitive measures, such as the Vocabulary and Block design sub tests from the Weschler Adult Intelligence Scale (WAIS).

6.They also found that girls who were physicians or lawyers, (compared with those in lower status 'feminine' jobs in medical and legal fields), tended to be first born or only children.

7. Girls who chose law were particularly high in achievement motivation (Williams and McCullers, 1983).

8. Sex role orientation, as measured by the BSRI or similar inventories is also linked with atypical choices.

Wolfe and Betz,(1981), found that masculine typed women were the most likely to choose non traditional career fields.

9. Most of the research mentioned has applied to girls in non traditional fields. One can speculate that some of the suggestions would apply to boys choosing languages.

F. Conclusions

In order to make a non-traditional educational choice, individuals have to overcome enormous pressure to conform to prevailing stereotypes. To do this, one assumes they must possess: (1) enhanced self esteem, particularly with regard to academic work, or (2) an overall high level of intelligence or marked bias of ability in the chosen field and (3) some other special personality characteristic.

Alternatively, or in addition, the environment must be supportive.

The other possibility is that the individual for various reasons to do with parental behaviours has a different sex role orientation and is able to make such a choice without conflict or difficulty.

IV. The Concept and Measurement of Psychological Androgyny

Development of a Scale

I. The Historical Perspective

The earliest measures of sex roles such as the Terman and Miles M-F Test,1936, the MF scale of the Strong Campbell Interest Inventory, (SCIV, Strong 1943), the MF scale of the Minnesota Multiphasic Personality Inventory, (MMPI, 1960), and Gough's California Psychological Inventory, (CPI, 1966), reflected the assumptions that:

a) masculinity-femininity was best defined in terms of sex differences to item responses;
b) a single bipolar dimension was being measured; and
c) the concept was unidimensional and could be measured by a single score.

These assumptions were questioned by Constantinople, (1973), who felt that they were not supported by the available data.

The traditional view implied that one was **either** masculine **or** feminine, and that if a test item were able to discriminate between the biological sexes it was appropriate for inclusion in the scale to measure the

construct. The algebraic sum of responses, (an M response was the opposite direction of an F response), located an individual along a continuum. As noted by Berzins,(1976), placement at the midpoint would denote "at best sex-role confusion or ambivalence, and at worst disquieting implications of deviance in sexual behaviour, bisexuality or general maladjustment".

II. The concept of Masculinity and Femininity as separate dimensions

More recently different assumptions have been made, (Bem 1974, Spence 1975, Berzins 1976):

a) masculinity and femininity are separate and independent dimensions;
b) sex roles are socioculturally defined and are not necessarily reflected by a sex difference in response; and
c) the stereotype includes positive, socially valued sex-typed characteristics.

Definitions of masculinity and femininity which were not mutually exclusive had been suggested by earlier researchers. Parsons and Bales, (1955), regarded masculinity as "cognitive instrumentality and goal-directiveness", and femininity as "being expressive,

supportive and affective". Bakan, (1966) described masculinity as "agentic", concern for oneself and one's own goals, and femininity as "communal", concern for self but in relation to others.

III. Androgyny

An implication that follows from the new approach to sex roles is that any individual can be high or low on both dimensions. Jenkin and Vroegh, (1969), had also seen masculinity and femininity as separate dimensions, but had assumed that each was only applicable to one sex. Bem, (1974), reintroduced the concept of psychological androgyny. "..many individuals might be both masculine and feminine, both assertive and yielding, both instrumental and expressive- depending on the situational appropriateness of these various behaviours". Androgyny is thus the blending of both positive masculine and feminine characteristics within one person, regardless of biological sex, or sexual orientation.

The idea of androgyny is not new, having roots in classical mythology and literature and more recently Jungian analytical theory. The integration of the masculine and feminine within oneself are seen as essential for personal growth and wholeness. Bem also viewed androgyny as an ideal. She regarded the androgynous

person as being very adaptive with a wider repertoire of behavioural responses than the strongly sex-typed person who might be limited in what was available to them because of the need to keep behaviour consistent with an internalised sex role standard.

IV. Measures of Sex Role Orientation

Current measures produce two separate scales to measure masculinity and femininity independently, and view the concepts as more complex dimensions than in the past. Each measure requires self description by the respondent, and men as a group score significantly higher than women on the masculinity scale, and women correspondingly, score higher on the femininity scale.

The five most frequently used scales in research and practice are the Bem Sex Role Inventory, or BSRI, (Bem 1974), The Personal Attributes Questionnaire or PAQ, (Spence, Helmreich and Stapp, 1974, 1975), The ANDRO scale, (Berzins, Weller and Wetter 1978) and the new M and F scales derived from the Adjective check list, (Gough and Heilbrun 1965 and Heilbrun 1976) and the California Psychological Inventory or CPI, (Gough 1957, Baucom 1976). As the measure that was adapted for this research is a modified version of a measure based on the BSRI (Smith

1981), this will be described in some detail. A brief comparison of three scales, taken from "Psychological Androgyny", Cook, 1985, is detailed in table 4.1 that follows.

Table 4.1
Summary of the Scale Characteristics of some Androgyny Measures

	BSRI	**PAQ**	**ANDRO**
Criteria item selection	Sex-typed desirability	Sex typicality	Congruence with BSRI and sex-typed desirability
Type of item	Positive adjectives	Positive adjectives	Behavioural statements
Number of items	20 per scale	8 per scale	28M 26F
Present. of items	Adjective list	Bipolar adjective	List of statements
Range of possible raw scores per scale	20-140	0-32	0-29M 0-27F

Source:
Cook, 1985, "Psychological Androgyny"

V. The Bem Sex Role Inventory

1.The Concepts

The BSRI measures masculinity, femininity and androgyny. A person who scores highly on either the M scale or the F scale is regarded as sex-typed and is someone "who has internalised society's sex -typed standards of desirable behaviour for men and women". (Originally, the difference between one's M and F score determined whether one was sex-typed or androgynous). Personality characteristics deemed 'masculine' or 'feminine' are not selected by the differential endorsement by males and females, as in the earlier scales referred to above, but on the basis of what is considered socially desirable for each sex. The original method of scoring assumed that an androgynous person had roughly equal amounts of masculinity and femininity. The modified scoring procedure, (Bem 1977), produced a fourth category of person who was neither sex-typed nor androgynous but 'undifferentiated'.

2.Item Selection

The pool consisted of 200 personality characteristics, which were positive, and either M or F in tone, and 200 that were neither M nor F in tone, and included equal proportions of positive and negative items. 40 undergraduate 'judges' assessed the desirability in American society, of each characteristic for one sex

rather than the other. 20 items were selected for the M scale, 20 for the F scale, and 20 neutral items for the Social Desirability scale, 10 of these being positive and 10 being negative.

3. Scoring

The BSRI is a self rating form. Respondents indicate on a 7-point scale, from 1, never or almost never true, to 7, always or almost always true, how they see themselves. The masculinity score is the mean self rating for the 20 masculine items, and the femininity score is likewise produced. The androgyny score was Student's t ratio for the difference between M and F. The greater the absolute value of the androgyny score, the more the person was sex-typed or sex reversed; the closer the score was to zero, the more the person was androgynous, and the t ratio would be non significant.

This scoring method was subsequently amended by Bem following criticisms that ignoring absolute numbers and emphasizing the proportional balance of sex role attributes was conceptually wrong, (Kelly and Worell, 1976). It meant that people who scored equally low on both M and F, would seem as androgynous as those who scored equally high on both. Bem revised her scoring procedure, and used that of the median split method recommended by

other researchers, (Berzins, Heilbrun 1976, Kelly and Worell 1976, Spence et al 1975). This produced 4 categories to which respondents were allocated according to whether their absolute mean scores were above or below the median: Androgyny, high M, high F; Masculine, high M low F; Feminine, low M, high F; Undifferentiated, low M, low F.

4. Psychometric Analyses

Bem administered the scales to over 900 undergraduate students. Alpha coefficients were computed as measures of internal consistency and were found to be greater than .8 for M. F. and the androgyny difference score. The M and F scales were also found to be empirically independent, (r = -.03). The near zero correlation between androgyny and the social desirability scale confirmed that the androgyny score was not measuring a social desirability response. Test-retest reliability over a 4 week interval was: M, r=.90, F, r=.90, A, r=.93.

Males scored significantly higher than females on the M scale, and vice versa. In the first undergraduate sample, 34% of the males, and 27% of the females were androgynous. In subsequent re-analysis of the data using the new method of scoring, Bem found that the two methods produced very

similar results in the defining of masculinity and femininity, but very different results for androgyny.

In the new analysis, 15.8% of males and 17.2% of females were categorised androgynous. She found that there were no significant differences between the undifferentiated group and the androgynous group on several measures, but they did differ significantly on self-esteem and a behavioural measure of responsiveness towards a kitten. She concluded that it was useful to separate the two groups , but stated "it is unclear whether the two groups differ fundamentally in their basic assumptions about gender. In other words, androgynous and undifferentiated individuals are alike in not being sex-typed". Bem recommended that for research purposes it was better to use the actual M and F scores rather than categories.

5. Criticisms of the BSRI

There is a continuing debate both about the validity of the BSRI as a measuring instrument, about the construct it is measuring, and whether sex typing is based on Gender Schematic processing, (Pedhazur and Tetenbaum 1979, Bem 1979, Bem 1981, Spence and Helmreich 1981).

Bem's answer to the criticism that the M and F scales were not supported by factor analysis was the development of a

short BSRI, based on factor analysis, and containing 10 items in each scale, (Bem 1981).

The conceptual criticism that remains is the non inclusion of any socially undesirable items in either scale. If the scales measure a stereotype, then that stereotype should include both positive and negative attributes. How a score for androgyny is best arrived at is another debatable point.

VI. Methods of deriving an Androgyny score.

All the measures mentioned above produce two separate M and F scales. Researchers are concerned about how different combinations of the two affect behaviour. Choice of scoring procedure should really be based on the purposes to which test results are to be applied as well as sound statistical and psychometric properties.

Methods currently used fall into the following categories:

1. M-F differences

a) The most straight forward is the simple difference between respondents' masculinity and femininity scores. The closer to zero, any individual's score is, the more androgynous they are.

b) Bem adjusted the difference according to the

variance among items comprising the M and F scales to give a t ratio. Individuals were sex-typed if their masculinity scores were significantly different from their femininity scores, (absolute value of t= 2.025, df=38 p .05). T ratio values that fell between plus and minus 1 were labelled androgynous. "Near masculine" and "Near feminine" fell between these cut offs.

An approximation can be obtained, when scoring the Bem scale, by multiplying the difference by 2.322, a figure based on Bem's original normative sample, (Cook,1984)

This method was initially preferred because it determined whether a persons self-description using masculine adjectives was meaningfully different, statistically speaking, from that using feminine adjectives. It also permitted comparison of distributions of sex-typed persons across various populations.

A conceptual criticism of the method is that it ignores the absolute strength of an individual's endorsement of M and F, (Spence and Helmreich 1979). It assumes a 'balance' of M and F is contributing to behaviour, and does not recognise that there might be a complex and more varied relationship. No distinction is made between those who are designated androgynous with low/low scores and those who

have high/high scores. Conceptually this is only important if the two groups are shown to be significantly different on various measures.

A statistical criticism, (Strahan, 1965), is that it violates the assumptions underlying Student's T. He suggested the use of the simple difference which is anyway highly correlated, (r=.98), with the t ratio.

c) The use of the absolute rather the signed difference between M and F. was advocated by Taylor and Hall, (1982). It obscures, however, sex by sex-role interactions. For example, a high scorer could have different combinations of M and F contributing.

d) Heilbrun, (1981), suggested the sum of M and F minus the absolute difference between the scores. This was intended to take into account both degree and balance of endorsement.

2.Additive methods

a) The most frequently used is the Median split recommended by Spence and Helmreich,(1979) and subsequently adopted by Bem. This has been outlined above. It is useful when the correlations between M and F and the

dependent variable are both linear, and the combination of the correlations is basically additive.

It has been labelled "crude and imprecise" in the classifying of individuals whose scores fall close to the median, (Pedhazur and Tetenbaum, 1979). When based on a specific sample, it is difficult to generalise results, unless standard cutting scores based on empirical norms, or on theoretical grounds, are used. Categorisation also leads to loss of information about the actual size of scores, there being no discrimination between the different members of the category, so comparisons can only be made between rather than within categories.

b) Variations on the median split method have been proposed, such as computing mean values for dependent variables of interest for each subject in each of the four categories, and doing a two way analysis of variance to test for main effect and interaction effect of masculinity and femininity. (Defronzo and Boucheau 1977). This is an alternative to using M and F scores in a multiple regression analysis.

3. Profile Similarity

Motowildo, (1981), recommended the use of the D^2 statistic, (Cronbach and Glaser 1953), to calculate

continuous scores for all four categories based on profile similarity.

Each individual occupies a position in a quadrant determined by two coordinates, in this case the M and F scores. The highest androgyny score would be equivalent to a position of 7:7, the highest masculinity score 7:0, and so on. The statistic compares the actual position or profile with the ideal. The formula for calculating the androgyny profile similarity score is as follows:

$$AP=72-[(M-7)^2+(F-7)^2]$$

This reflects (1) the degree to which two profiles are similar in elevation, the mean of scores that comprise an individuals profile

(2) scatter, or the amount of dispersion among scores comprising an individuals profile

and (3) shape, the residual information in the profile after elevation and scatter have been accounted for.

"Scatter and shape correspond to the notion of balance between masculinity and femininity scores that Bem, (1974), initially used as an operational definition of androgyny. Elevation corresponds to the notion of level in the contention of Spence et al, (1975), that people with

high scores on both masculinity and femininity should be differentiated from those with low score on both."

The scores derived in this way are continuous and range from 0-72, the latter being the highest level of similarity between an individual and the ideal profile. If required, subjects can be re-allocated to 4 categories on the basis of a median split of these derived scores.

Motowildo suggests the following advantages of scoring androgyny in this way:

a) the method does not rely on sample specific statistics

b) it permits finer comparisons between individuals with different sex role orientations

c) it facilitates the study of relationships between sex role orientation and other individual differences.

4. The method of choice will depend on how one wants to use one's data.

VII. Development of a scale

1. The Smith Questionnaire (SMITH, 1980)

A researcher at Southampton University compiled a measure of self-assessed masculinity and femininity, similar to the Bem questionnaire, but modified to overcome

what he regarded to be the shortcomings of Bem.

(i) He included items on both scales which were stereotypical but socially undesirable.

(ii) The rating of social desirability and undesirability was done by the subjects from whom the stereotypes were derived.

(iii) He advocated the median split method of scoring based on the median of the sample group rather than using a fixed mid-point.

a) Method of deriving items

200 subjects, 134 of these university undergraduates, and 66 white collar and clerical workers, each completed 5 different questionnaires. Each questionnaire had the same list of 120 descriptive adjectives. These were derived from previous studies and included attributes regarded as Masculine Desirable, Masculine Undesirable, Feminine Desirable, Feminine Undesirable, Masculine Ambivalent, Feminine Ambivalent, Masculine or Feminine Desirable and Masculine or Feminine Undesirable.

The subjects used a seven point rating scale to decide (1) the male sex stereotype, (2) female sex stereotype, (3) Self image (4) Social approval men get from society for displaying such characteristics, and (5) social approval for women.

b) The Scales

42 items were rated as stereotypical for men by both sexes. A further 42 items were rated as stereotypical for women by both sexes. These items were put in order of stereotypicality, according to the size of their F.Ratios in an analysis of variance. Items were then classified in terms of whether they were rated as desirable or undesirable for either or both sexes.

Smith found roughly equal proportions of desirable and undesirable items in each stereotype. He suggested this was because both kinds of item were on the original questionnaire. He also suggested that previous researchers had found the male stereotype to be more desirable than the female stereotype because of the inclusion of more socially desirable masculine items than socially desirable feminine items on previous questionnaires. This material was used to construct two shorter questionnaires.

2. This research

For the purpose of this research, and to enable some comparison with research based on the BSRI, a questionnaire was derived using the Smith items (with permission of the author). For each scale, M and F, the 20 regarded as the most stereotypical were selected and arranged in random order. (See appendix)

From table 4.2, you will see that the M scale contains 11 items desirable for men, 8 which are undesirable, and 1 which is neutral. The F scale, table 4.3, shows a different picture. 18 of the items are rated as socially desirable for women, and 2 only are undesirable. Therefore selecting items for the scales on the basis of "most stereotypical", leads to a more socially desirable F scale. The probability is that subjects of both sexes will score more highly on F than M. This is not too important when the median of the sample is used to assign subjects to categories.

Bem derived a shorter version of the original BSRI consisting of 10 M items and 10 F items. In view of the lack of balance in the Smith scale as described above, an attempt was made to select from the 40 items, 10 M and 10 F items which were more balanced as far as desirability for both sexes was concerned. Factor and reliability analyses were carried out on both versions of the Smith scale.

Table 4.2

Social Desirability of the Masculinity Scale Items

Masculinity Scale Items	Social Desirability Rating
Arrogant	Undesirable both
Stern	Undesirable both
Daring	Desirable M., Undesirable W.
Reckless	Undesirable both
Strong	Undesirable M., Undesirable W.
Ambitious	Desirable M., Neutral W.
Uses Harsh Language	Undesirable both
Coarse	Undesirable both
Willing to take Risks	Desirable M., Neutral W.
Masculine	Desirable M., Undesirable W.
Dominant	Undesirable M., Undesirable W.
Boastful	Undesirable both
Rational	Desirable both
Hide Emotions	Desirable M., Undesirable W.
Feel superior	Undesirable both
Achievement Oriented	Desirable M., Neutral W.
Aggressive	Neutral men
Loud	Undesirable both
Assertive	Desirable M., undesirable W.
Logical	Desirable both

Table 4.3

Social Desirability of the Femininity Scale Items

Femininity Scale Items	Social Desirability Rating
Likes Art and Music	Desirable both
Home-oriented	Desirable W., neutral M.
Feminine	Desirable W., Undesirable M.
Well-groomed	Desirable both
Soft-spoken	Desirable both
Appearance-oriented	Desirable both
Neat	Desirable both
Nagging	Undesirable both
Sensitive	Desirable both
Timid	Undesirable both
Gentle	Desirable both
Understanding	Desirable both
Warm	Desirable both
Appreciative	Desirable both
Tender	Desirable both
Able to express emotions	Desirable W., undesirable M.
Helpful	Desirable both
Affectionate	Desirable both
Emotional	Desirable W., undesirable M.
Tactful	Desirable both

3. Factor Analysis

This is a technique for simplifying information about variables that are correlated in order to interpret the data. "Factor analysis helps identify those underlying, not directly observable constructs", (Norusis, 1948). A factor has been described as "a construct operationally defined by its factor loadings" (Royce, 1963)

The object in this case was to confirm by factor analysis that the 40 variables from the Smith questionnaire could be at least partially explained by the 2 factors of masculinity and femininity. The purpose of a second analysis was to confirm that a reduced list of 20 variables, selected for the balance of social desirability' also represented the same two factors. A possibility for further research, beyond the scope of this project, would be to use the results of the analysis to identify items for a new shorter questionnaire.

The 40 variables, Q01 - Q40, were entered into the analysis. 139 cases were used. The analysis had 4 stages: computing the correlation matrix; extracting the factors; rotation in order to make them more interpretable; and computation of factor scores for each case.

a) The Correlation Matrix

The correlations among the variables give an indication of the existence of underlying factors. For a sample this size, it is regarded as prudent to look for correlations whose absolute value is at least .3 (Child,1978). With a sample size of 100, a correlation of .255 is significant at the 1% level, .194 at the 5% level, so we would be erring on the side of caution. Table 4.4 summarises the correlations for the variables regarded as stereotypically feminine, and table 4.5 gives the same information for the masculine variables.

All the correlations of .3 and above, with one exception, were in the expected direction; masculine variables correlated positively with masculine variables and negatively with feminine ones. The exception was 'Achievement-oriented' (M.scale) which positively correlated with Neat (F.scale), and suggested that one of the variables was not a good item for the scale. The number of correlations of this size is less than one would hope for. Conceptually, however, M and F are regarded as independent, and small and insignificant correlations between variables from the two scales, are preferred to many large negative ones.

Table 4.4

Summary of Correlation Matrix for Femininity Scale Items

Femininity Scale Items	Number Coefficients equal to or greater than .3	
Likes Art and Music	3 positive	
Home-oriented	1 positive	3 negative
Feminine	2 positive	2 negative
Well-groomed	2 positive	1 negative
Soft-spoken	3 positive	
Appearance-oriented	3 positive	
Neat	4 positive	1 negative
Nagging	none	
Sensitive	7 positive	1 negative
Timid	1 positive	5 negative
Gentle	4 positive	1 negative
Understanding	7 positive	
Warm	5 positive	2 negative
Appreciative	2 positive	1 negative
Tender	7 positive	
Able to express emotions	5 positive	1 negative
Helpful	3 positive	
Affectionate	7 positive	
Emotional	7 positive	3 negative
Tactful	1 positive	1 negative

Table 4.5

Summary of Correlation Matrix for Masculinity Scale Items

Masculinity Scale items	Number of coefficients equal to or greater than .3	
Arrogant	7 positive	
Stern	none	
Daring	5 positive	2 negative
Reckless	3 positive	1 negative
Strong	3 positive	
Ambitious	2 positive	
Uses Harsh Language	6 positive	3 negative
Coarse	none	2 negative
Willing to take Risks	4 positive	2 negative
Masculine	5 positive	4 negative
Dominant	5 positive	
Boastful	6 positive	1 negative
Rational	1 positive	1 negative
Hide Emotions	none	3 negative
Feel superior	2 positive	
Achievement Oriented	2 positive	
Aggressive	7 positive	1 negative
Loud	9 positive	2 negative
Assertive	5 positive	1 negative
Logical	2 positive	1 negative

b) Factor Extraction

The method used was principal axis factoring, similar to principal components. Two factors were specified. With this method, the first component is the one that accounts for the largest amount of variance in the sample. The second component is not correlated with the first. In theory there could be as many factors as there are variables. The total variance explained by each factor or variable is the Eigenvalue. All variables and factors are expressed in standardised form with a mean of 0 and a standard deviation of 1. When there are two factors, the total variance, (the sum of the variance of each variable) will be 2.

In this analysis, the factor matrix showed two general factors, one accounting for 60.5% of the variance, the other 39.5%. Inspection of the loadings, or correlations of the variables with the factor, suggested that factor 1 was femininity and factor 2 masculinity. The communality of the variables was in all cases quite low suggesting considerable unique variance. Taking the factors individually, the first 11 accounted for only 68.6% of total variance, suggesting that more than a two factor solution was necessary to explain the data, possibly because masculinity and femininity are global concepts with sub-scales within them.

c) Rotation

The method chosen was Varimax. This is an orthogonal rotation to a simple structure. It attempts to minimise the number of variables that have high loadings on a factor and thus aid interpretation. It can be demonstrated graphically using the factor loadings as co-ordinates. (See table 4.6). The variables at the ends of the axes have high loadings on the factor. The variables near the origin have small loadings on both factors. Variables not near either axis are explained by both factors.

This method was chosen because the constructs M and F are considered to be independent. (With hindsight, an oblique rotation might have been as useful. Norusis argues that even if factors are uncorrelated in the population, they need not be in the sample. "Oblique rotations have often been found to yield substantively meaningful factors". Kline states that an oblique solution is necessary in order to extract higher order factors.)

Rotation does not change the total variance, but only the proportions explained by each factor. After rotation, the masculine and feminine variables had loadings on the two factors as shown in tables 4.6 and 4.7.

19 of the feminine items loaded positively on the first factor. Of these, 12 had negative loadings on the second factor. 15 items had positive loadings on factor 1 that were equal to or greater than .3. Of these, 7 had small positive loadings on the second factor. The negative loadings on factor 2 were weak, with the exception of three items which did not have strong loadings on 1: Home-oriented, Soft-spoken and Timid. The last item in fact loaded negatively on both, although more so on factor 2 than factor 1.

Similarly, 19 of the masculine items loaded positively on the second factor. Of these, 13 had negative loadings on the first factor. 13 of the items had positive loadings on factor two which were equal to or greater than .3. There were more masculine items (6 in fact) which had large negative loadings on the factor describing femininity than there were feminine items with large negative loadings on the masculine factor. Three of these were 'good ' M items (Arrogant, Uses Harsh language, Masculine), two of the others, Coarse and Logical, had small loadings on Factor 2, and Hides Emotions, had a small but negative loading on factor 2.

Table 4.6

Femininity Scale, Factor Loadings

Feminine items	**Factor 1**	**Factor 2**
Likes Art and Music	0.31148	0.05834
Home-oriented	0.03666	- 0.37052
Feminine	0.50448	- 0.26456
Well-groomed	0.46438	- 0.02363
Soft-spoken	0.09258	- 0.38156
Appearance-oriented	0.23943	- 0.11165
Neat	0.34654	- 0.15119
Nagging	0.02941	- 0.01627
Sensitive	0.54894	- 0.12700
Timid	- 0.05145	- 0.53470
Gentle	0.48920	- 0.19073
Understanding	0.57214	0.18242
Warm	0.68346	0.22776
Appreciative	0.41440	0.13537
Tender	0.66620	- 0.08440
Able to express emotions	0.63611	0.09495
Helpful	0.40313	0.14434
Affectionate	0.58452	0.07883
Emotional	0.60532	- 0.01976
Tactful	0.34489	- 0.16571

Table 4.7

Masculinity Scale, Factor Loadings

Masculine items	**Factor 1**	**Factor 2**
Arrogant	- 0.31556	0.39732
Stern	- 0.15124	0.12185
Daring	0.02159	0.67103
Reckless	- 0.15277	0.43516
Strong	0.06719	0.45547
Ambitious	0.07452	0.39944
Uses Harsh Language	- 0.33200	0.45470
Coarse	- 0.46888	0.20065
Willing to take Risks	0.00688	0.59002
Masculine	- 0.45630	0.35016
Dominant	- 0.10796	0.55317
Boastful	- 0.29160	0.37787
Rational	- 0.19243	0.07884
Hide Emotions	- 0.47939	- 0.04018
Feel superior	- 0.26924	0.24549
Achievement Oriented	0.04018	0.23979
Aggressive	- 0.22363	0.58665
Loud	- 0.07416	0.67558
Assertive	0.07264	0.62620
Logical	- 0.34449	0.09620

Generally, the loadings on the two scales seem to support the concept that items which are regarded as stereotypically M or F, are not necessarily correlated with the opposite scale.

If the scales were to be shortened on the basis of the factor analysis, Timid would be regarded as a doubtful item on the F scale, and Home-Oriented, Soft-Spoken, Appearance Oriented and Nagging, as not very good. On the M scale, Hide Emotions is a doubtful item, and Logical, Stern, Coarse, and Rational, also have small loadings on the factor.

4. Reliability Analysis

This analysis was carried out using the originally selected 20 items of each scale, as confirmed by the factor analysis, and also on a shorter version with 10 items per scale. The latter was an attempt to improve consistency and make the scales more balanced in terms of 'Desirability' but the latter proved difficult. For each scale, the total sample of 139, and men and women separately were analysed. The procedure performs an item analysis on the components of additive scales. Ideally, the sample should have been at least 200, (Kline, 86)

a) The Masculinity Scale

The means for each item ranged from 4.9 (logical) to 2.5 (coarse). Out of the 380 separate correlations in the correlation matrix, 39 were .3 or more, and a further 44 were .2 but less than .3.

The item total statistics showed that the alpha coefficient, the most efficient measure of reliability, was .82168. The mean of the item means was 3.75991. The item total correlation, that is the correlation between each item's score and the scale score, supported the findings of the factor analysis. Four items had correlations of less than .3. These were, Stern, Rational, Hides emotions, and Logical,

b) The Femininity Scale

The mean of this scale was 4.34245, with item means ranging from 5.4 for Likes Art and Music, to 2.7 for Nagging'. In the matrix, 37 correlations were equal to or greater than .3, and a further 45 were equal to or greater than .2.

The item total statistics gave an alpha coefficient of .80228. Of the item total correlations, 10 were .3 or above, 4 were less than .2. These were Home-oriented, Soft, Nagging and Timid.

Similar results were obtained in the separate analyses of men and women. The alpha coefficients obtained were as detailed in table 4.8 that follows:

Table 4.8

Internal Consistency of the M and F Scales

	M Scale	F Scale
	alpha coefficients	
Total Sample	.82168	.80228
Males	.82962	.80472
Females	.78741	.77021

5. Improving the Scales

The scales as described were in some respects less than perfect. They were unbalanced as far as the socially desirable items were concerned and they contained some 'poor' items. A shorter version of each scale might have overcome these difficulties. This could have been achieved in a number of ways:

a) Taking items with the highest loadings on the factor.

This would mean dropping 4 items with loadings of less

than .2 from the M scale, leaving 7 undesirable items, 1 neutral and 8 desirable. Removing 4 items with low factor loadings from the F scale, left 16 desirable items.

b) Trying to achieve a better balance of social desirability.
This was not possible because the original pool of 40 had very few undesirable items

c) Selecting items with the highest item-total correlations.
This resulted in the items shown in table 4.9 below. Again all ten F items were desirable. 5 of the M items were desirable, and 5 were undesirable. The alpha coefficient for the M scale was .81 and for the F scale .82, with 139 subjects.

d) Including only those items which were desirable.
This would have left only 9 items in the M scale, and there were only 4 to eliminate on the F scale. It was also contradictory to the original thesis that a stereotype consists of both desirable and undesirable behaviour. There is an argument, however, that for some people, notably Bem, androgyny is possessing the 'best' of both stereotypes.

Table 4.9

Items with the largest factor loadings on the M and F Scales

Masculinity	**Femininity**
Assertive	Emotional
Loud	Affectionate
Aggressive	Able to express emotions
Dominant	Tender
Risks	Warm
Harsh Language	Understanding
Strong	Gentle
Reckless	Sensitive
Daring	Well-groomed
Ambitious	Feminine

Table 4.10

Items with the largest item-total correlations

Masculinity	**Femininity**
Arrogant	Feminine
Daring	Well-groomed
Uses harsh language	Neat
Risks	Sensitive
Masculine	Gentle
Dominant	Understanding
Boastful	Warm
Aggressive	Tender
Loud	Affectionate
Assertive	Emotional

Conclusion

The scales used in the analysis could have been improved, but as all 40 items were the most stereotypical, and the alpha coefficients were high enough for the scales to be reliable, it was decided to use these original scales rather than a shorter version as in (c) above, where there was still an imbalance as far as social desirability was concerned.

V. Antecedents and Correlates of Androgyny

I. Introduction

In the last ten years or so Psychological Androgyny, as a relatively new concept, has been widely researched. Summarising this research is difficult for a number of reasons, both sheer volume, and methodological variations which will be mentioned later, but a very comprehensive overview is given in "Psychological Androgyny", (Cook 1985), to which I shall refer. Two meta-analytical studies, (Bassoff and Glass, 1982, and Taylor and Hall, 1982) help to overcome some of the conceptual difficulties of summarising very diverse research. Whitley, (1983), described a meta analysis as "a quantitative evaluation of a set of empirical studies that integrates the results of their statistical analyses".

The purpose of this chapter is to:

(i) highlight the areas of agreement with regard to family background variables as determining factors in the development of androgyny or sex role behaviour that is not congruent with biological sex, and

(ii) to look at the correlates of androgyny, both traits as measured by paper and pencil tests, and

behavioural outcomes. The justification for this is that it may give some insight into the reasons why some men and women do make non-stereotypical educational choices.

II. Methodological variations in the Research

There are many different measures of androgyny, as described in chapter IV. The content of the different scales vary in breadth. Much of the research has used the BSRI whose M and F scales are regarded as broad global constructs which are closely related to other gender related variables. Other measures such as Spence and Helmreich's PAQ are more narrow in concept, with scales that measure primarily a person's endorsement of instrumental and expressive personality traits.

Scales also vary in the inclusion or not of socially undesirable items. Methods of scoring are also different. Associations that are found between different variables and sex roles however measured, may also depend on the populations that are sampled.

Research into the convergence between the scales shows that it is "not as high as would be desirable for scales presumably measuring the same construct, (Cook, 1985). Wilson and Cook, (1984), report that the median correlations for all possible pairs of major androgyny

measures to be .65 for the M scales and .53 for the F scales.

Bassoff and Glass (1982), in a meta analysis using 26 studies, showed that regardless of measure, the average correlations between various indices of mental health and M and F were similar. Cook feels however that some subtle relationships may only be discernible with specific measures.

The different methods of scoring were described in the last chapter. These differences not only suggest different statistical analyses (main effect or interaction between M and F) but may also lead to differences in classification of individuals (Wilson and Cook, 84), and the validity of the conclusions drawn.

Much of the research has used college students, usually American, nearly always psychology undergraduates. This makes generalisation to other samples of doubtful value.

Some research has used paper and pencil tests to measure traits. Other experiments have looked at behaviour under laboratory conditions. Whether either of these approaches are valid predictors of real life behavioural outcomes is debatable.

Finally, Cook states that many pieces of research are single efforts without any follow up, and with results that confirm only part of a hypothesis.

III. The assumptions underlying the Androgyny research

These are summarised and commented on as follows by Cook:

(1) Masculinity and femininity are independent dimensions.

She does find that current measures do represent expressive/communal and instrumental/agentic distinctions. These are independent, but some scales are multi-dimensional and different aspects of M and F may be measured.

(2) The dimensions have important implications for diverse sex role related characteristics and behaviours.

"Sex role phenomena are likely to be multi-dimensional and multi-determined, rather than exhibiting a straight forward connection to masculine and feminine traits. In particular, the role of situational factors needs to be recognised"

(3) Each dimension has a powerful impact on behaviour.

She finds only partial support for this. Femininity has predictive value for some characteristics, but research demonstrates stronger and more frequent effects for masculinity.

(4) Specific combinations of M and F have a 'systematic, theoretically consistent, effect on behaviour'

The research tests this out by assigning individuals to one of 4 sex role categories: androgyny, masculinity, femininity, undifferentiated. There is the expectation that members of each category will behave in predictably different and meaningful ways.

The research does not show the differences expected. Cook states that any differences may simply be directly related to the masculine and feminine definitions built into the androgyny scales. Biological sex of the subjects may also affect results, see (5) below. Bernard, (1980), found that there was significant discrimination, $p>.01$, between the four categories for male subjects, but androgynous and masculine women were not significantly different, nor were feminine and undifferentiated women.

(5) Biological sex interacts with M and F to produce variations in behaviour.

Androgyny research concentrates on within sex rather than between sex differences. Sex by sex role interaction also needs to be explored. "Androgynous men and women who share an absence of traditional sex typing, may still differ from one another in important respects. (Cook, 1985).

Heilbrun, (1984), found that androgyny was more advantageous to women than men.

(6) Androgyny, that is high levels of both M and F, is an ideal.

This was the view of Bem, and it is seen by others as a superior stage of development. "The process of becoming a fully androgynous person is the goal of a lifetime, an evolution towards wholeness and full expression of potentiality" (Olds, 1981). Another view is that there might be negative consequences to consider. (see below)

IV. Antecedents of Androgyny

Olds, (1981), in "Fully Human" discusses the process of becoming androgynous rather than traditionally sex-typed for both men and women. He found that androgynous men were closer to their mothers than their fathers in childhood. They tended to have three or more brothers, and felt positively about childhood friends who were non-traditional. During adolescence they were more negative about athletic experiences, and tended to be more academically oriented. Their significant relationships were with women, and they chose men-friends who were more sensitive. Olds stressed the impact of "the influence of positive, personal relationships with strong career women or feminists".

Androgynous women also viewed their mothers as being "strong, independent, active or dominant". They too were positive about non traditional childhood acquaintances. Both feminine and androgynous women were likely to be closer to their mother than their father, but whereas the feminine woman was "Daddy's girl", the androgynous woman had a more intense relationship. "It is the nature of the relationship provided by the father, and the type of behaviour and personality characteristics that are rewarded by the father that seem to constitute the important difference for androgynous women".

Androgynous women also tended to be oldest girls. Olds felt, however, that for women, adolescence was the important stage. Androgynous women liked school, did well academically, and were encouraged for achievement. They saw themselves as ambitious, relatively introspective, and independent thinkers from an early age. Adolescence could be unhappy and insecure because of the confrontation with traditional female role requirements. Olds felt the key factors were the influence of other women as non-traditional role models who reinforced non-traditional behaviours. "Half of the androgynous women described coming from high-achieving, striving, or radical intellectual families and cultural heritages, of having fathers who pushed and rewarded achievement or

assertiveness, and mothers who encouraged them to be able to support themselves and advance in school".

Support given by husbands or other significant males, the influence of the women's movement, and the impact of experiences which required greater independence were also important.

Other research also high-lights the differential effect on the sex role development of men and women of different child-rearing practices. Cook summarises as follows:

(1) Sibling family structure differentially affects the relative degree of M and F in men and women, (Lamke et al, (1980) and Shaw and Rodriguez, (1981)). The latter found that androgynous and masculine subjects were more likely to be first or only children than the feminine and undifferentiated group, suggesting that high M, irrespective of the degree of F, was the important factor.

Lamke et al found that the number of older brothers was related to androgynous sex role development in females. Perceived closeness to older sisters was related to androgynous sex role development in males.

(2) The participation of the father in household tasks also has an effect, (DeFronzo and Boudreau (1979)).

(3) Men and women assigned to the same sex role category (e.g: androgynous men, androgynous women) reported different child rearing experiences, (Kelly and Worell, (1976)). This research used a sample of 181 male and 300 female undergraduate psychology students. For men, androgyny correlated with 'elevated affection from both father and mother', femininity with warmth from mother, and masculinity and undifferentiation with coolness.

For women, androgyny correlated with greater maternal reinforcement for being curious, greater maternal involvement, and less father permissiveness. Kelly and Worell saw these findings as being consistent with a social learning theory of sex role acquisition, and they felt androgyny for both sexes was more likely when the same sex parent exhibited cross-typed characteristics.

(4) Spence and Helmreich, (1978), found associations for each sex, between M and F and the respondents' perceptions of and relations with parents.

- few young men identified with their mothers
- for young women, the influence of mother and father were rated equal more often, or equally divided between

them both.

- young women were more responsive to their parents masculine characteristics than sons were to their parents feminine characteristics

- sons were likely to score high on feminine characteristics only if both parents or father were perceived as androgynous.

- young women were likely to be androgynous if either both parents or one parent were androgynous

Spence and Helmreich concluded that patterns for young women's development were more complex than for men.

In conclusion, the literature suggests that "the process, likelihood and implications of becoming androgynous, may be different for men and women", Cook (1985). Block, (1976) suggests it is easier for a man to adopt some feminine characteristics than it is for a woman to adopt masculine ones. Challenging social norms requires the masculine qualities a man already possesses. On the other hand, men are less likely to adopt androgynous preferences. "women have more to gain now from becoming more masculine than men would from femininity, whose benefits are often unseen, underplayed and devalued", Cook (1985)

V. Correlates of Androgyny

The following comments make no attempt to distinguish between research based on self reported traits, behavioural outcomes in a laboratory situation, and actual outcomes, but reference has already been made to the difficulties in comparing results.

1. Psychological Development

Androgyny is viewed as a stage of development superior to that of non androgynous persons, (Olds, (1981)). This is comparable with the Jungian view of 'Individuation', the bringing together of all aspects of oneself, including the masculine and the feminine. Higher levels of psychological development may be "associated with the development of self concepts reflecting an integration of the agentic concerns, self enhancement and self extension, with the satisfactions deriving from communion and mutuality", Block (1976).

More recent research does support the hypothesis that androgynous typed people receive the most favourable scores or classifications on various indices of psychological development, (Amstey and Whitbourne (1981), Nettles and Loevinger (1983).) Androgynous men and women are liked best by others and are seen as adjusted, (Mayor et al, (1981).)

2. Self Esteem

The literature suggests three alternate models: (a) sex role congruence with gender being associated with high self esteem; (b) androgyny in both men and women being associated with high self esteem; and (c) the masculinity component being associated with high self esteem.

Early research suggested a positive relationship between self esteem and masculinity/femininity for both sexes, with the same rank ordering of the sex role categories: A, M, F, U., Spence et al (1975), and Wiggins (1978). Both feminine typed men and women were lower in self esteem than the masculine typed.

Numerous other researchers, Wetter (1975), Bernard (1980) and Giguet (1977) and Flaherty and Dusek (1980) had found that it was mainly the masculine component of androgyny that correlated with self esteem, (model c). When a significant relationship ω4≤ present for femininity, it was for women only. (model a).

Flaherty (1980) had used the BSRI and the Coopersmith scale to measure academic self-esteem. In his sample of 156 psychology students, self esteem positively correlated with masculinity in both men and women and femininity in

women. The women as a group had higher self esteem on this measure than the men.

Heilbrun, (1981), found that androgynous women were higher on self esteem than the other sex role types. Androgyny in men was less advantageous in this respect. The earlier research of Jordan, (1976) had also found that in women androgyny correlated with self esteem.

Bernard Whitley, (1983), in his review of the research using a meta analysis of 38 previous studies, found that masculinity, femininity and the interaction of the two were all positively related to self esteem, but confirmed that masculinity carried the most weight. He found no support for the congruence model. In addition, he found that the strength of any correlation depended both on the sex role measure (whether socially undesirable items were included or not) and the type of self esteem. For example, social self esteem, a specific component of global self esteem, was more closely related to masculinity than other types of self esteem.

Different patterns of relationships between M, F and self esteem have been found for adolescents, Lamke (1982), Wells (1980).

3. Attitudes about Sex Roles

For women, relationships between masculinity and femininity and different attitudes have been found. Less traditional attitudes are associated with higher levels of masculinity, Jones et al (1978), Orlofsky et al (1977). Yanico (1982), reported that androgynous women held less stereotyped attitudes about traditional female occupations than sex-typed subjects of both sexes. It is these attitudes that presumably lead to less traditional behaviour. Atkinson and Huston (1984) found that there were complex relationships among sex-role attitudes, M and F and performance of feminine and masculine- typed household tasks that differed by sex.

4. Attributions re Success and Failure

Brewer and Blum (1979) found a link between sex role identification for women and attributions regarding achievement in mathematics and science. Androgyny was found to be causally related to internal control over mathematics/science achievement. There was no similar relationship for men, or for women in non mathematical/science areas.

5. Career Choice, Creativity and Achievement

It would be expected that one behavioural outcome of non traditional sex-typing would be a non traditional career

choice. Bem (1975) had found that women who were androgynous were less dependent and conformist, in a laboratory situation. She hypothesised that sex-typed people would use gender as cognitive schema to organise and process information to a greater extent than do androgynous people, (Bem 1981).

Stein and Bailey, (1973), did find that masculine typed women achieved in non-stereotypical areas, they did not necessarily have a low identification with the female role, ~~ALTHOUGH~~ they did have a relatively high masculine role identification. Gaddy et al (1983) found that masculine typed women were more likely to return to employment after having children than feminine typed women.

Williams and McCullers (1983) also found that masculine women chose atypical careers. Previously, Yanico et al (1978), had found that women who had chosen Engineering courses were more androgynous than men in Engineering and women in Home Economics.

Clarey et al (1982) used the BSRI and a career preference questionnaire to explore the relationship between sex roles and attitudes towards traditional and non traditional careers. They reported correlations between

sex role identity and both preference and perception of preferred career.

Motowildo (1982) using the BSRI and supervisors ratings at work, on a sample of 38 men and 24 women, found that the highly androgynous were more accepting of non traditional job changes and were more supportive of others who took on non traditional jobs.

Antill and Cunningham (1982), investigating the relationship between sex-typing and performance on ability tests, found that masculine typed men and women did better on mechanical ability tests, but there were no sex role differences in performance on a speed and accuracy test. Signorella and Jamison (1986) found no evidence for an association between androgyny and better cognitive performance.

Hargreaves (1981) found that there was a significant interaction effect of masculinity/ femininity on the creativity of 9-11 year old girls.

Tinsley et al (1983) in an undergraduate study, found that androgynous and opposite sex typed students had greater conflict over career choice because of the difficulty in

choosing an occupation that led to 'cognitive consistency'.

6. Greater Behavioural Flexibility

Behavioural flexibility has been held out as being the main benefit of androgyny and the reason why androgyny is seen as an ideal state. Possession of the 'best' masculine and feminine characteristics that one can exercise appropriately according to the circumstances, leads to adaptive behaviour, Bem (1974), Bem, Martyna and Watson (1976), and Kelly and Worell (1977). As noted already, however, an androgynous person may also experience greater conflict because they will prefer gender appropriate activities less than appropriately sex typed persons, Bem and Lenney (1976).

Flaherty and Dusek (1980), produced results that supported Bem's theory of greater flexibility, but Bernard (1980) using the BSRI and Cattell's 16 Personality Factor questionnaire (16PF), rejected the hypothesis that androgynous people were more competent and adaptable. He was measuring 'traits' however, and commented "Behavioural validations have supported the behavioural flexibility of androgynous males and females, whereas trait measurement may be more susceptible to the social desirability of masculinity"

Reference has already been made to Motowildo's research, (1982), where he found that people high on androgyny showed greater adaptability at work,

Wiggins and Holzmuller (1973) reported that androgynous men were more flexible in their interpersonal behaviour than androgynous women. They did however, use measures that took into account a wider view of interpersonal behaviour (and not therefore the same as Bem's 'adaptive' behaviour) and which included less desirable dimensions. They found significant interactions between gender and sex role classifications on six out of eight interpersonal variables.

Jones et al, however, (1978) found that personal flexibility and adjustment were associated with the presence of masculine traits rather than both masculine and feminine ones. He found that it was masculine women who were the most flexible, and feminine typed people, both men and women, preferred to be masculine. He felt the theory was not adequate for men. He found that feminine men were less secure and flexible in numerous areas, the exception being androgynous men in areas of creativity and political awareness.

Heilbrun (1981) also found that women gain more from being androgynous than men.

7. Positive Mental Health

Some research seems to indicate that the outcomes of androgyny are better for women than men, (refer to Heilbrun below). Women who are androgynous are more adjusted and less anxious, Llewellyn (1981), Jordan (1975), Mayor et al (1981)

Flaherty and Dusek (1980) found that androgynous subjects scored higher than undifferentiated ones on adjustment, and androgynous and masculine ones scored better than feminine and undifferentiated types on leadership and achievement.

Jones,(1978), found that men were less adaptive, particularly feminine men. Neville, (1975), found that androgynous persons, although high on self esteem, and low on psychoticism were high on neuroticism.

Two meta analytical studies, Bassoff and Glass (1982) and Taylor and Hall (1982) have attempted to summarise previous findings. Bassoff analysed 26 previous studies, and found that overall androgynous and masculine types scored better on all measures than feminine types. He also

found that masculinity made a more powerful contribution than femininity. The Taylor and Hall study also found that it was masculinity that predicted psychological well-being.

8. Psychological Disturbance

Heilbrun (1976), found that fewer androgynous and more undifferentiated women were seeking help from a university counselling service. In general, there were lower levels of masculinity in groups with adjustment problems. Berzins et al (1978) reported that "within both sexes, psychopathology appears to be associated with normatively low masculinity scores and among men but not women, with somewhat elevated femininity scores".

VI. Conclusion

Is androgyny an ideal? Cook suggests not. There are negative aspects of both masculinity and femininity, and possible negative consequences of androgyny. An androgynous balance can be dysfunctional, Kaplan (1979). Behavioural flexibility can lead to conflict in situations where conflicting response tendencies are elicited, Kelly and Worell (1977). Androgynous persons may suffer from ambiguity in social situations, Kaplan and Sedney, (1980). There may be intrapersonal conflict for the androgynous

person making a career decision, Tinsley et al (1983). Androgynous women with liberal sex role attitudes have a more difficult time making career decisions than their traditionally sex typed peers. "Androgyny may carry some specific liabilities for individuals that have not been recognised", Cook (1985)

The research does seem to suggest that it is more advantageous for women than men to be either androgynous or opposite sex-typed. The influence of masculinity rather than the interaction effect of both masculinity and femininity seems to be the more important.

The implications for further research are that the following should be investigated:

(1) sex by sex role interactions

(2) the behaviours related to the four categories,

and (3) the effects of M and F separately on outcomes such as educational choice.

It would appear that as androgyny affects men and women differently, the reasons for women choosing science may not necessarily be the same as those that men have for choosing languages, if in fact non traditional educational choice is related to androgyny.

VI. The Pilot Study

I. Introduction

This study used a small sample of students who were studying 'A' levels at a tertiary college. The initial aim of the exercise was to confirm that the choice of school subjects showed gender bias, or as Ormerod, (1975), maintained, the subjects themselves had a gender in the sense that they were part of the male and female stereotypes. Physics was selected as the science subject, and French the modern language.

The second aim was to try out the adapted version of the Smith inventory described in chapter IV, and to see if there were any informative associations between sex role categories and traditional and non-traditional educational choices that might warrant a further larger scale study.

II. The Sample

This consisted of 41 students, 24 male and 17 female, all in the first year of a two year course consisting of three, and in some cases, two or four, 'A' level subjects. Their age range was 16-18 years. The tertiary college which was in an outer London borough, provided all post 16

state education for that area. The students who took part were selected because of their membership of particular teaching groups, (two physics and two French), whose lecturers had agreed to cooperate. These two subjects were chosen as they were identified as being masculine and feminine respectively on Ormerod's gender spectrum (Ormerod 1975), and at opposite ends of the continuum. Although at sixth form level choices are not always strictly polarised into arts-science, and many student do take mixed courses, the majority of the physics students were taking straight science courses. The language students, however, tended not to be foreign language specialists. A breakdown of their courses can be seen in the appendix.

III. Choice of Subject by Sex

The breakdown of the subject choices, see table 6.1, confirmed the general expectation that more boys than girls will enrol for a physics course, and more girls than boys will choose French. The chi square test of association showed this was significant. $p < .001$

Table 6.1

Choice of 'A' level subjects by sex

	French		Physics		Total	
	N.	%	N.	%	N.	%
Boys	5	27.8	19	82.6	24	58.5
Girls	13	72.2	4	17.4	17	41.5
Total	18	100.0	23	100.0	41	100.0

IV. The Questionnaires

All subjects were asked to complete the sex role inventory and a brief personal questionnaire indicating:

(a) type of previous education

(b) members of family and their occupations

(c) the person responsible for their upbringing

(d) why they had chosen that particular 'A' level (physics or French) as part of their course

(e) their immediate educational/ career intentions and

(f) what they hoped to be doing in ten years time.

V. Findings

A. The Sex Role Inventory

For the group as a whole, the median scores for masculinity and femininity were 3.35 and 4.3 respectively. These scores were used to assign subjects to one of four categories; Androgynous, Masculine, Feminine, Undifferentiated, according to the median split method described in chapter IV.

The boys obtained a slightly higher mean score than the girls on masculinity, and a lower femininity score, as one would expect. (See table 6.2 that follows). These differences do not appear to be significantly different. The pearson correlation between the two scales was -.06, that is a very small and insignificant association, suggesting independence of the two scales.

The overall means for M and F were 3.4 and 4.2 respectively, suggesting that either that the sample were particularly feminine, or as seems more likely, the nature of the scales produced that effect.

As the median split method of assigning cases to sex role categories was adopted, (see chapter IV), the differences in the means was not considered important.

Table 6.2

Sex role by sex, mean scores

	Masculinity mean score	Femininity mean score	
Boys	3.35	4.0	(N=24)
Girls	3.3	4.3	(N=17)

Table 6.3 shows the breakdown of subject choice by sex:

Table 6.3

Sex role, subject choice and sex

Mean scores

		Masculinity mean score	Femininity mean score	N
Boys	Physics	3.6	3.9	19
	French	3.3	4.4	5
Girls	Physics	3.8	4.3	4
	French	3.2	4.3	13

Some possible differences are now apparent;

- the boys who chose physics were more masculine and less feminine than the boys who chose French.
- the girls who chose physics were more masculine than the girls who chose French, but were similar in femininity.
- the boys who chose French were more feminine than the girls who chose French, but were also more masculine.
- the girls who chose physics were more masculine than the boys who chose physics, and were also more feminine.

As both the sample size, and consequently the cell sizes were very small, these comments are only tentative.

The breakdown of the sample group by sex role category can be seen in table 6.4 that follows. 26.8% of the entire group were androgynous, with a greater percentage of the girls being so classified. Nearly half the girls, 47% were feminine, and very few were either masculine or undifferentiated. Nearly 30% of the boys were masculine typed, and a very high percentage, 25%, were feminine, thus accounting for the very large overall group percentage of 34.1% who were classified feminine. As

noted earlier, the overall mean score on femininity was higher than the masculinity score.

Although as expected, a greater percentage of boys than girls were masculine typed, and a greater percentage of girls than boys were feminine typed, the picture does not approximate to the findings of other studies using larger samples. In the BSRI normative sample, 39% of the females were feminine, 12% masculine, 30% androgynous, and 18% were undifferentiated. The corresponding male percentages were 12, 42, 20 and 27. In this small sample, relatively fewer boys were masculine typed, and more were feminine typed. There were also more feminine typed girls and fewer classified as undifferentiated. The numbers classified as androgynous were fairly similar.

Within the subject choices, it would appear that:

- no masculine typed boys chose languages
- boys who did choose languages were A, F or U
- some boys who were A, F or U chose French
- only 1 feminine typed girl chose Physics compared with 7 who chose French
- no undifferentiated typed girls chose physics
- androgynous and masculine typed girls chose both

Table 6.4
Breakdown of sample by sex role category

	A	%	M	%	F	%	U	%	N	%
Boys										
Physics	4	66.7	7	100.	4	66.7	4	80.0	19	79.2
French	2	33.3	0	0	2	33.3	1	20.0	5	20.8
Total	6	100.	7	100.	6	100	5	100	24	100
Row %		25.0		29.2		25.0		20.8		100
Girls										
Physics	2	40.0	1	50.0	1	12.5	0	0	4	
French	3	60.0	1	50.0	7	87.5	2	100	13	
Total	5	100	2	100	8	100	2	100	17	100
Row %		29.4		11.8		47.0		11.8		100
Total (%)	11	26.8	9	30.0	14	34.1	7	17.1	41	100

A androgynous, M masculine, F feminine, U undifferentiated

If we combine the choices of the boys and girls into stereotypical and non-stereotypical, and re-classify the sex role categories into those that are congruent with biological sex (same) and those that are not (opposite),

we find that those who made non-stereotypical choices tended to be androgynous or opposite sex typed rather than similar sex typed or undifferentiated. Those who made stereotypical choices were more likely to be same sex typed. These results are summarised in table 6.5

If we combine the androgynous and opposite groups into one single group, and the same and undifferentiated ones into another, in order to increase expected cell size so as to do a chi square test, we have the figures reported in table 6.6. The test is significant at the .025 level.

Table 6.5

Sex role category and subject choice (i)

	A	O	S	U	total
Stereotypical	7	5	14	6	32
Non-stereotypical	4	3	1	1	9
Total	11	8	15	7	41

A androgynous, O opposite, S same, U undifferentiated

Table 6.6

Sex role category and subject choice (ii)

	A + O	S + U	N
Stereotypical	12	20	32
Non-stereotypical	7	2	9
Total	19	22	41

$p > .025$

A + O androgynous and opposite,

S + U same and undifferentiated

B. The Personal Questionnaire

This was intended to give some further insight into the reasons for non-stereotypical choice, and possible family variables associated both with non-stereotypical choice and androgyny. No statistical analyses could sensibly be carried out because of the small size of the sample.

Inspection of the data suggested that having a working mother, and a definite career aim might be associated with girls choosing physics. A working mother, also seemed to be associated with boys choosing French, although career aims were less definite. Single sex education was also associated with non-stereotypical choices for both sexes,

as was the chosen career being already a family occupation. It may be that non-stereotypical choices are facilitated for those students whose home or school experiences has provided non-stereotypical role models.

Biographical Notes

The following notes summarise the biographical details and other information about the nine subjects who had made non-stereotypical choices.

Girls who chose Physics

Case 1.

This student was classified androgynous. She was taking 'A' levels physics, chemistry, biology and art. She chose physics because she felt she had ability. She enjoyed the subject, and her father was able to help her with her homework. She intended to continue onto higher education, but did not know what course or career she wished to follow. Her long term aim was to be earning lots of money and taking long holidays in exotic places. She described her father as an 'eccentric research scientist'. Her mother worked in the family business. She had been brought up by both parents. She had one older brother. Her previous education, had been in a girls only, state, day school, which she described as 'old fashioned'.

Case 2

This student was classified masculine. She was studying 'A' level physics, biology and chemistry. She had chosen physics because she wanted to study it at university and do research in that field. Her Long term aim was to be a research scientist. Her father was a biologist, and her mother a teacher. She felt she had been brought up mainly by her mother. She had two older sisters, one a biologist, and one younger one who was still at school. She had attended a girls only, state, day school.

Case 3

This student was classified androgynous. She was studying 'A' level physics, geography and biology. She had chosen physics because she had ability, enjoyed it, and needed it to be a physiotherapist. Her long term aim was to be working in India or Africa as a physiotherapist. Her father was a television producer, her mother a lecturer n English. She had one older sister at university. She felt she had been brought up mainly by her mother. Her previous education had been in a girls only, state, day school.

Case 4

This student was classified feminine. She was studying 'A' level physics, chemistry and biology. She had chosen physics because she enjoyed it, and she hoped to study to

be a doctor. Her long term aim was to be working either as a G.P. or in a hospital. Her father was a physicist, her mother a lecturer in optics. She felt she had been brought up by both parents. She had one younger brother. Her previous education had been in a girls only, state, day school.

Boys who chose French

Case 1

This student was classified Feminine. He was studying 'A' level French, English and Russian. He chose French because he enjoyed it, and he had ability. He intended to go to university, but did not know what specific course he would take, or what job he wanted. He thought that in ten years time he might be working in languages abroad. His father was a civil servant, his mother a housewife. He felt he had been brought up by both parents. He had one younger brother, and an older sister who was a secretary. His previous education had been in a state school. It was not stated whether this was mixed or single sex.

Case 2

This student was classified androgynous. He was studying 'A' level French, English and economics. He chose French because he enjoyed it, he had ability, and he needed it

for his future career. He intended to go onto higher education, but did not know for what specifically, nor what he hoped to be doing in ten years time. His father was a manager in a large multinational company. His mother was not in paid employment. He felt he had been brought up by both parents. He had one younger brother. He had previously been educated in a boys only, state day school.

Case 3

This student was classified undifferentiated. He was studying 'A' level French, English Literature and Latin. He chose French because he had ability and enjoyed the subject. He was going to continue with higher education, but did not know which course or which career he would pursue. He hoped in ten years time to be employed either as a creative artist or as a gardener. His father was a lecturer in art, his mother worked on the administrative staff of a polytechnic. He considered he had been brought up by both parents. He had one older brother, and 4 older and one younger sister. The brother and the two working sisters had art related jobs. His previous education had been in a boys only, state, day school.

Case 4

This student was classified androgynous. He was studying 'A' level French, English and art history. He chose French

because he enjoyed it and it seemed to be the only possible third subject. He wished to continue with his education, but had no specific course or career in mind. His long term aim was to be leading a happy, if not successful, life. His father was a lecturer in English, his mother a health visitor. He considered he had been brought up by both parents. He had one older sister who was a wardrobe assistant with an operatic company. He had previously been educated in a boys only, state day school.

Case 5

This student was classified feminine. He was studying 'A' level French, English and Latin. He had chosen French because he enjoyed the subject, particularly the literature, and he needed it for his future career. He intended to continue with higher education. He didn't specify what course or job he had in mind, but in ten years time he hoped to be achieving recognition and fame for his writing. His father had died when he was eleven. His mother was Head of an Art Department in an Adult Education Institute. He considered that his teachers and himself had been responsible for his upbringing, as his mother was always working or studying. He had one older brother and one older sister. He had previously been educated in a mixed, state day school.

VI. Conclusions

The results seemed interesting enough to pursue a larger study. The indications were that there was a link between sex role category and non-stereotypical choice. There also appeared to be family variables, particularly whether the mother was in paid employment, that might be important.

The hypotheses that were formulated on the basis of this pilot study and back ground reading of other previous research were:

1. Women in science are likely to be androgynous or masculine, high in self esteem, and have mothers who work. They are likely to be high on psychoticism as measured by the Eysenck Personality Questionnaire.
2. Men in languages are likely to be androgynous or feminine.
3. Women in science will be more able than men in science, and will have a higher record of achievement, and greater perceived control over achievement outcomes.
4. Androgynous men and women are likely to be high achievers whatever their field.

VII. Research Design

This chapter reports:

- the overall design
- a description of the variables and different measures
- the identification of the sample and the data collection
- a description of the sample
- the overall scheme of data analysis

I. Introduction - the overall design

1. Research Questions

As a result of the pilot study described in the last chapter, the ideas suggested by the background reading, and the hypotheses generated, the following research questions seemed the relevant ones to address in a more major study of subject choice and attainment in a sample of students in higher education.

1. What are the antecedents and correlates of psychological androgyny?
2. What are the characteristics of the androgynous personality?

3. In what way is psychological androgyny related to choice and achievement in higher education?
4. Why do some women choose science subjects at degree level, rather than female stereotypical subjects?
5. Why do some men choose languages rather than typical masculine subjects?
6. Are the factors that determine non-stereotypical choices in languages and science the same?
7. What are the personality characteristics of men who choose languages?
8. How do they differ from men who choose science and women who choose languages?
9. What are the personality characteristics of women who choose science?
10. How do they differ from men who choose science and women who choose languages?
11. What are the personality characteristics of high-achieving women?
12. Are they significantly different from high achieving men?

2. Areas of Concern

The above questions are captured within the three areas of concern identified for this study:

a) **psychological androgyny,** (questions 1-2)

b) gender differences in patterns of **educational choice,** (questions 3-10)

c) gender differences in **educational achievement** (questions 3, 11-12)

3. Dependent and Predictor Variable Measures

It was necessary to have a measure of androgyny, and information about the variables that the literature had indicated were either antecedents of, or associated with androgyny, such as family background, educational experience and personality factors such as self-esteem.

The actual degree enrolments would provide the measures of 'choice', and the end of year examination grades the measures of 'achievement'. It was felt that details of both current and future career and educational plans would also be useful, as there were indications from the pilot study that there were differences between scientists and language specialists, and androgynous and non androgynous persons in this respect.

The research referred to in previous chapters indicated that the variables associated with the identified outcomes fall into three groups: family background and upbringing; ability, and previous education and attainment; and

personality variables including measures of psychological androgyny and self-esteem. A complete list of the variables used in the analysis is shown in appendix 7.5.

II(a). Measures used for the selected variables.

1. Self Esteem Measures

Measures of self esteem were used because research findings, (Spence et al 1975, Wiggins, 1978, Flaherty & Dusek, 1980, Bernard, 1980) had suggested that it was related to both androgyny and masculinity. Self-esteem, like intelligence, can be viewed either as a global concept or as specific to a task or situation. For purposes of this research, it seemed appropriate to use (1) a measure of global self esteem, (2) a measure related to academic work in general,and (3) a measure specifically related to the forthcoming examinations. Whitley's meta analysis, (1983), had suggested that the strength of the correlation between sex role categories and self esteem depended on the type of measure.

a) The Rosenberg measure of Global Self-esteem (appendix 7.2) was selected because it is short, comprising 10 items only, it is quick and easy to complete and is suitable for the age group of the sample. It is a Guttman type scale with reproducibility of .93 and item scaleability of .73. There are 4 negative and 5 positive items, each with 4

possible responses; strongly agree, agree, disagree, strongly disagree, with scores of 4,3,2,or 1, or the reverse, depending on whether the item is positive or negative. The maximum score, being very high on global self-esteem, is 36

b) The measure of academic self esteem that was used, was the 'Self Concept of Scholastic Ability Scale' used by Coombs and Davies, (1966), in a study of the academic achievement of senior pupils, referred to in Cohen (1976). No information is available about the reliability and validity of the scale. It is a Likert type scale, with the statement reflecting little self assurance scoring 1, and the statement reflecting the most scoring 5. Respondents endorse the one statement that is most accurate for them.

c) Question 10 (appendix 7.1) was designed to measure self-esteem specifically related to the forthcoming task, that is, final examinations. A score of 5 was given for endorsing 'First' down to 1 for a 'Fail'.

2. Attributions re Success and Failure

It has been suggested that better performance by men than women in male stereotypical fields such as mathematics and science, can be partly attributed to the differential attributions regarding success and failure of men and

women. (Brewer and Blum, 1979). It is argued that achievement outcomes help to determine future expectancies. Men are more likely to attribute success to internal and stable factors such as ability or effort, women to external and unstable factors such as teaching or good luck. On the other hand, men would be more likely to attribute failure to external factors such as bad teaching or bad luck, and women to internal factors such as lack of ability or lack of effort. These attributions depend on whether the outcome has confirmed prior expectancies and therefore leads to a self defeating pattern for failure.

Questions 7 and 11, (taken from Brewer and Blum 1979) were included in the personal questionnaire, in order to test whether students made the expected attributions with regard to non-stereotypical fields, and whether androgynous or opposite sex-typed persons made the same or different attributions compared with stereotypically sex-typed people. I would expect, as hypothesised previously, that if a girl chose science, and a boy chose languages, their attitudes would be atypical and their attributions regarding success and failure different from the norm.

Table 7.1

Perceived Sources of Control over Outcomes: scoring

	Attributions		**Score**
	Success	Failure	Total Control
	ability	effort	1
	ability	external factors)	2
or	effort	effort)	
	effort	external factors)	3
or	external	effort)	
or	external	external)	
	effort	ability)	4
or	external	ability)	

Note: a low score indicates attributions of success to internal factors, and failure to external
a high score indicates attributions of success to external factors, and failure to internal

Both questions are scored as follows; 1 for ability, 2 for effort, 3 for teaching, 4 for luck. The individual attributions for success and failure are then combined in order to produce a Total Control score, ranging from 1 for the greatest perceived internal control over outcomes to 4 for the least control. The possible combinations are shown in Table 7.1

3. The Personality Questionnaire

Eysenck's EPQ was chosen because it is easy to self administer, can be completed in ten minutes, has a built in lie scale and is simple to score using plastic templates. The most recent version, (1975), consists of 90 statements to which the respondent answers 'Yes' or 'No'. 23 items make up the neuroticism-stability scale. This has an internal consistency of .8. Another 21 items make up the extraversion-introversion scale which also has an internal consistency of .8.

A new scale, psychoticism, is derived from 28 of the items. The internal consistency of this scale, as well as its test-retest reliability and construct validity, have been questioned by J.Block in Buros 8th Mental Measurement Yearbook. The research of Bamber et al,(1983), however, suggests that a high P score is related to non-stereotypical female choices in education. This was another reason for choosing this personality measure.

Eysenck defines psychoticism as "an underlying personality trait present in varying degrees in all persons". He says that if it is present in a marked degree, "it predisposes a person to the development of psychiatric abnormalities but only a very small proportion of people with high P scores are likely to develop a psychosis in the course of

their lives" He suggests that it might be better to use the term "tough mindedness" as far as normal people are concerned. This could be a label used to describe a person strong enough to defy convention and choose a non-stereotypical career field!

The reliability and validity of the N scale are regarded as acceptable, but both the meaning and validity of both the E scale and the Lie scale have been questioned. According to Eysenck, the Lie scale measures "dissimulation", but may also measure a stable personality factor such as "social naivety".

In this study the N and E scores were used to derive a four-fold classification based on median splits: Neurotic Introvert, Neurotic Extravert, Stable Extravert, Stable Introvert.

4. The Androgyny Questionnaire

This has been examined in some detail in chapter IV. The version chosen, an amended version of Smith's adaptation of Bem, was selected because it seemed desirable to use a scale that had been based on a U.K. population of undergraduate students and others rather than an American population, in view of the fact that cultural stereotypes are culturally biassed.

The other advantage of the Smith scale was that it included undesirable as well as desirable aspects of the stereotypes, although it was realised after the data had been collected that this tended to produce an unbalanced scale, the masculine scale containing more undesirable adjectives than the feminine one.

Therefore, as described earlier in chapter IV, an attempt was made to derive a shortened version of the scales which might be more efficient and more balanced. Consequently the data provided two alternative measures, one producing two scales of 20 items each, the other shorter scales of 10 items each. Only the results of the statistics derived from the longer version are reported in this study.

The raw scores from the scale were used to derive a four-fold classification based on median splits, the shortcomings of which have already been discussed. In addition, the Motowildo formula was used to derive the four linear scales in order to compute Pearson correlations.

5. The Morrisby Differential Test Battery

This is an ability battery developed by J. Morrisby in 1955. The individual tests may be used independently, but the entire battery is intended to be interpreted

differentially. The interpretation assumes that bias rather than level of ability is the more important factor in determining achievement in a specific educational or career area, although certain minimum levels of ability are assumed before one can achieve at all in a written examination.

Although used extensively for selection purposes in industry and in further education, there has been criticism of this battery because of the lack of published reliability and validity data, although recently more has been available.

It was selected for use in this research because of the very detailed information it produces about different aspects of ability. Unfortunately, only 48 of the sample were prepared to spend over three hours taking the tests. Consequently, this additional information is only available for a small sub group of the main sample.

II. (b) Summary of variables used in this analysis

1.Family Background

Those selected for investigation were the occupation of parents and siblings, the occupational status of the parents, number of brothers and sisters and position in

family, and whether or not one or both parents was primarily responsible for upbringing.

2.Ability, Education and Attainment

The ability variables were those from the Morrisby Battery. The educational information included school type (single sex or mixed, grammar or comprehensive, independent or state, day or boarding) at both 11-16 and 16-19. Past attainment measures were the number of 'O' and 'A' levels taken, and average grades obtained.

3.Personality

The variables used were:

a) the 4 categories derived from the adapted measure of psychological androgyny, combined with sex to make 8 categories, and further combined into stereotypical and non-stereotypical choice.

b) the linear Measures of androgyny, masculinity, femininity and undifferentiation derived by the Motowildo formula from the original measures of masculinity and femininity, (see chapter IV), (Motowildo,S.J.,1981).

c) the 4 categories derived from the EPQ

d) the 2 Eysenck dimensions used independently.

e) the 3 measures of self esteem,

f) attributions for success, failure and total control.

4.Other variables

Other factors that seemed important were considerations to do with choice of subjects, such as the time decisions were made, stated reasons for choice, and outcomes such as immediate and future plans.

III. Data collection and general characteristics of the sample.

1.The Sample

Although the pilot study had sampled 'A' level students, the decision was made to use university undergraduates for the main study. Choices at this stage are more likely to be indicative of life choices, and more polarised. As noted earlier, either French 'A' level or physics could be combined with mathematics and economics, for example, and neither would be indicative of a specialised language or science preference.

Accordingly, a college of London University was selected which offered both Languages and Sciences as single honour degrees. Two modern language departments, French and German, were approached and four physical science

departments; Electrical Engineering, Mechanical Engineering, Physics and Naval Architecture, as examples of 'female' and 'male' stereotypical areas respectively. It was hoped that overall, approximately equal numbers of male and female students would participate in the research, the predominance of women in languages balancing the predominance of men in science.

Students were not randomly selected but efforts were made as far as the Science Departments were concerned, not to choose those where there was a very high incidence of overseas students, such as in Electronic Engineering, in order to eliminate cultural bias where sex stereotypes might be significantly different from those in the U.K.

2. Method of Data Collection

As much of the data could only be collected via the post, it seemed advisable to choose standardised tests, with safeguards against faking, that could be self-administered, and which were not very time-consuming in order to facilitate a good response.

A questionnaire was constructed,(see appendix 7.1), which was very similar to that used in the pilot study, and which dealt with family and educational background, and current and future plans. In addition, questions were

included which related to attributions re success and failure in academic work (q.7 and q.11), and task specific self-esteem (q.10). Separately attached was a measure of personality, (appendix 7.4), measures of global and academic self esteem, (appendix 7.2), and the adaptation of the Bem Sex Role inventory previously described in chapter IV, (appendix 7.3).

The students in the chosen departments were approached by letter and invited to cooperate by completing and returning the questionnaires. They were also asked to attend a three hour testing session in order to provide data on abilities. The questionnaires were to be returned anonymously via the departmental tutors. The incentive for cooperating was the offer of feedback, at individual personal interviews, of test and questionnaire results. It was assumed that as all these students would shortly be making important career/life decisions, that information of this kind would be regarded as useful.

158 students returned questionnaires (excluding 2 who were eliminated on the grounds of age-it was felt that maturity might harden stereotypical attitudes). The age range was 18-33 years with a median of 20.5. Not all the students were prepared to give up time for testing and only 48 provided this extra information and were also interviewed.

It was felt that data on past achievement provided by 'O' and 'A' level results was another indicator of ability that could be used instead, although the profile that indicated a bias toward science or language would not be available.

Table 7.2 gives a breakdown of the subjects who participated by sex, and subject choice, there being slightly more male than female subjects, and more language students than science students. These figures are, however, fairly typical of the general picture of male/female representation in different subject areas at under-graduate level. The comparable figures for U.K. domiciled undergraduates in universities, in 1982-83, in Great Britain are shown in table 7.

Table 7.2

Breakdown of sample by sex and subject choice

	Male		**Female**		**Total**	
	N	**%(row)**	**N**	**%(row)**	**N**	
Naval arch.	8	88.9	1	11.1	9	
Electrical Eng.	21	77.8	6	22.2	27	
Mechanical Eng.	13	81.2	3	18.8	16	
Physics	8	72.7	3	27.3	11	
Total Science	**50**	**79.4**	**13**	**20.6**	**63**	(39.9%)
French	17	29.8	40	70.2	57	
German	15	39.5	23	60.5	38	
All Languages	**32**	**33.7**	**63**	**66.3**	**95**	(60.1%)
Sci. + Lang	**82**	**51.9**	**76**	**48.1**	**158**	(100.0%)

Arch=architecture, Sci=science, Lang=languages

Table 7.3
UK domiciled, University Undergraduates, 1982-83

	Male %	Female %
Civil Engineering	94.0	6.0*
Electrical Eng.	95.0	5.0
Mechanical Eng	95.5	4.5
Physics	85.9	14.1
French Lang/studies	19.8	80.2
German lang/studies	28.4	71.6

*Separate figures for Naval Architecture not available

Source:University Statistics 1982-83, volume 1, Students and Staff, HMSO.

IV. Description of Sample, Predictor Variables

1. Family Background

Over 90% of the sample were born in the U.K. or North America, 3.2% being non-British European and 6.3% Asian. Nearly three quarters came from social classes I and II, (registrar general's classification based on the occupation of the father, see table 7.5)). Very few of the fathers, 6 %, were unemployed. Nearly one third of the mothers were not in paid employment.

Table 7.4

Employment status of parents

	Father	Mother
Number employed	155	107
% of total	98.1	67.7

Table 7.5
Occupational Classification of the Fathers

	N	%
Professional	53	33.5
Intermediate	63	39.9
Skilled non-manual	13	8.2
Skilled manual	11	7.0
Other*	18	11.4

* includes retired, army officers, part skilled, unskilled and not known

24.7% were only children, 45.2% were either first or only children. 23.4% were brought up by their mothers on their own.

2. Education, Ability and Achievement

Sixty percent were educated until age 16 in state schools. At 16 there was a slight shift away from the private sector but mainly into F.E. rather than the school system. Nearly two thirds were in single sex schools until 16 with quite a large shift at that stage into a mixed environment.

Achievement at both 'O' and 'A' level reflected some of the patterns demonstrated in chapter II as far as sex differences were concerned, but the group, particularly at 'O' level, were higher achieving than the average school leaver, as one might expect.

Table 7.6

'O' and 'A' level achievement

	Mean no. passes		Average grade	
	Males	Females	Males	Females
	n=82	n=76	n=79	n=73
'O' level	8.463	8.566	4.137	4.266
	n=82	n=76	n=76	n=76
'A' level	3.061	3.118	5.786	5.714

The mean number of 'O' level passes was 8.513 with the girls achieving a slightly higher but not statistically significant number, 8.566 compared with the boys 8.463. The average 'O' level grade, calculated on the basis of all subjects entered whether passed or not and using a scale of 5 for a grade A down to 1 for an E or CSE 3, was 4.199. The girls were significantly better with 4.266 compared to the boys 4.137, ($t = 1.7$, $p < .05$, $df = 150$)

At 'A' level the overall mean number of passes was 3.089, the girls obtaining the slightly higher number of 3.118 compared with the boys' 3.061. The average grade, again calculated on the basis of entries rather than passes, with 7 for an A down to a 1 for an F, was 5.750. The boys

obtained a marginally better average score of 5.786 compared with the girls' 5.714.

Gender differences in the pattern of entry to 'O' levels reflected the general patterns already discussed in chapter II and confirmed that with this sample also, science was 'masculine' and languages were 'feminine'. Selecting those subjects used by Ormerod in his gender spectrum, (1975), the similarities between this sample and national statistics can be seen in the table that follows on the next page.

Only English and religious education appeared to be less 'feminine' for this sample. In the case of English, this was no doubt because the students were all aspiring to go to university when they chose their 'O' level subjects, and their choices therefore reflected the minimum entry requirements for higher education.

Table 7.7

Gender differences in entry to 'O' levels

	%Boys this sample *	%boys 1984 England	%boys 1972 Eng. & Wales
Chemistry	69(66)	58	70
Physics	68(65)	73	79
Mathematics	53(51)	53	61
Geography	51(49)	57	55
Music	30(29)	32	36
Biology	44(42)	36	37
History	43(41)	49	48
2nd F.Lang	40(38)	37	41
Latin	40(41)	49	50
Art	37(36)	43	43
French	48(46)	40	46
English	53(51)	45	43
RE	56(54)	40	37

* adjusted to take into account male bias 52%

F.Lang = foreign language, RE = religious education

Measures of ability were available for a sub group of 48 only. The girls had higher mean scores on abstract reasoning, verbal ability and perceptual ability. The boys had higher scores on numerical ability, spatial awareness and mechanical reasoning.

Table 7.8

Ability measures, mean scores by sex

	Men n=19	Women n=29
Abstract Reasoning	14.68	16.07
Verbal ability	13.68	15.72
Numerical ability	12.79	12.41
Perceptual ability	13.00	14.17
Shapes	12.89	11.45
Mechanical ability	12.95	8.00*

* $p<.01$, anova

On this ability battery, the raw scores are converted to scale scores from 1-20, with a mean of 10 and a standard deviation of 4. Other than the girls' mechanical score,

all were above average compared with the general population, as would be expected.

3. Personality Factors

a) Self Esteem

This sample obtained scores ranging from 16 to 40, on the global measure, with a mean of 30.032. The mean for the boys was slightly higher than the girls', 30.765 compared with 29.230.

On the academic self esteem measure, scores ranged from 1 to 5 for both sexes, the mode for all being 3. The mean for the boys was 2.840, and for the girls 2.757.

On the specific measure, the range of scores for the girls was 1 to 5, for the boys 2 to 5, and the boys mean score was 3.600 compared with 3.438 for the girls.

Table 7.9
Self-esteem mean scores

	Men n=81	Women n=74	All n=155
Global	30.765	29.230	30.032*
Academic	2.840	2.757	2.8
Specific	3.600	3.448	3.52

* p .05, anova

b) Attributions

The majority of the sample attributed both success and failure to effort, or the lack of it, although teaching was seen as being an important element in success by both sexes. No-one attributed failure to bad luck, and only one of the girls saw good luck being responsible for success.

Table 7.10
Attributions re: Academic success/failure
mean scores

	Men n=75	Women n=76
Success	2.21	2.20
Failure	1.96	2.01
Control	2.77	3.04

As explained above, the 'control' score is derived from the other two scores and is an index of the extent to which one feels one has control over outcomes. The lower the score, the more one is in control. The male sample, on average, felt they had greater control.

c) Androgyny

The sample rated themselves more highly on the F scale than the M scale, (the mean on F was 4.416 compared with 3.760 on M) and it was not clear whether this was because this sample of university students were more feminine than the norm or because the ratings were influenced by social desirability. The original Bem Sex Role Inventory, was standardised on a population of 340 female students and 476 male students at Stanford university. The combined mean for the F scale was 4.82 and for the M scale 4.95, the corresponding median values being 4.90 and 4.95. The differences may be due to culture or differences in item types because of the modifications and introduction of the undesirable items.

The distribution of scores in the 4 categories, was as follows;

Table 7.11
Frequencies, sex role categories by sex

	Males	%	Females	%	Total	%
Androgynous	16	19.8	15	20.5	31	20.1
Masculine	40	49.4	11	15.1	51	53.1
Feminine	12	14.8	36	49.3	48	31.2
Undifferentiated	13	16.0	11	15.1	24	15.6
Total	81	100	73	100	154	100

Almost half the women and half the men were stereotypically sex-typed. The comparable figures for men and women on the Bem standardisation sample were 42% and 39% respectively. About 20% of each group were androgynous as in the Bem sample.

d) **The Eysenck Personality Questionnaire**

The mean scores for this sample which follow, indicate that on average the women were more neurotic and more extravert, scored higher on the lie scale, and less high on the psychoticism scale.

Table 7.12

EPQ mean scale scores by sex

	Males n=71	**Females** n=65	**Total** n=136
Neuroticism	10.211	12.400	11.184
Extraversion	11.394	12.954	12.140
Lie Scale	5.887	6.154	6.015
Psychoticism	4.577	3.231	3.934

When the scores for the first two dimensions are placed in categories based on the means, as recommended in the

manual, the distribution is as follows:

Table 7.13

Frequencies, EPQ categories

	Total % (n=136)	**Males** % (n=71)	**Females** % (n=65)
Neurotic Introvert	29.4 (40)	31.0 (22)	27.7 (18)
Neurotic Extravert	16.2 (22)	9.9 (7)	23.1 (15)
Stable Introvert	22.1 (30)	26.8 (19)	16.9 (11)
Stable Extravert	32.4 (44)	32.4 (23)	32.3 (21)

4. Other Variables related to Choice

(a) Time of Decision

It is interesting to note that over half the sample, 56.5%, had decided their university course before the end of their 'O' level year, and another 30% by the end of their first year in the sixth form.

Table 7.14

Timing of subject decisions

	N	%	cum%
Primary school	4	3.2	
Sec. year 1-3	17	13.7	16.9
year 4	15	12.1	29.0
year 5	34	27.4	56.5
year 6	38	30.6	87.1
year 7	8	6.5	93.5
later	8	6.5	100

This is of course related in part to the educational system and previous options which have closed doors. Table 7.14 above suggests that as far as this sample was concerned, the boys who chose languages at university had already ruled out some science options. Half had already given up chemistry by the time they took their 'O' levels, nearly half had given up physics, and more than two thirds had given up biology.

The scientists appeared to retain more options. 62% had French 'O' level. Of the girls who chose science at university, 77% had French 'O' level.

Table 7.15

'O' level achievement by sex and subject choice

	Males		Females	
University choice	**Science**	**Lang**	**Science**	**Lang**
	n=50	n=32	n=13	n=63
'O' level	numbers of students with pass in the specific subject			
Mathematics	46	26	12	53
Physics	43	18	12	16
Chemistry	40	16	12	13
Biology	25	10	8	36
French	31	30	10	57
German	10	23	6	44
Latin	9	19	6	36

Lang = language

(b) Stated reasons for choice

Interest in the subject was stated as being an important factor in the choices for 92.9%, with ability being important for 75%. For 20% the choice of subject was 'necessary' for a particular job. Pressure from parents or school was only given as a reason by 1.3% and 3.8% of the total sample respectively.

Three quarters of the sample said they would make the same choice again.

(c) Future aspirations

These were very varied, no single aim being overwhelmingly important although half the sample were hoping to have a career established in the next 10 years.

V. Scheme of Data Analysis

Three areas of concern have been identified: psychological androgyny, educational choice, and educational achievement. These were to be the main outcome variables, although androgyny was also to be treated as a predictor with respect to the other two outcomes. Measures were selected, and variables identified which might discriminate between gender behaviour and outcomes, particularly non- stereotypical behaviour. The list of variables as coded for computer analysis is presented in appendix 7.5.

One of the difficulties with investigating three different but possibly linked outcomes, was dealing with a very large number of predictor variables. Originally there were 12 family variables, 25 education and ability variables, 22 personality variables, and 18 associated with choice of

degree. Some of these had been statistically derived from the raw data using appropriate formulae, for example: the number of 'O' level passes per student out of 43 different subjects; the EPQ categories derived from the two individual scales of neuroticism and extraversion; and the 4 linear scales and 4 categories derived from the masculinity and femininity raw scores. Both categories and continuous scales were necessary for subsequent analyses.

The data were further transformed in the following ways:

(i) all the categoric data had to be recoded 0/1 in order to be suitable for the discriminant and regression analyses.

(ii) it was felt essential to explore the data using simple analyses such as anova, and crosstabulation, in order to reduce the number of variables, and make the subsequent analyses more efficient. To do this, some of the continuous variables were temporarily recoded into three categories, for example: average 'A' level grade was recoded into 'low', 'medium' and 'high'.

(iii) inspection of the frequency distributions of the raw data had indicated that some variables would not be useful in their present form. For example: 'occupational status of mother' was recoded into a variable indicating whether mother was employed or not employed. Subsequent crosstabulations suggested this was a

more useful categorisation. Similarly, parental influence showing 4 possibilities was transformed into influence of mother, or not.

(iv) some variables were combined with sex and/ or choice of degree, as we were interested in these interactions with outcomes, for example: sex and sex role type.

Statistically, each topic was explored in three steps. The first stage of the statistical analysis after the transformations referred to above, was to explore the data using simple analyses in order to see which associations might be investigated further, and which variables if any should be abandoned. For example, 'Occupation of mother' was not found to be useful. 'Position in family' as a continuous variable was retained, but the categories; 'only' 'oldest', 'middle', 'youngest' were not. On the other hand, 'time of decision' with regard to subject choices was not subsequently used with the 7 original categories, as this discrimination was not helpful, but the recoded two categories of 'early' and 'late', were used.

The most useful outcome of these preliminary investigations was identifying three subsets from the set of predictor variables, one for each of the three

outcomes, for use in the regression and discriminant analyses. In some cases variables were retained because previous research had suggested a link with one or more of the outcomes, although preliminary results did not confirm this. For example, androgyny and sibling family structure as predictors of non- stereotypical choice were kept in the analysis.

Some variables, for example 'time of decision' and the 'lie scale', that had not been considered significant, nor referred to in previous research, were identified in the preliminary investigations as being potentially useful. This in fact proved to be the case. Variables that were not included in the multivariate analyses in any form are listed in appendix 7.6

The second stage in investigating the data was the use of discriminant function analysis. This is described in detail in chapter IX. This was chosen in order to find out which combinations of predictor variables would distinguish between people who were androgynous and those who were not; people who made stereotypical choices and those who did not; people who were high academic achievers and those who were not. It is also possible, with discriminant analysis, not only to classify existing cases, but to predict group membership of new cases.

The next stage of the analysis was to use regression. This is described in detail in chapter X. This is another powerful multivariate technique which examines the relationship between a combination of predictor variables and an outcome. When variables are combined, subtle effects can be discerned. It is possible to isolate the effects of different combinations of variables, as opposed to the single effect of one variable on the outcome. Variable A, for example, may have no discernible effect on the outcome, except when working in conjunction with variables B and C.

VIII. Preliminary Analyses

The effect of the predictor variables on:

1. Androgyny, 2. Educational Choice, 3. Achievement.

I. Introduction

In the last chapter the sample was described in terms of all the main predictor variables. In this chapter, the three outcomes will be examined in the light of cross tabulations using the chi squared statistic, and Pearson product moment correlations. The intention was to see which associations, with reference to the research questions posed in chapter VII, needed to be investigated further in the multivariate analyses.

The statistical package used for all the analyses was SPSSX

II. Androgyny

A. General Considerations

In these preliminary analyses, the measures of androgyny and other sex role types selected as dependent variables were:

a) The four categories, androgyny, masculinity, femininity, and undifferentiation, derived from the

median split scoring of masculinity and femininity, as described in chapter IV. When the sample were categorised in this way, nearly half were 'appropriately' sex typed (48.7%), 14.9% were opposite sex typed, 19.5% were androgynous, and 16.9% undifferentiated.

b) The continuous measures of androgyny, masculinity, femininity and undifferentiation derived from each individual's score on masculinity and femininity by using the Motowildo formula.

For purposes of examining associations between the categories and the various predictors, the continuous predictor variables were also transformed into three categories, low, medium, high, based on frequencies. The following reports relate to this treatment.

B. Preliminary investigations into the antecedents and correlates of androgyny and other sex role categories.

1. Family Background

(a) Employment of parents

For the group as a whole, (men and women), the father's occupation, his occupational status, and whether the mother was employed or not, were not factors that were significantly associated with specific sex role categories.

There was however a significant association, ($p<.05$), between androgynous women and the employment status of the mother. 86.7% had mothers who were in employment compared with 72.9% for the total In contrast, 60.0% of women in the undifferentiated category had non working mothers compared with 27.1% over all.

(b) Upbringing/ influence of parents

Of the 145 for whom the information was available, 75.2% had been brought up equally, as they perceived it, by both parents, and 24.8% by the mother alone. Although the associations were not significant, the comparative percentages for women categorised as masculine, were 36.4% and 63.6%, and for those categorised undifferentiated, 44.4% and 55.6% respectively.

(c) Siblings and position in family

Position in family, being a first or only child, middle or youngest, did not appear to be significant for the group in discriminating between the four sex role categories. There was, however, a significant association, ($p<.05$), with femininity, suggesting that only or oldest children have higher levels of femininity.

Although no significant associations were found, for girls, androgyny and masculinity appeared to be associated with having more siblings.

2. Education, Attainment and Ability

Whether education 16-19, and 11-16, was in a grammar school or a comprehensive was significantly associated with the sex role categories, suggesting an association between androgyny and grammar school education. See table 8.1 below. No other educational variable, or measure of past attainment was important.

Table 8.1

Frequencies, Sex role categories and School type, 16-19

	Grammar N	**Comprehensive** N	**Total** N
Androgynous	23	6	29
Masculine	28	20	48
Feminine	27	21	48
Undifferentiated	14	12	26

($p<.001$)

When the above categories were examined separately by sex, there were no further significant associations, but it appeared that:

- a greater percentage of both men and women

categorised as androgynous were educated in selective schools 11-16 years, compared with the group as a whole.

- a greater percentage of women categorised as androgynous were educated in single sex schools from 16-19 compared with the group as a whole.

- a greater percentage of women categorised as masculine were educated in selective schools 11-16, compared with the group as a whole.

- a greater percentage of men categorised as feminine were educated in a state school 16-19 compared with the group as a whole.

In an analysis of variance, there were significantly different means for the four sex role categories on many of the ability variables. See table 8.2 below. Unfortunately this data was only available for a small group of 47.

The data show those classified as androgynous to be better on numerical ability. Those who were masculine typed were better on abstract reasoning and verbal, spatial and mechanical ability. As the masculine category contained

more men than women, it is likely that gender had a mediating effect on the scores.

Table 8.2

Mean scores on ability measures for sex role categories

	Androg N=9	**Masc** N=10	**Fem** N=18	**Und** N=10	**Sig** p<
Abstract Reasoning	15.89	17.70	13.06	17.6	.01
Verbal ability	16.11	16.40	12.94	15.9	.05
Numerical ability	15.11	13.70	10.89	12.6	.001
Perceptual ability	15.00	15.00	12.50	13.8	not
Spatial ability	13.00	14.2	9.72	13.1	.01
Mechanical ability	10.56	11.90	7.72	11.5	.05

Androg = androgyny Masc = masculinity
Fem = femininity Sig = significance

3. Personality

(a) The EPQ scales and categories

When the EPQ categories were cross tabulated with the 4 sex role categories, there was no significant association, but 50% of the androgynous cases were categorised as stable extraverts.

There was a significant association, ($p<.001$), when extraversion, (three categories, low medium, high) was

cross tabulated with masculinity. High levels of extraversion were associated with high levels of masculinity.

Both the lie scale and the psychoticism scale showed significant associations when cross tabulated with the sex role categories ($p<.05$). The data suggested that the associations were different for men and women. As there were a number of empty cells and small groups, one can only make tentative conclusions. It did seem, however, that female androgyny was associated with higher levels of psychoticism than was androgyny in men.

When the EPQ scales were correlated with the continuous sex role variables independently, the relationships with masculinity and femininity were quite different. (see table 8.3 and comments below)

Androgyny was positively correlated with psychoticism and extraversion, and negatively correlated with neuroticism and the lie scale. The pattern of direction of the correlations of these variables with masculinity was similar.

Table 8.3

EPQ scales correlated with sex role scales

	N	E	L	P
Androgyny	-.0842	.3052 ***	-.0134	.0663
Masculinity	-.1868 **	.0325	-.2948 ***	.0862
Femininity	.2248 **	-.0913	.2608 ***	-.1287
Und	.0794	-.3736 ***	-.1160	-.0963

*** p<.001 ** p<.01 * p<.05

N: neuroticism, E: extraversion, L: lie scale,
P: psychoticism, Und: undifferentiated

Femininity, on the other hand, correlated positively with neuroticism and the lie scale and negatively with extraversion and psychoticism. The only positive correlation with being undifferentiated was neuroticism.

(b) Self esteem

Table 8.4

Correlations between self esteem measures and sex role

	Global	Academic	Specific
Androgynous	.3343 ***	.1143	.1252
Masculine	.1502	.0849	.1151
Feminine	-.1938 **	-.0606	-.0862
Undifferentiated	-.3332 ***	-.0563	-.0495

*** p<.001 ** p<.01

There were three measures of self esteem. All were positively correlated with the continuous measures of androgyny and masculinity, and negatively correlated with femininity and being undifferentiated. The only significant association was with global self esteem.

(c) Attributions for success and failure

In a crosstabulation there was an association, ($P<.05$), between the sex role categories and attributions for success:

Table 8.5

Frequencies of Attributions for Success for each Sex Role Category

	Ability N	Effort N	Teaching N	Total N
Androgynous	1	11	16	28
Masculine	6	25	17	48
Feminine	7	29	12	48
Undifferent.	5	16	3	24
Total N	19	81	48	158

Interestingly, there were unexpectedly greater attributions to teaching compared with effort and ability. There was a fourth possible attribution, 'luck', but only one person out of the total sample attributed success to this

By combining the responses for success with the corresponding ones for failure, a total control score was derived. The higher the score, on a scale of 1-4, the less perceived control over outcomes related to academic success.

The associations between control and the sex role categories were not significant, but it appeared that an androgynous person would have less perceived control over outcomes.

When the three scales were correlated with the continuous measures of sex role, being androgynous was positively and significantly correlated with success and control, suggesting that the more androgynous person has less perceived control over outcomes. This was also an unexpected finding.

Table 8.6

Frequencies for perceived control over outcomes

	1	2	3	4	Total
Androgynous	1	2	11	13	27
Masculine	7	7	23	11	48
Feminine	4	8	25	11	48
Undifferentiated	1	7	14	2	24
Totals	13	24	83	37	157

n.b. 1 = high, 4 = low

Table 8.7
Sex roles and attributions correlations

	Success	Failure	Control
Androgynous	.3244 ***	-.1151	.1818 *
Masculine	.0151	-.0538	-.0329
Feminine	-.0262	.0737	.0210
Und.	-.3223 ***	.1199	-.1993 **

*** p<.001 **p<.01 * p<.05
Und: undifferentiated

4. Other variables that might be associated with Androgyny

It had been hypothesised that androgynous or opposite sex typed people might make decisions about degree choice earlier, be influenced by different factors when making choices, have different current or future plans. There were some significant associations against the sex role categories: two stated reasons for subject choice, necessity and parental pressure, and two aspirations, financial success and a home and family,

C. Conclusions

In order to explore further the antecedents and correlates of androgyny, several variables were considered suitable for inclusion in the multivariate analyses reported in chapters IX and X. These were selected on the basis of strength of association in the preliminary analysis. Some variables such as number of sisters and position in

family, which the literature review had suggested as being important were also included even though strong associations had not emerged at this stage.

The variables that were used in the subsequent analyses were as follows:

Family

Number of sisters, position in the family, employment status of mother

Education and Ability

School type 11-16, and for the smaller group for whom information available; abstract reasoning, verbal ability, numerical ability, spatial ability, mechanical ability.

Personality

Extraversion, the lie scale, psychoticism, neuroticism, global self esteem, perceived control over outcomes.

Life outcomes and other variables

Necessity and parental pressure as reasons for subject choices, aspiring to financial success and a home and family.

III. Degree Choice

A. General Considerations

Science is still a 'masculine' subject, and languages are 'feminine'. This sample supported that view. Only 20.6% of the Science sub group were female, and only 33.7% of the Languages group were male. (See table 8,1)

Table 8.8
Frequencies of Degree Choice by Sex

	Men	Women	Total
Science	50	13	63
Languages	32	63	95
Total N	82	76	158
	$p<.01$		

If we classify male language choice and female science choice as 'non-stereotypical', then we see that 71.5% made stereotypical choices, and 28.5% made non-stereotypical ones.

Although not truly a random sample but self-selected (ie those students in the chosen departments of the university college approached who chose to respond), the pattern reflected that of the university population as a whole, as described in chapter II.

B. Predictors

1.Family Background

(a) Employment of parents

67.5% of the mothers of the subjects were employed in some capacity. This was higher than the national average, but perhaps not atypical for an undergraduate population.

A significantly larger number of students with mothers in employment chose languages than chose science. Those who chose science tended to have mothers who were not employed. There were no sex differences in this respect.

Table 8.9
Frequencies for Occupational Status of Mothers

	Employed	Not employed	Total
Male language	23	8	31
Female language	46	14	60
All language	**69**	**22**	**91**
Male science	7	6	13
Female science	26	21	47
All science	**33**	**27**	**60**
Total	**102**	**49**	**151**

$p<.01$

Only .6% of the fathers were not employed. Whether employed or not, and the nature of the employment, did not appear to influence degree choice. There was some significance in status. Across the whole sample, there were very few fathers in skilled non manual jobs, and none was employed in unskilled or manual activities. Most

fathers were classified as professional or intermediate. A greater percentage of the stereotypical choices came from the professional or intermediate groups than the skilled non manual group, whereas one third of the non-stereotypical choices came from the skilled non manual group.

Table 8.10
Frequencies for Occupational Status of Fathers

	Prof.	Int.	Sk.NM	Total
Male language	9	10	10	29
Female science	4	3	3	6
Non-stereo choice	**13**	**13**	**13**	**39**
Male science	23	21	5	49
Fem. language	17	35	8	60
Stereo. choice	**40**	**56**	**13**	**109**
Totals	**53**	**67**	**26**	**148**

$p<.01$
Prof = professional Int = intermediate
Sk.NM = skilled non-manual

(b) Upbringing

Whether brought up by both parents or mother alone (no-one was brought up by their father alone) was not a factor in choice of science or language overall. There was, however, a significant association ($p<.05$) in respect of non-stereotypical choice particularly for women choosing science, where 50% had been brought up by their mothers alone.

Table 8.11
Frequencies for Parental influence on upbringing

	Mother	Both parents	Total
Male language	10	19	29
Female science	6	6	12
Non-stereotypical	**16**	**25**	**41**
Male science	6	41	47
Female language	15	44	59
Stereo. choice	21	85	106
Totals	**37**	**110**	**147**

$p<.05$

(c) **Parental Occupation**

It had been hypothesised that having a parent in a scientific or language based occupation might influence choice. This did not appear to be the case for this sample. Nor did the occupations of adult siblings appear to have any effect.

(d) Siblings and Position in Family

Position in family did not prove to be significant, although the data suggested that a non-stereotypical choice was less likely by first or only children. There also appeared to be a relationship between the number of brothers or sisters and choice. As the number of sisters increased, the likelihood of choosing languages increased. As the number of brothers increased, the likelihood of choosing science increased. This was not significant. No relationship was found between the total number of siblings and degree choice.

2. Education, Ability, Attainment

(a) School type

A significant factor affecting choice was whether schooling at age 16-19, was single sex or mixed. This showed an association ($p<.01$) with degree. Single sex education was associated with language choice, for both boys and girls, and a mixed school was associated with science choices, particularly for boys.

Table 8.12
Frequencies for school type and subject choice

	Single sex (16-19)	Mixed (16-19)	Total
Science	24	36	60
Languages	54	32	86
Totals	78	68	146

$p<.01$

When sex and degree choice were combined, and crosstabulated with school type, there was an association, ($p<.05$),supporting the suggestion that single sex schools are associated with language choices by both boys and girls, and mixed schools seem to be associated with science choices for boys. School type, however, did not appear to be associated with choice of science by girls, but as the sample size was so small this finding can only be regarded as inconclusive.

Language choice, particularly by boys, also seemed to be associated with grammar school education aged 11-16, and science choice with comprehensive education. ($p<.05$)

(b) Attainment

Relatively more students choosing science had obtained more 'A' levels (4 or 5) than students choosing languages.($p<.05$) Moreover, the average 'A' level grade was significantly higher for the science students than the language students. ($p<.01$). There were no sex differences in this respect.

Table 8.13
Number of 'A' level passes by subject groups

	under 4	4 or more	Total
Science group	41	22	63
Language group	75	20	95
Total	116	42	158

The number of 'O' levels obtained, and average 'O' level grade did not appear to be associated with subject choice at degree level or non-stereotypical choice.

(c) Ability

The ability tests showed, as one would expect, that science students were significantly higher on abstract reasoning, numerical ability and perceptual ability. The

language students were higher on verbal ability. There were no sex differences in this respect.

3. Personality

(a) Masculinity, Femininity, and Androgyny

Table 8.6 shows the relationship between the androgynous categories and degree choice by sex. It confirms and reflects sex differences in choice of subject but also shows that there were relatively more androgynous cases in the male language group than the other three groups, and there was a tendency for the male language group to be categorised as androgynous, feminine or undifferentiated rather than masculine.

When the measures of masculinity and femininity were used independently, they were significantly associated with both degree choice and sex/degree combined. This probably reflected a sex rather than a gender difference. Masculinity showed an association with degree choice, ($p<.001$), as one would expect, reflecting the correlation between masculinity and male sex, and male choice of science. Masculinity also showed an association with sex and degree combined, ($p<.001$).

Table 8.14
Sex Role categories and choice of degree by sex

	ML	FS	MS	FL	Total
Andro	08	02	08	12	30
row %	26.7	6.6	26.7	40	100
col %	25.8	16.7	16.0	19.7	
Masc	10	02	28	09	49
row %	20.4	4.1	57.1	18.4	100
col %	32.2	16.7	56.0	14.7	
Fem	07	06	05	31	49
row %	14.3	12.2	10.2	63.3	100
col %	22.6	50.0	10.0	50.8	
Und	06	02	09	09	26
row %	23.1	7.7	34.6	34.6	100
col %	19.3	16.7	18.0	14.7	
col total	31	12	50	61	154
row %	20.1	7.8	32.5	39.6	100

ML: language choice by men FL: language choice by women MS: science choice by men FS: science choice by women And Androgynous Masc: Masculine Fem: Feminine Und: Undifferentiated

Masculinity was also significantly associated with non-stereotypical choices, that is language choice by men, science choice by women. Such choices were associated with average levels of masculinity. There were relatively fewer of these choices in the high masculinity category. The difference was not, however, statistically significant.

Femininity also had a strong association with both degree choice and choice of degree combined with sex, indicating as expected that medium and high femininity is more common with language choice,($p<001$).

When femininity was crosstabulated with non-stereotypical choices, it showed that language choice by men correlated with medium and high femininity, and science choice by women with an average level of femininity.

Undifferentiation (ie not being sex typed), was associated with degree choice ($p<.05$) and less significantly with degree combined with sex. This suggested that more non-sextyped people take languages than science. There were also relatively more men taking languages in the low and medium categories, more women taking science in the medium category, more men taking science in the high category, and more women taking languages in the low category. The men rather than the women influenced these findings.

An analysis of variance of group means confirmed that the science group were significantly higher on masculinity than the language group ($p<.01$), and that the language group were significantly higher than the science group on femininity ($p<.001$)

(b) Extraversion/ Neuroticism

When the EPQ categories were cross tabulated with degree choice and degree by sex, there were significant Chi square associations, ($p<.01$) and ($p<.05$) respectively.

Table 8.15
EPQ categories and degree choice by sex

	NI	NX	SI	SE	Total
Male language	13	4	4	8	29
Female Science	1		2	6	9
Male Science	9	3	15	15	42
Female language	17	15	9	15	56
Totals	40	22	30	44	136

NI: neurotic introvert NX: neurotic extravert

SI: stable introvert SE: stable extravert

These results suggested that categorisation as a neurotic introvert was associated with language choice by men. Categorisation as a stable extravert was associated with science choice by women. Men who chose science were either stable introverts or stable extraverts. Women who chose languages were either neurotic introverts or neurotic extraverts.

When the two scales were considered independently, only neuroticism-stability showed an association with the sex by degree groups in a cross tabulation. ($p<.05$). In an analysis of variance the language group mean was higher than the science group mean on both neuroticism and extraversion, but this was not significant.

Table 8.16
Psychoticism and Subject Choice

	Low	Medium	High	Total
Male language	1	20	8	29
Female science	4	3	2	9
Male science	2	29	11	42
Fem. language	1	51	4	56
Totals	8	103	25	136

$p<.001$

Psychoticism had an association ($p<.05$) with degree choice. All those who made language choices had scores in the medium range, and those who chose science had relatively more low and more high scores. The science group as a whole were higher than the language group on psychoticism, but the scale seems to have a U shaped association with the degree choice by sex groups. Women who chose science had more low and more high scores on psychoticism than those who made stereotypical choices. (see table 8.13 above)

Self-esteem

The self esteem variables showed no significant association with the dependent variables related to degree choice, although the science group means were higher than the language group on all the self esteem measures.

Attributions

There appeared to be no significant differences in the way students choosing science rather than languages attributed success and failure. However, when the two scores were combined, (see table 8.22 that follows), there was a significant difference ($p<.01$) suggesting that a language choice was associated with less perceived control over outcomes. The analysis of variance supported this, the mean for the language group being significantly higher than the mean for the science group ($p<.001$)

Table 8.17
Perceived control over outcomes
Frequency of response

Score*	Language		Science		Total
	Male	Female	Male	Female	
	N	N	N	N	N
1	2	4	7	1	14
2	4	7	10	3	24
3	13	31	23	7	74
4	10	21	5	2	38
Total	29	63	45	13	150
	92		58		150

* The higher the score, the less perceived control over outcomes

4. Other Variables associated with Choice

The time decisions were made to opt in one direction rather than another varied from primary school to second year sixth and later for the minority of slightly mature students in the sample. The most 'normal' time (70% of the sample) was 4th year, 5th year or first year sixth. There were no significant differences in the time when decisions were made between science and languages, although 20% of the science choices were made before the 4th year compared with 15.2% of language choices. There was also a tendency for the stereotypical choices to be 'early' and the non-stereotypical ones to be either 'normal' or 'late'.

Most people had conscious reasons that they gave for making choices. Seven options were considered as likely factors that might influence choice. Subjects could endorse any or all. Each is commented on below, and table 8.15 summarizes the strength of the stated reasons.

Table 8.18
Reasons for choice of subject; % endorsement

Reason	MS	ML	FS	FL	All
Ability	69	90	54	76	75
Interest	92	94	69	98	93
Need	49	6	8	8	20
Money	0	0	8	0	1
School pressure	2	6	8	3	6
Career	6	0	31	3	6
Parental pressure	4	0	0	0	1

a) Interest and Ability to do the subject were the 2 stated reasons that were most frequently endorsed by the total sample,

b) Ability was endorsed more often by boys than girls in choice of either degree, but particularly in languages.

c) Interest, though important for both sexes in choice of either degree, was endorsed more often by women, particularly for a language choice.

d) The science group endorsed Need for the subject more frequently than the languages group, possibly because some of the subjects were being sponsored by employers who specified the course of study.

e) Within the subject groups there were some sex differences. In science, interest and need were more important to men than women, whereas money, school pressure and career prospects were more important to women. In languages, ability and pressure from school were more endorsed by men than women, while interest and career prospects were marginally more important factors to the women.

f) School pressure, though not endorsed very frequently at all seemed to be a common, though not very significant factor in non-stereotypical choice.

g) Parental pressure was not regarded as a significant factor in any choice.

75% of all the subjects said they would repeat the same course if they could start all over again. There were no differences between the sexes or subject groups in this respect.

Expressed current plans fell into 4 groups:study, employment, travel, and undecided. There were no significant differences between the language group and the science group, although more of the language group were undecided, and more of the science group were looking to employment. There were no sex differences.

Subjects were asked about their hopes for the future. Again they could endorse any or all of 10 possibilities. The highest endorsement, 52% was for a career, in spite of this not being stated as important in degree choice. Significantly more women than men wanted a family, more men than women wanted responsibility. Women in science endorsed employment more than any other sub group, but had

the same % endorsement for a family, and were less interested than other groups in a career.

C. Conclusions

The above exploration of association between the predictor variables and choice of subject suggested that useful variables for inclusion in a multivariate analysis would be;

Family

- employment status of mother
- occupational classification of father
- parental influence in upbringing
- number of brothers, number of sisters

Education and Ability

- whether school single sex or mixed
- whether school grammar or comprehensive
- average 'O' and 'A' level grades

Personality

- masculinity and femininity, androgyny, being undifferentiated
- neuroticism, and psychoticism
- perceived control over outcomes

Reasons and other variables associated with choice

- stated reasons for choice: ability, interest necessity, financial prospects, parental pressure

- time of decision making
- aspiring to a home and family

Choice of science seemed to be influenced by having a non-working mother, a father from occupational groups 1 and 2, being brought up by both parents, and having fewer sisters than brothers.

Choice of language seemed to be associated with a working mother, a father from occupational group 3, having fewer brothers than sisters, and less perceived control over outcomes.

Non-stereotypical choice seemed to be associated with being brought up by mother alone, femininity, psychoticism, neuroticism, androgyny, and the time the choice was made.

IV. Achievement

A. General Considerations

The measure of achievement selected as the independent variable was the grade awarded in final or end of year examinations; first class coded 5, upper second 4, lower second 3, pass 2, and fail 1. For purposes of the discriminant analysis reported in chapter IX, these 5 groups were also regrouped into 2; high (firsts and upper seconds) and low (lower seconds, pass and fail).

There were no significant sex differences in the class of degree awarded, although relatively more men either obtained firsts or pass degrees or fails. More women achieved upper seconds. This was also the pattern of subject differences, there being more science firsts and more lower grades than in languages. The chi square measure of association showed this to be significant, ($p<.05$). There were no significant differences between the mean examination grades when the sample were broken down into subject groups by sex.

B. Predictor Variables and Achievement

1. Family Background

None of the family variables appeared to be important. Although not statistically significant, no 'Only' children failed or got third class degrees.

2. Education, Ability and Past Attainment

(a) School type

There was some association between results and whether the school were comprehensive or a grammar school. This was particularly so for the boys ($p<.01$) aged 11-16, and aged 16-19. The pattern for the 11-16 year olds, suggested that grammar schools obtained relatively more upper and lower seconds, but the comprehensives were equally good at producing firsts, and at doing badly. Aged 16-19, comprehensives appear to produce more firsts and upper seconds than grammar schools.

Upto age 16, whether the school was single sex or mixed was significant particularly for the boys, ($p<.05$). It appeared to show that the mixed school produced relatively more first class degrees, although the relative numbers of upper seconds were the same. There were relatively more lower class degrees from the single sex schools. This would suggest that before age 16, a mixed grammar school education, and after 16, a comprehensive education is likely to produce better degrees. There are however, sex differences.

(b) Attainment

There was some association with the number of 'A' levels

obtained, particularly for the girls ($p<.05$). Average 'O' level grade was also important for both sexes ($p<.01$)

(c) Ability

The ability tests, which only applied to a small sample of 48, were all significantly correlated with exam results; verbal ability ($p<.01$), numerical ability, ($p<.05$), perceptual ability, ($p<.01$), spatial ability, ($p<.05$), mechanical, ($p<.01$).

In an analysis of variance, however, only mechanical ability, ($p<.05$) and outer confidence, a personality measure from the same battery, ($p<.01$), were significantly associated with examination success.

3. Personality

There were some significant, positive correlations as follows; academic self esteem,($p<.001$), specific self esteem ($p<.001$), perceived control over outcomes ($p<.05$). There were also some significant negative correlations; The EPQ lie scale, ($p<.05$), and psychoticism, ($p<.05$)

The crosstabulations supported an association between examination success and three personality variables: academic self esteem, specific self esteem and attributions for success in examinations.

Surprisingly, for this sample, the Eysenck measures of neuroticism and extraversion were not associated with examination performance. Neither were the androgyny measures, although none of the cases classified as androgynous failed.

C. Conclusions

The predictors affecting academic achievement for this sample were associated with educational experience and personality. Androgyny was not a factor in determining examination success. Self esteem, attributions for success, ability, past achievement, and type of school were important. Family background was not. Some of the situational factors operated differently for the sexes.

Useful variables for inclusion in a multivariate analysis to explore the prediction of achievement would be;

Education, Ability and Attainment

- school type: grammar or comprehensive, 11-16 and 16-19; single sex or mixed, 11-16
- number of 'A' levels passed, average 'O' level and 'A' level grade
- verbal ability, numerical ability, perceptual ability, spatial ability, mechanical ability,

Personality

- academic and specific self esteem
- attributions for success and perceived control over outcomes
- the lie scale, and psychoticism from the EPQ and outer confidence.

Although the sex role categories did not appear to be associated with achievement in these preliminary analyses, masculinity and femininity were retained for further investigation.

In the next two chapters each of the three areas of interest is explored further using both discriminant function analysis and regression.

IX. The Prediction of Psychological Gender, Subject Choice and Attainment: Discriminant Function Analysis

Each area of interest was dealt with in turn in separate analyses. Psychological androgyny was considered first as an outcome, and then subsequently as a predictor of both degree choice and achievement.

A. Statistical note on discriminant function analysis

One purpose of discriminant function analysis is to classify individuals into groups on the basis of discriminating variables, so as to compare predicted with actual groups. The coefficient obtained for each variable is known as the Unstandardised Discriminant Function Coefficient. Coefficients help to determine the linear discriminant equation for each group, (similar to the multiple linear regression equation). The coefficients are also used to obtain a discriminant score for each case, on the basis of which cases are classified into groups according to Bayes' rule. The discriminant score is the weighted average of the variables, the weights being estimated so as to obtain the best separation between the groups. The standardised mean score for all cases is 0 and the pooled within-groups variance 1. The average or mean score for each group, is the group centroid.

The linear discriminant function requires that the predictor variables have a multivariate normal distribution, but if dichotomous variables are included, the function has been shown to perform well. (Norusis,M.J.,1985, Gilbert, 1981, Moore, 1973) Variables which are linear combinations of other variables are not permitted. In this analysis, the variables selected for the pool were both continuous and dichotomous.(See appendix to Chapter VIII)

A limitation is that cases are excluded from the analysis if there is missing information for any variable used to define the group. This can lead to bias if the subjects who don't give data are very different from those who do. In this research it led to some very small sample sizes for the sub groups, and hence some dubious results. To reduce this effect, variables were first selected on the basis of the preliminary investigations referred to in chapter VIII, and previous research. This 'pool' of variables was then reduced to the number of variables actually selected in a first analysis, as explained below.

A stepwise analysis was selected which was based on minimising Wilks' lambda, (the proportion of total variance in the discriminant scores not explained by differences between the groups) in order to see which

variables had the most discriminating power. A second analysis was then undertaken using only those variables which had been selected in the first in order to make a more efficient analysis, by lowering the ratio of predictor variables to cases. (It should be noted, however, that the value of a coefficient for any particular variable depends on the other variables in the function, and taking variables out of the function affects the relative importance of those remaining)

B. Psychological Gender: prediction of classified group membership

Androgyny was considered as a dependent variable in this analysis, but subsequently, (sections C and D that follow), was treated as a predictor when degree choice and achievement were being considered.

As a dependent variable, it was explored in several ways on the basis of prediction of group membership from pools of variables. The following were the different variables used:

(a) The four categories, androgyny, masculinity, femininity and undifferentiation. The entire sample and men and women separately were analysed.

(b) The same categories re-grouped by sex: male androgynous, female androgynous, male masculine, female masculine, male feminine, female feminine, male undifferentiated and female undifferentiated.

(c) The above re-grouped into;

1. Androgynous (male and female),
2. Opposite sex typed(male feminine and female masculine),
3. Stereotypical (male masculine and female feminine),
4. Undifferentiated (male and female).

(d) Further re-grouping into :

1. Stereotypical (3 and 4 above) and
2. Non-stereotypical (1 and 2 above)

(e) The continuous sex role measures, derived using the Motowildo formula as described in chapter IV.

In the initial analyses, 19 variables were in the pool, and 123 cases were used. To improve efficiency, each analysis was done a second time, the pool being those variables that were selected and used in the first analysis . The original pool of 19 were chosen on the basis of the preliminary analyses (chapter VIII) and were

as follows:

Family:

Number of sisters, employment status of mother, father in a scientific occupation, influence of mother, father in an occupation related to languages position in family

Education:

type of education 11-16, number of passes at' A' level, degree choice.

Personality:

Neuroticism, extraversion, the lie indicator psychoticism, control over outcomes, global self-esteem.

Other variables associated with degree choice:

Stated Reasons:

Necessity, parental pressure

Aims/ motivations

wanting financial success, wanting a home and family

I. Classification according to the sex role categories

1. The original sex role categories

12 different variables overall, in 3 different analyses,

(total sample, men only, women only), were selected from the pool of 19. These 12, (employment status of mother, whether father had a scientific occupation or not, position in family, type of school 11-16, number of 'A' levels passed, extraversion, the lie scale, psychoticism, perceived control over outcomes, global self esteem, necessity as a reason for subject choice, and aspiring to a home and family), formed the pool for a second analysis. This resulted in the cases used being increased from 123 to 126.

A stepwise solution was chosen for the discriminant analysis, the number and combination of variables used being determined by the programme. (Basically variables are not selected which contribute too much variance that is not explainable by differences between the groups).

Six were chosen for the total sample: extraversion, the lie scale, psychoticism, global self esteem, necessity as a reason for choice and aspiring to a home and family. These were all good discriminators in the first function. Only 39.61% of cases were, however, correctly classified, the category with the most correct being masculinity, 46.9% These results can be seen in table 9.1 that follows below.

Table 9.1

Discriminant Analysis: sex role categories

	Total	**Men**	**Women**
	A M F U	**A M F U**	**A M F U**
Membership	21,39,44,22	11,29,11,12	10,10,33,10
Variables	6	4	9
Wilks lambda	.6592448	.6086883	.5044837
chi sq sig	0.0001	0.0042	0.0783
Eigenvalue	.33043	.44346	.36207
Variance	70.54	76.26	46.51
Canon corr	.4983612	.5542749	.5155817
r^2	.2484639	.3072207	.2658244
% classified correctly	39.61	39.51	58.9

Note: A= Androgynous, M= Masculine, F= Feminine, U= Undifferentiated, sq= squared, sig- significance corr= correlation.

When the male and female samples were analysed separately, marginally better classification was achieved for women. Nine discriminating variables were selected. These were: employment status of mother, whether father was in a scientific occupation or not, position in family, number

of 'A' levels passed, the lie scale, psychoticism, perceived control over outcomes, global self-esteem and necessity as a reason for choice. 58.9% of the cases were correctly classified.

Only 4 variables were used to classify the male sample. These were: school type 11-16, the lie scale, psychoticism, and global self-esteem. These led to 39.5% of the sample being correctly classified.

It can be seen from table 9.2 that it appears easier to predict membership of the androgynous and opposite sex role groups than membership of the groups that are congruent with biological sex.

2. Re-grouped sex role categories

The categories were re-grouped in several ways as described in B(b) and (c) above. The results are summarised in table 9.3. When sex was taken into account, producing 8 categories, (Andsex), and the entire sample were treated together, the 7 variables used to discriminate in the first run were entered into the pool for the second run and 6 were selected. These were extraversion, the lie scale, psychoticism, global self esteem , necessity as a reason for choice, and aspiring to a home and family. Again, the numbers correctly

Table 9.2
Predicted membership of sex role categories

Total Sample

Group	N	A	M	F	U
Androgynous	30	**36,7%**	23.3%	23.3%	16.7%
Masculine	49	20.4%	**46.9%**	22.4%	10.2%
Feminine	49	32.7%	10.2%	**44.9%**	12.2%
Undifferentd.	26	19.2%	26.9%	34.6%	**19.2%**
not grouped	4	0%	25.0%	50.0%	25.0%

Correctly classified 39.61%

Men

		A	M	F	U
Androgynous	16	**50.0%**	25.0%	18.8%	6.3%
Masculine	38	26.3%	**39.5%**	10.5%	23.7%
Feminine	12	25.0%	8.3%	**41.7%**	25.0%
Undifferentd.	15	0.0%	26.7%	46.7	**26.7%**
not grouped	1	0%	0%	100.0%	0%

Correctly classified 39.51%

Women

Androgynous	14	**64.3%**	21.4%	14.3%	0.0%
Masculine	11	9.1%	**72.7%**	18.2%	0.0%
Feminine	37	21.6%	10.8%	**48.6%**	18.9%
Undifferentd.	11	18.2%	9.1%	0.0%	**72.7%**
not grouped	3	33.3%	0%	66.7%	0%

Correctly classified 58.9%

note: undifferentd= undifferentiated

classified were low, only 29.87%. The variables chosen were identical to those selected to discriminate between the original 4 sex role categories, although androgyny was easier to predict, 50% of the female androgynous group being correct and 37.5% of the male androgynous group.

Re-grouping into 4 categories, androgynous, opposite, stereotypical and undifferentiated, produced the same overall classification of 29.87 %, using 4 variables: global self-esteem, extraversion, number of 'A' levels passed, and perceived control over outcomes. Again, the androgynous category was easiest to predict, with 60% of cases being correctly classified, and nearly 50% of the opposite sex role type.

Better classification was achieved when the groups were further re-grouped into 2 only; a stereotypical one and a non- stereotypical one. Originally, it had seemed logical to classify undifferentiated cases as non-stereotypical, but the results of the previous analyses suggested that they should form part of the stereotypical group.

In this analysis, 12 variables comprised the pool, this being the combined set of those previously selected in the analysis of the whole group and men and women separately. 7 variables were selected: number of sisters,

influence of mother, position in family, number of 'A' levels passed, the lie scale, perceived control over outcomes, and aspiring to a home and family. 123 cases were used, and 63.64% were classified correctly. 64.2% of the non-stereotypical group were correctly placed and 63.4% of the stereotypical group.

These results suggested that when the groups were rearranged on the basis of whether they were stereotypical or not, family variables become more important as predictors. Table 9.3 that follows summarises these results.

Members of the non-stereotypical group appeared :

- to have more sisters
- to have been brought up by mother alone
- to be older than their siblings
- to have fewer 'A' level passes
- to score lower on the lie scale
- to have less perceived control over outcomes
- to want financial success

Table 9.3

Discriminant Analysis

Sex Role Categories defined in different ways

	Andsex	**Sextype**	**Typical**
Groups	13,11,31,10, 12,33,14,10	21,21,59,22	42,81
Variables	6	4	7
Wilks Lambda	.4819075	.8223379	.88768
chi sq sig	0.000	0.0474	0.0405
Eigenvalue	.50150	.13572	.12654
Variance	59.32	65.80	100.0
Canon Corr	.5779254	.3456887	.33515
%Correct class	29.87	29.87	63.64%
		Non-stereo	64.2%
		Stereo	63.4%

Note: sq=square, sig=significance, corr=correlation.

Andsex groups: male androgynous, female androgynous, male masculine, female masculine, male feminine, female feminine, male undifferentiated, female undifferentiated.

sextype groups: androgynous, opposite, stereotypical, undifferentiated

Typical groups: stereotypical, non-stereotypical

When male and female groups were analysed separately on Typical, there was better discrimination. The results are summarised in tables 9.4. and 9.5

73.9% of the total group of 73 women were classified correctly, using 5 variables that were selected from the pool of 12. The results suggested that women categorised as non-stereotypical in their sex role orientation:

- were less likely to have fathers in scientific occupations
- scored lower on the lie scale*
- scored higher on psychoticism*
- had less perceived control over outcomes*
- were less likely to give necessity as a reason for subject choice

* correlated well with the function

In the analysis of 81 men, 67.9% were correctly classified using 7 variables. Men categorised as non-stereotypical:

- were more likely to have been brought up by their mother alone
- were older than their siblings

- were less likely to have been educated in a comprehensive school from 11-16 years
- had fewer 'A' levels
- scored lower on psychoticism
- were less likely to give necessity as a reason for subject choice
- were more likely to have future aspirations about home and family

All the variables correlated well with the function.

It is interesting to note that when the male and female samples were treated separately, different family variables emerged as predictors. Although psychoticism was selected for both samples, high levels predicted non-stereotypical behaviour in women, low levels predicted for men.

Details of all the variables used in the different analyses of the sex role categories are shown in appendix 9.1.

Table 9.4
Discriminant Analysis
Stereotypical and Non-stereotypical sex role groups

	Males	**Females**
Membership	22,39	20,42
Variables	7	5
Wilks lambda	.7030944	.8039914
chi sq sig	0.0066	0.0280
Eigenvalue	.42228	.24379
Variance	100.0	100.0
Canon corr	.5448904	.5779254
r^2	.2969055	.3339978

Note: sq=squared, sig=significance, corr=correlation

Table 9.5
Classification of Results
Females

Group	**N**	**NS(1)**	**S(2)**
Non-stereotypical	25	**80.0%**	20.0%
Stereotypical	48	29.2%	**70.8%**
Not grouped	3	66.7	33.3

% correctly classified overall 73.9

Males

Group	**N**	**NS(1)**	**S(2)**
Non-stereotypical	28	**75.0%**	25.0%
Stereotypical	53	35.8%	**64.2%**
Not grouped	1	100%	0%

% correctly classified overall 67.9

II. Classification on categories defined by the continuous measures of sex role.

In these analyses, each variable was treated separately. with each case being assigned a value for each of the 4 variables, androgyny, masculinity, femininity and undifferentiation, as opposed to being assigned to just one category as in the previous analysis. Both the entire sample and men and women separately were analysed.

It had been postulated that it might be easier to distinguish between cases who were high on say androgyny with those who were low, rather than between those who were androgynous and those who were masculine or feminine or undifferentiated. The 4 dependent variables, were recoded into high and low categories using a median split.

Initially, the same 19 independent variables were put into the pool as in the previous analyses, and a second series of analyses undertaken using as the pool the ones that had been selected by the programme in the first.

1. Androgyny

6 variables were selected from the 19, and 123 cases were used, 61 men, and 62 women. In the second analysis, 9 variables, the combined set of all those chosen in the analysis of the whole sample, and men and women

separately, were entered into the pool. This resulted in 127 cases being used and overall 63.64% of the cases being correctly classified using 4 discriminating variables.

All the selected variables correlated well with the function. For the sample as a whole, being high on androgyny was associated with:

- not having comprehensive education 11-16
- being high on global self-esteem
- not having a father in a scientific occupation
- being lower on the lie scale

Table 9.6
Discriminant Analysis, Androgyny

Groups	**Total**	**Males**	**Females**
1,low/2,high	61,66	29,36	32,30
Variables	4	7	5
Wilks Lambda	.8680648	.6646651	.8275957
chi sq sig	.0016	.0010	.0538
Canon corr.	.3632288	.5790810	.4152160
r^2	.1319352	.3353348	.1724043
Eigenvalue	.15199	.50452	.20832
% Correctly classsified:			
total	63.64	71.6	58.9
low	64.9	71.1	53.8
high	62.3	72.1	64.7

Note: sq=square, sig=significance, corr=correlation.

When analysed separately, the group means for men and women showed the same associations, although different discriminating variables were selected. Men who were high

on Androgyny:

- were less likely to have mothers who were employed
- were less likely to have fathers in scientific occupations
- were less likely to have had comprehensive schooling 11-16
- were higher on global self esteem
- scored lower on the lie scale
- were more likely to make subject choices because of necessity
- were more likely to be aspiring to financial success

Women who were high on androgyny:

- were less likely to have fathers in scientific occupations
- were less likely to have been at a comprehensive school 16-18
- scored higher on Psychoticism
- were less likely to make subject choices because of necessity
- were more likely to have home and family as an aspiration

It seems to be easier to discriminate between men who are high and low on androgyny than between the women who fall into those two groups.

2. Masculinity

122 cases were used in the analyses, 60 men and 62 women. When the analysis was repeated with only 8 variables in the pool, 134 cases were used, 69 being categorised low, and 65 high. The results are shown in table 9.7 that follows. For the group as a whole, being high on masculinity was associated with:

- scoring less on the lie scale
- scoring higher on psychoticism
- being higher on global self-esteem
- making subject choices on the basis of necessity

Men who were high on masculinity:

- had more 'A' level passes
- scored less on the lie scale
- were higher on global self-esteem
- scored higher on psychoticism
- were more likely to make subject choices on the grounds of necessity

Women who were high on masculinity

- were less likely to have fathers in scientific occupations
- scored less on the lie scale
- scored more on psychoticism
- were more likely to make subject choices on the grounds of necessity

Table 9.7
Discriminant Analysis, Masculinity

Groups	**Total**	**Males**	**Females**
1,low/2,high	69,65	23,47	46,18
Variables	4	5	4
Wilks Lambda	.7868410	.7099331	.8885587
chi sq sig	.0000	.0004	.0673
Canon corr.	.4616915	.53855786	.3338283
r^2	.21316	.290044	.11144
Eigenvalue	.27090	.40858	.12542
%correct class			
all	66.88	74.07	63.01
low	68.8	80.0	57.7
high	64.9	71.4	76.2

Note: sq=square, sig=significance, corr=correlation

Once again, predicting which groups the women belonged to was more difficult than predicting membership for men. High psychoticism was a factor predicting masculinity in both men and women, but only androgyny in women.

Table 9.8

Discriminant Analysis: Femininity

Groups	**Total**	**Males**	**Females**
1,low/2,high	66,68	49,21	17,47
Variables	6	6	6
Wilks Lambda	.7258842	.6573059 .	7745513
chi sq sig	0.000	0.0001	0.0197
Eigenvalue	.37763	.52136	.29107
Canon corr.	.5235606	.5854008	.4748144
r^2	.2741157	.3426941	.225448
% Correct classification			
all	65.58	76.54	71.23
low	59.7	77.2	80.0
high	71.4	75.0	67.9

3. Femininity

In the second run 11 variables were put in the pool, resulting in 134 cases being used and overall 65.58% of the sample being correctly classified. All 6 variables

selected correlated well with the function, the two most important being psychoticism and the lie scale.

Being high on femininity was associated with:

- not having a mother who was employed
- being higher on neuroticism
- being higher on the lie scale
- being lower on psychoticism
- being lower on global self-esteem
- not giving necessity as a reason for subject choice

When the male group were analysed separately, the same discriminating personality variables were chosen. In addition the number of 'A' levels passed was selected, cases in the 'high' group having fewer 'A' level passes.

In the first run of this analysis, position in family and influence of mother had also been chosen as discriminating variables. Group means had indicated that men who were high on femininity were more likely to have been brought up by their mothers alone, and were older than their siblings. In the final analysis, these were not among the variables selected.

6 variables were selected to discriminate between women in the two groups. Group means indicated that women high on Femininity:

- were less likely to have mothers who were employed
- were more likely to have fathers in scientific occupations
- scored higher on the lie scale
- were low on psychoticism
- were less extravert
- were more likely to give necessity as a reason for subject choice.

4. Being Undifferentiated

Initially, 123 cases were used, 61 males, 62 females. In the second analysis, 10 variables were put into the pool. 131 cases were used, and 64.94% of the total sample were correctly classified. Table 9.9 that follows, shows the results.

For the sample as a whole, being undifferentiated was associated with:

- not being brought up by mother alone
- having mother in employment
- having more passes at 'A' level.
- having had comprehensive education 11-16
- being high on neuroticism

- being low on extraversion
- being low on psychoticism
- being low on global self-esteem

Global self esteem had the largest standardised discriminant function coefficient. 'A' level score, neuroticism and psychoticism did not correlate well with the function.

Table 9.9

Discriminant Analysis, Being Undifferentiated

Groups	**Total**	**Males**	**Females**
1,low/2,high	65,66	36,32	29,34
Variables	8	6	4
Wilks Lambda	.7741667	.5722339 .	8692281
chi sq sig	.0001	.0000	.0822
Eigenvalue	.29171	.74754	.15045
Canon corr	.4752192	.6540383	.3616240
r^2	.22583	.4277661	.1307719
% Correct classification			
all	64.94	71.6	64.38
low	70.1	76.2	77.1
high	59.7	66.7	52.6

The group means for the male sample alone indicated the same criteria for membership, although psychoticism and influence of mother were not selected as discriminating variables. Position in family was selected as a discriminating variable, suggesting that men who are in the 'high' group on undifferentiation were more likely to be younger than their siblings.

In the analysis of the female group, only 4 variables were selected. Women high on undifferentiation:

- were less likely to have been brought up by mother alone
- were more likely to have fathers in scientific occupations
- were more likely to have mothers who were employed
- scored less on extraversion

III. Summary of Results and Comments

Finding a few variables that would discriminate between the 4 sex role categories and successfully predict group membership proved difficult. It was easier to deal with each category separately. The analysis was more successful with the androgynous and opposite categories, possibly because the variables considered had been selected on the basis of their relevance to androgyny or non-stereotypical behaviour.

The different analyses were not entirely in agreement, except in suggesting that the antecedents and outcomes of androgyny are different for men and women.

When discriminating between the 4 sex roles, family variables, (influence and employment status of mother, father in a scientific occupation and position in family), were only important when the sample of women WAS treated separately. Comprehensive education 11-16 was a discriminating variable for men only, as was having fewer 'A' levels for women.

There was the same lack of agreement over personality factors. The lie scale, psychoticism and global self esteem were discriminating variables for both sexes, but psychoticism however, operated differentially. Androgynous

women were likely to have higher levels and the men lower levels. The women also perceived themselves as being less in control over outcomes, and scored lower on the lie scale. Aspiring to financial success was a discriminating variable for the whole group.

The analyses suggested that there were similarities between androgynous and opposite sex role types. When these groups were combined and compared with the stereotypical cases, family variables emerged as being important, and better discrimination was achieved.

There were again some gender differences. Non-stereotypical men were likely to have been brought up by their mothers alone, and to be older than their siblings. They were also likely to have fewer 'A' levels, and not to have been educated in a comprehensive school. The women were less likely to have fathers in scientific occupations.

Better discrimination and prediction was achieved when low and high values of each sex role variable were considered separately, and more weight should perhaps be attached to these results.

When high androgyny was compared with low androgyny, having a father in a scientific occupation, and comprehensive education were discriminating variables for both sexes. The employment status of mother emerged as important for men. Global self esteem, and the lie scale were also important variables for the men. Psychoticism was a discriminating variable for the women.

Outcomes associated with being androgynous suggested as important in both analyses were necessity as a reason for subject choice, and wanting a home and family in the future.

The importance of the different variables in the analyses is summarised in appendix 9.1

C. Choice of Degree

The purpose of this analysis was to investigate the reasons for non-stereotypical choices and to explore the role of androgyny as a predictor.

This outcome was examined in three ways;

(i) Science or language choice (2 groups)

(ii) Science or language choice by sex (4 groups)

(iii) Stereotypical or non-stereotypical choice (2 groups: male science/ female language and male language/ female science)

The same 23 variables, identified in the preliminary analyses reported in chapter VIII, were used as the pool in the first run of all three discriminant analyses. Because of missing values, 45 cases were excluded from the analysis, and 113 cases were used. The pool was reduced for subsequent analyses to the number chosen by the programme in the first run of each analysis.

I. Degree Choice

19 variables, (see list below), the combined set of those selected in the analysis of the total sample, and males and females treated separately, were in the pool. 113

cases were used, and the results are shown in table 9.10 that follows.

The 19 variables in the pool were:

Family;

father in a professional occupation, father in a skilled non-manual occupation, father in an intermediate occupation, whether mother employed or not, number of brothers, number of sisters, influence of mother.

Education

whether mixed schooling 16-19yrs, average 'O' level grade, average 'A' level grade

Personality

neuroticism, masculinity, femininity, psychoticism, perceived control over outcomes, being undifferentiated.

Other variables associated with choice

Ability, interest, necessity and career possibility as expressed reasons for choice, the time subject choices were made, and wanting a home and family.

17 of the above variables were used in the analysis. The function discriminated well; 87.34% of cases were correctly classified, the eigenvalue suggested more between than within variance, the canonical correlation

showed that 65% of the total variance between the groups had been accounted for, and the size of Wilks' lamda showed that the proportion of variance in the discriminant scores not accounted for by differences between the groups, was relatively small.

The 6 variables with the largest correlations within the function, that is more than .2, were:

- (.37) necessity for a particular degree as a reason for choice
- (.34) femininity
- (.31) masculinity
- (.27) neuroticism
- (.26) interest as an expressed reason for choice
- (.21) career possibility as a reason for choice

The group means suggested that those who chose science:

- needed that particular degree
- had career possibilities in mind
- attended mixed schools post 16
- had a higher overall average 'A' level grade
- had fathers in professional occupations
- had more sisters*
- made their subject choice earlier rather than later in their school career.

- had higher levels of masculinity
- had more perceived control over outcomes

Those who chose languages:

- felt they had ability
- had home and family as a future aspiration*
- had mothers who were employed
- were more likely to have been brought up by mother alone
- were higher on femininity
- were more neurotic
- had less perceived control over outcomes
- had more brothers
- gave interest in the subject as a reason for choice

* These variables did not correlate well with the function.

Table 9.10

Discriminant Analysis, Degree Choice

	Total	**Males**	**Females**
Groups	**Sc La**	**Sc La**	**Sc La**
Actual Membership	40,73	32, 23	7, 50
Variables used	17	11	6
Wilks lambda	.3491338	.3897808	.3264577
Significance	.0000	.0000	.0000
Eigenvalue	1.86423	1.56554	2.06412
variance F1	100%	100%	100%
Canon corr.	.806728	.7811653	.8207572
r^2	.650810	.6102192	.6736424
No. of Functions	1	1	1
% Correct class.			
all	87.34	84.15	86.84
science	82.5	82.0	30.8
language	90.5	87.5	98.4

Notes:

Sc= science La= languages corr=correlation

When this analysis was undertaken for male and female cases separately, similar results were obtained. (Refer to table 9.10 above). 11 variables enabled 84.15% of cases in the male group to be classified correctly, and 6 variables led to 86.84% of the female group to be classified correctly. The female science group was difficult to predict, only 30.8% being correct.

There were, however, some differences in the variables selected. For the male group the variables that correlated best with the function were: necessity as a reason for choice (.43), femininity (.34), father in a skilled non manual occupation (.31), and masculinity (.30).

On the basis of the variables selected, and from inspection of the group means, it would appear that men who chose languages as opposed to science were more likely than those who chose science :

- to have mothers who were employed
- to have fathers from a skilled non-manual occupation
- to have scored higher on femininity,
- to have less perceived control over outcomes
- to have given ability as a reason for choice
- to have given interest as a reason for choice

- were more likely to have made the choice later in their school career.

They were less likely:

- to have attended a mixed school from 16 -19
- to have high average 'A' level grades
- to have scored high on masculinity
- to have given necessity as a reason for choice

For the female group, the variables that had the largest correlations with the function were: ability as a reason for choice (.75), career prospects as a reason for choice (.56),and average 'O' level grades (.25). Women who chose science, compared with women who chose languages:

- were more likely to have fathers in professional occupations
- had higher average 'O' level grades
- were less neurotic
- were less likely to give interest as a reason for subject choice
- were more likely to give necessity as a reason for choice
- were more likely to have a home and family as a future aspiration

The very small sample size and the very low correct classification, particularly for the female science group, suggest these comments be treated with caution.

II. Degree Choice by Sex

This analysis attempted to find variables that would discriminate between 4 groups; male science, male language, female science and female language. It was not expected that this analysis would be as efficient in predicting membership of the different groups, as the separate analyses by sex described earlier. It was felt however that it would be useful to see whether there were similarities between the two non-stereotypical groups.

17 variables entered into the pool were selected in the analysis. 113 cases were used. The first function accounted for 65.76% of the variance. The variables that correlated best with this function were femininity (.43), necessity as an expressed reason for choice (.41), and neuroticism (.27).

The variables selected were as follows:

Family

employment status of mother, father in a professional occupation, father in a skilled non-manual occupation, number of brothers

Education and Ability

average 'O' level grade, average 'A' level grade, whether education 16-19 were in a single sex or mixed school

Personality

neuroticism, femininity, perceived control over outcomes

Other variables associated with choice

ability, interest, necessity, financial prospects and career possibilities as reasons for choice, and time decisions were made.

The overall correct classification was 67.09%, but as in the previous analyses, the female science group was difficult to predict accurately. As 38.5% were wrongly classified as male language, see table 9.11 below, it did suggest there might be something in common between the two non-stereotypical groups. This is explored further in section III below.

Table 9.11
Discriminant Analysis: Degree choice by sex
Classification of cases

		Percentage classified correctly			
Actual membership		**Ml**	**Fs**	**Ms**	**Fl**
Male lang	32	**65.6**	0.0	9.4	25.0
Femscience	13	38.5	**30.8**	15.4	15.4
Malescience	50	6.0	4.0	**80.0**	8.0
Femlang	63	28.6	1.6	4.8	**65.1**

Table 9.12
Discriminant Analysis, Degree Choice

	Degree by Sex	**Stereo/non-st**
Groups	**Ml Fs Ms Fl**	**Ns S**
Actual Membership	23, 7, 33, 50	35, 95
Variables used	17	8
Wilks lambda	.1620768	.7871422
significance	.0000	.0006
Eigenvalue	1.84885	.27042
variance Fl	65.40%	100%
Canon corr.	.8055935	.4613652
r^2	.6489808	.2128578
No. of Functions	3	1
% Correct class.		
all	67.09	69.62
group 1	65.6	68.9
group 2	30.8	69.6
group 3	80.0	
group 4	65.1	

Notes:

Ml = Male language) Non-stereotypical choices
Fs = Female science)
Ms = Male science) Stereotypical choices
Fl = Female language)

III. Stereotypical and Non-Stereotypical Choice.

In this analysis, groups 1 and 2, in table 9.12 above, were combined to form a non-stereotypical group, and 3 and 4 a stereotypical one. The objective was to find out whether men and women making unusual choices had any common traits or experience.

It had been hypothesised that androgyny might lead to such choices. Previous researchers had found it useful to look not only at the interaction of masculinity and femininity, the components of androgyny, but also the separate effects of masculinity and femininity on outcomes. As the variables used in discriminant function analysis must be statistically independent, the decision was taken to include both masculinity and femininity as discriminating variables, but not androgyny.

In the second run of the analysis, 14 variables were entered into the pool, and 8 were selected. Overall, 72.31% of cases were correctly classified. 73.7% of cases in the stereotypical group were correctly placed and 68% of the non-stereotypical group. Wilks lambda, however, was .7871422, suggesting variance in the discriminant scores not accounted for by group differences. Only 21% of the variance between the groups was accounted for by the function.

The discriminating variables selected were: ability as a reason for choice;

fathers in skilled non-manual occupations

fathers in professional occupations

psychoticism necessity as a reason for choice;

financial prospects as a reason for choice

career possibilities as reason for choice

time of decision

All of these variables correlated well with the function except fathers in professional occupations

The results, and inspection of the means, suggested that people who made non-stereotypical choices :

- were more likely to have fathers in skilled non manual occupations
- had higher scores on psychoticism
- were more likely to give ability as a reason for choice
- were less likely to give necessity as a reason for choice
- were more likely to give financial prospects as a reason for choice

were more likely to give career prospects as a reason for choice

- were more likely to have made the choice at a later stage in their school career.

IV. Comments

1. Degree choice: science or language

17 Variables explained 64% variance between two groups using the complete sample. Choice of science was associated with father being in a professional occupation, education in a mixed school, good 'A' level grades, higher levels of masculinity, greater perceived control over outcomes, career certainty, and making a subject choice early in school career,

Language choice seemed to be associated with having a mother in employment, being brought up by mother alone, being high on femininity, neuroticism, less perceived control over outcomes, believing one had the specific ability and confidence to succeed, and seeing home and family as a goal,

The problem associated with the analysis of the sub groups was the small sample sizes, particularly the female science group. This and the lack of homogeneity makes the the following summary of the findings rather suspect:

When men and women were treated separately:

a) Female Science.

The important discriminating variables were: having a professional father (this relates to other research re parenting and value from opposite sexed parent), having higher than average 'O' Level grades compared with men, (this probably acts as a deterrent, as boys choose science anyway), being more neurotic than men who choose science, interest in the subject, and need for a subject that related to a career.

b) Male language.

The discriminating variables were: having a mother in employment, having a father in a skilled non manual occupation, single sex education 16-19 (suggesting that it is easier to be different in a non mixed environment), higher levels of femininity, low masculinity, belief in ability, and making an educational choice later in school career,

2. Non-stereotypical choices

This analysis investigated the likelihood of common factors influencing non-stereotypical choice. As there were more male language cases than female Science, the preferences of the former group biassed results.

There were 130 cases used in the analysis. The 7 discriminating variables could only explain 21% of the variance between the stereotypical choice group and the non-stereotypical group.

The only family variables were having a father in a skilled non-manual occupation, and having more sisters. Choices were based on ability rather than necessity, and were made at a later stage in one's school career. Financial success was an aspiration. Higher levels of psychoticism appeared to be associated with non-stereotypical choice.

It was felt that because of the preponderance of male language over female science, some of these factors were related to language choice and/or male gender. But psychoticism and time of decision were worth exploring further.

One reason for exploring degree choice as an outcome was to see if androgyny, or its separate components, masculinity and femininity, were predictors of non-stereotypical choices. Both masculinity and femininity were selected as discriminating variables when the degree choices of the total sample were analysed, and when the male sample were looked at separately. Femininity was a

discriminating variable when degree choices by sex (4 groups) was examined. Neither variable was selected when the non-stereotypical choices of both sexes were looked at together. Androgyny, rather than its components was not examined because variables used in a discriminant analysis must be statistically independent.

To summarise, it was difficult to find any real correspondence between the two non-stereotypical groups, male language and female science, that was not a function of a sex or degree difference. The exceptions were time of decision and psychoticism. The implications of this will be discussed later.

Although non-stereotypical maternal roles seemed significant in the prediction of non-stereotypical choices when males and females were analysed separately, this factor did not emerge when all non-stereotypical choices were examined together. This is presumably because these behaviours affect men and women differentially.

D. Achievement

The measure adopted for this outcome was the final examination grade. This was treated in two ways; first with 5 categories, equivalent to final degree results,and second with two categories, high and low. In both cases subjects were analysed as a total group, and as separate male and female groups.

Achievement had been chosen as a dependent variable, not in order to predict success per se, but because of interest in androgyny as a predictor of success. It had been hypothesised that androgynous candidates would be higher achieving than other sex role types.

The results of the preliminary investigations (see chapter VIII), had indicated, however, that the important predictors were not androgyny but self esteem, attributions about success and failure, other personality dimensions, ability and past achievement.

Initially, thirteen variables were included in the analyses. Although androgyny had not appeared to be a useful predictor, masculinity and femininity as separate dimensions were included. These pool of variables were as follows:

Education

School type 11-16 and 16-19, whether single sex or mixed 11-16, average 'O' level grade, average 'A' level grade, and total number of 'A' level passes.

Personality

Masculinity, femininity, specific self esteem, academic self esteem, attributions regarding academic success, the lie scale, and psychoticism.

I. Achievement, 5 categories

In the final run, see tables 9.13 and 9.14 that follow, the 11 variables that comprised the combined set of variables selected in the analysis of the total group, and the male and female groups separately, were put into the pool. 103 cases were used, and 8 discriminating variables led to the correct classification of 40.14% of the cases. These were as follows: school type 11-16, average 'O' level grade, average 'A' level grade, number of 'A' levels passed, specific self esteem, attributions re success, the lie scale and psychoticism.

It is clearly difficult to discriminate accurately between 5 classes of degree, but easier to deal with 2 groups as the subsequent analysis showed. This analysis was probably as efficient as was possible given the fact that the

examination grades were produced by different departments and were not standardised.

Table 9.13

Discriminant Analysis:

Predicted Membership of examination categories

Group Deg	N	1 fail	2 pass	3 lower 2 second	4 upper second	5 first
1	7	**28.6%**	42,9%	14.3%	14.3%	0%
2	10	30.0%	**50.0%**	10.0%	10.0%	0%
3	48	16.7%	6.3%	**41.7%**	20.8%	14.6%
4	58	10.3%	1.7%	31.0%	**31.0%**	25.9%
5	19	10.5%	5.3%	10.5%	10.5%	**63.2%**
not grouped	16	12.5	0	12.5	37.5	37.5

When the male and female groups were analysed separately, there was marginally better classification, but this was probably due to the smaller size of the groups. The same 11 variables were put into the pool, 6 were selected in the analysis of the male sample, and 5 in the analysis of the female sample. There were some differences in the choice of variables, previous examination grades and

attributions re success being used to discriminate between the male groups, and the lie scale being a discriminator in the female analysis. What both groups had in common was specific self esteem, school type 11-16, and the number of 'A' levels they had acquired.

Table 9.14

Discriminant Analysis: Achievement

	Total	**Males**	**Females**
Groups	5 4 3 2 1	5 4 3 2 1	5 4 3 2 1
Actual Memb.	14,44,34,7, 4	8 20 15 4 3	6 23 19 2 1
Variables	8	6	5
Wilks Lambda	0.4003906	0.2269171	0.3180631
chi sq sig	.0000	0000	.0001
Eigenvalue F1	0.86997	1.46020	1.14322
variance	73.64	68.0	71.98
Canon corr.	0.6820798	0.7704088	0.7303504
r^2	.4652303	.59352972	.53341171
Functions 4	4	4	
% Correct	40.14	48.65	54.41

II. Achievement, 2 categories

In this analysis 9 variables were put in the pool. These

were the combined set of those selected in the first run of the analysis of the total sample and males and females separately. 101 cases were used. For the total sample, 7 variables were selected leading to an overall correct classification of 69.01, and 73.8% of the 'low' group, and 64.9% of the 'high' group. Five of the seven variables selected correlated well with the function, the strongest being the total number of 'A' level passes.

The discriminating variables were:

Education and achievement

number of 'A' levels, average 'A' level grade, school type post 16

Personality

specific self esteem, the lie scale, psychoticism, academic self-esteem

From the group means it would appear that the higher achieving group :

- were more likely to have been educated after age 16 in a comprehensive school,
- had passed a greater number of 'A' levels,
- had higher 'A' level grades
- were more confident about success in these specific exams,
- had higher scores on academic self-esteem

- had a lower score on the lie scale,
- had lower scores on psychoticism.

The higher achieving group were slightly higher on masculinity and lower on femininity. Because of our interest in androgyny, these variables were included in the initial pool of variables, but at no stage in the discriminant analysis were they selected as strong discriminators.

When men and women were analysed separately, much better classification was again obtained. There were, again, some differences in choice of variables. 6 variables enabled 70.27% of the male group to be classified correctly, and 5 variables resulted in 79.41% of the female group to be correctly classified. Table 9.15 shows these results.

Table 9.15
Discriminant Analysis: Achievement (2 categories)

	Total	**Males**	**Females**
Groups	1 2	1 2	1 2
Actual membership	66 44	28 21	29 22
Variables used	7	6	5
Wilks lambda	.6697192	.5222277	.6035071
chi sq sig	.0000	.0001	.0002
Eigenvalue f1	.49316	.91487	.65698
Canon corr	.5747006	.6912108	.6296768
r^2	.3302808	.4777724	.3964929
% Correct class:	66.20	70.27	79.41

Inspection of group means suggested that the men who achieved:

- had a greater number of 'A' levels
- were more likely to have had comprehensive education after the age of 16
- scored higher on specific self-esteem
- tended to attribute success to external factors
- had lower scores on psychoticism
- were more likely to have been in a mixed school from 11-16 years.

The women in the higher achieving group:

- had a greater number of 'A' levels
- had higher average 'A' level grades
- scored more highly on both specific and academic self- esteem
- scored lower on the lie scale

III. Comments : Achievement

The primary reason for exploring achievement was to examine the role of androgyny in academic success generally, and particularly in non-stereotypical areas. Although the preliminary analyses, (chapter VIII), had ruled out the importance of androgyny as a predictor, masculinity and femininity as separate concepts were

included in the discriminant analyses. In neither analysis were these factors important.

Other issues to do with differences in gender achievement which have already been touched on in previous chapters were also of interest; whether there were differences in achievement in non-stereotypical areas, both pre-entry and finally.

As detailed earlier, in the section on degree choice, girls choosing science did have higher average 'O' level grades than girls choosing languages or boys choosing science or languages. Their 'A' level grades were slightly lower than boys choosing science.

There were no significant gender differences in degree results. (see chapter VIII).

As noted earlier, discriminating between 5 categories of degree result was not as efficient as dealing with two. The overall picture that emerged from the two analyses was that confidence and previous achievement were important for both sexes, but there were gender differences.

Specifically, the number of 'A' levels passed, and specific self esteem were the best discriminating

variables for both sexes. Comprehensive education 16-19, a tendency to attribute success more to external factors than ability or effort, and low scores on psychoticism were associated with examination success for men. The important other factors for women were academic self esteem and average 'A' level grades.

E. General Conclusions arising from the Discriminant Analysis

I. Sex Role Types

In the discriminant analyses, androgyny and the other sex roles were explored in two ways. We were interested in the antecedents correlates and outcomes, of each sex role type when compared with the other three, and also as independent concepts when high levels of the concept were compared with low levels. It was assumed that it was possible to possess varying degrees of each type of behaviour.

It was found more difficult to discriminate between the four categories than between high and low levels of each type of behaviour. There seemed to be some similarities between the androgynous and opposite sex role types and the stereotypical ones, in terms of antecedents, correlates and outcomes. Different effects were found for men and women when treated separately, compared with the

results for the group as a whole. Moreover, two variables which were found to be discriminators for each sex separately, were not found to be important for the group as a whole.

Results, therefore, were somewhat ambiguous. In summary, the following variables seemed important either as discriminating factors for androgyny by itself, or when considered with the other sex roles, or when combined with opposite sex role types:

Both Men and Women

- not being educated in a comprehensive school 11-16
- having fewer 'A' levels
- psychoticism; low levels, men; high levels, women
- wanting financial success
- wanting a home and family
- ability and necessity as reasons for career choice
- low on the lie scale
- being older than siblings
- less likely to have fathers in scientific occupations

Men

- high levels of global self esteem
- being brought up by mother alone

Women

- mothers who are employed
- less control over outcomes

It was felt that exploring androgyny using regression analysis, might clarify things further.

II. Degree Choice

The particular interest in this outcome had been to learn the reasons why girls chose science subjects, and boys chose languages, whether there were any shared reasons, and whether these reasons were different from the ones given for stereotypical choices. It had been hypothesised that androgyny might be a factor.

This was explored, using discriminant analysis, by looking at three sets of outcomes; language choice versus science choice; choice of languages by men, compared with science by women; and both non-stereotypical choices compared with the stereotypical ones. Small sub groups made the analysis difficult, and there was the likelihood of bias.

Results indicated a science profile that was quite different from the language profile. Compared with the group of scientists as a whole, women who chose science

were more interested, needed the subject for a career, and had higher 'O' Level grades. Men who chose languages, compared with the language group as a whole, delayed the time of their educational choices, had fathers who were in skilled non manual occupations, and had been educated in single sex schools 11-19.

The two non-stereotypical groups had in common, higher levels of psychoticism, and the fact they had made their educational choices later rather than earlier.

It was decided to use regression analysis with non-stereotypical choice as an outcome both to confirm these findings and explore the effects of masculinity and femininity together as well as the effect of non-stereotypical maternal roles. This latter factor had seemed important in the preliminary analyses, had seemed significant in the discriminant analysis when men and women were looked at separately, but not when the non-stereotypical group as a whole was examined.

III. Achievement

The primary concern with this outcome had been whether androgyny was a factor in success, particularly in a non-stereotypical area. We were also interested in gender differences in achievement in non-stereotypical areas.

The discriminant analysis attempted to find variables that would discriminate between 5 different classes of degree, and between high and low achievement. The latter analysis was the more efficient.

Androgyny was not found to be a strong factor. For both men and women, specific self esteem and previous achievement were important. There were gender differences. The best discriminating variables for men were comprehensive education 16-19, external attributions for success, and lower levels of psychoticism. The important factors for women were academic self esteem and higher average 'A' level grades.

No discriminant analysis was carried out for the separate non-stereotypical groups using this outcome, because of the very small size of the female science group. It was decided that a regression analysis might be more appropriate in this respect.

X. The Prediction of Psychological Gender, Subject Choice and Attainment: Multiple Regression Analysis

A. Introduction

As we saw in chapter IX, the discriminant analysis was not efficient in predicting the membership of the four sex role types: androgyny, masculinity, femininity, and being undifferentiated. When the discriminating groups were stereotypical choice and non-stereotypical choice, the male language group were easier to predict than the female science group, partly because of the small sample size of the latter group. When the two non-stereotypical groups were combined, it was difficult to find much correspondence between men who made non-stereotypical choices choices and women who did. Nor did some expected predictors, such as parental roles and androgyny, prove to be important. No attempt was made to discriminate between high and low achievers in non-stereotypical areas because of the very small groups that would have been under consideration.

It was therefore considered appropriate to do a regression analysis in order to confirm findings that were tentative, and to see if a different kind of analysis would find

significance in some of the other possible predictors. It also seemed more appropriate to use a regression analysis where the sample sizes for the dependent variable were small as the groups did not have to be further subdivided as in a discriminant analysis.

B. Statistical note on regression

The regression model can be used when there is a linear relationship between a predictor and a dependent variable. Multiple regression uses a set of independent variables. The model assumes there is a normal distribution of the dependent variable for every combination of the values of the independent variables in the model. Dichotomous variables are represented by indicator variables coded as 0 or 1. The F test associated with the analysis of variance is a test of whether there is a linear relationship between the dependent variable and the entire set of independent variables.

The partial regression coefficient, (B) is the coefficient for any one particular variable adjusted to take account of the other independent variables in the equation. The magnitude depends on the units in which the variable is measured. As these vary between variables, the coefficients are made more comparable with each other, by being expressed in standardised form or Z scores. These

are Beta coefficients. When R^2 increases as a result of a new variable being entered into the equation, the size is an indication of the unique contribution made by that variable.

Regression analysis was used with the following dependent variables:

1. The continuous measures of the 4 sex role types, and androgynous and opposite sex role types combined. The whole sample and male and female groups were separately analysed.

2. Non-stereotypical educational choice, that is a language choice by men or a science choice by women. The whole sample and each sex were analysed separately.

3. Male and female achievement in non-stereotypical areas.

The dependent variable used was the final examination grade on a five point scale. The combined group of men who chose languages and women who chose science were analysed together as well as separately.

In each analysis the pool of predictor variables consisted of those that other research had suggested might be useful, and those suggested by the previous analyses

reported in chapters VII and IX. A stepwise solution was chosen in each analysis. The details are summarised in appendix 10.1.

C. Regression: Sex Role Types

Sixteen variables were entered into the pool. These were as follows:

Family

influence of mother, employment status of mother, whether father in a scientific occupation or not, position in family, number of sisters.

Education

whether school 11-16 grammar or comprehensive, number of 'A' levels passed.

Personality

neuroticism, extraversion, psychoticism, the lie scale, perceived control over outcomes, global self esteem.

Reasons for choice and aspirations

necessity as a reason for subject choice, wanting financial success, wanting a home and family.

I. Androgyny

This analysis was very efficient, 4 variables out of 16 explained 17% of the variance in the group as a whole. Two variables only accounted for 20% of the variance in the male group, and 14% of the variance in the female group was explained by two predictors.

For the group as a whole, being androgynous was positively associated with global self esteem and extraversion, grammar school education 11-16 (as opposed to comprehensive), and not having a father in a scientific occupation.

There were different predictors for men and women, the self esteem and grammar school education being important for the androgynous men, while extraversion, and feeling they had less control over outcomes were predictors for the women. These results are tabulated below in tables 10.1 to 10.4.

Table 10.1
Regression Analysis: Androgyny

	All cases	Males	Females
Multiple R	.4325	.4661	.3995
Adjusted R^2	.1658	.1975	.1366
F (Eqn)	8.8000	10.966	6.933
Significance F	.0000	.000	.002

Table 10.2
Predictors of Androgyny, total group

Variable	Beta In	Correl	Sig T
Global self esteem	.3276	.3276	.0015
Extraversion	.1829	.2783	.0298
Sing Sex Ed 11-16	- .1605	- .1747	.0203
Father Sci Occ	- .1588	- .1661	.0315

Table 10.3
Predictors of Androgyny, Males

Variable	Beta In	Correl	Sig T
Global Self Esteem	.3899	.3899	.0007
Sing Sex Ed 11-16	- .2578	- .3056	.0122

Table 10.4
Predictors of Androgyny, Females

Variable	Beta In	Correl	Sig T
Extraversion	.3337	.3337	.0245
Total Control	.2317	.3144	.0443

Note: Correl=correlation, Sing sex ed=single sex education
Sci Occ=scientific occupation

II. Masculinity

This analysis was more efficient for the total sample and the male group than the female group. 5 variables explained 29% of the variance in the total group. 3 variables explained 27% of the variance in the male group, while only 17% of the variance in the female group was explained by 3 variables.

Masculinity was positively associated with psychoticism, and necessity as a reason for subject choice. It was negatively associated with the lie scale, neuroticism, and wanting a home and family.

Masculine men were high on psychoticism, low on the lie scale and were not neurotic. Masculine women had a similar profile, but in addition, wanted financial reward. As so much variance was not explained, there are presumably other factors.

These results are tabulated in tables 10.5 to 10.8 that follow.

Table 10.5
Regression: Masculinity

	All cases	Males	Females
Multiple R	.5617	.5434	.4483
Adjusted R^2	.2930	.2682	.1677
F (Eqn)	14.011	10.894	6.038
Significance F	.0000	.000	.001

Table 10.6
Predictors of Masculinity, Total group

Variable	Beta In	Correl	Sig T
Psychoticism	.3572	.3572	.0002
Lie Scale	- .2590	- .3027	.0000
Neuroticism	- .2821	- .1940	.0004
Wanting a home/family	- .1753	- .2373	.0274
Necessity as a reason	.1427	.2214	.0384

Table 10.7
Predictors of Masculinity, Males

Variable	Beta In	Correl	Sig T
Lie Scale	- .3578	- .3578	.0010
Psychoticism	.2939	.3552	.0018
Neuroticism	- .2945	- .2162	.0030

Table 10.8
Predictors of Masculinity, Females

Variable	Beta In	Correl	Sig T
Lie scale	- .2844	- .2844	.0024
Psychoticism	.2610	.2602	.0070
Wanting a home/family	.2377	.1118	.0337

III. Femininity

Once again, the analysis was very efficient in predicting the total group and the male group. 30% of the variance was accounted for by 4 variables, while 3 variables explained 32% of the variance in the male group. 3 variables could only account for 16% of the variance in the female group.

Femininity was associated with neuroticism, the lie scale and wanting a home and a family. It was negatively associated with psychoticism. Men who were feminine were similar to this profile except that wanting a home and family was not a significant predictor.

Women who were feminine had positive associations with the lie scale, negative ones with psychoticism, and in addition, appeared not to want financial reward. This factor seemed to discriminate between women who were masculine and women who were feminine.

Being feminine, appeared to be the opposite of being masculine as far as these predictors were concerned.

These results are tabulated in tables 10.9 to 10.12 that follow below.

Table 10.9
Regression: Femininity

	All cases	Males	Females
Multiple R	.5656	.5811	.4436
Adjusted R^2	.3021	.3122	.1634
F (Eqn)	17.992	13.254	5.881
Significance F	.0000	.000	.001

Table 10.10
Predictors of Femininity, Total group

Variable	Beta In	Correl	Sig T
Psychoticism	- .3813	- .3813	.0000
Lie Scale	.2497	.2969	.0000
Neuroticism	.3135	.2259	.0000
Wanting home/family	.1552	.2259	.0248

Table 10.11
Predictors of Femininity, Males

Variable	Beta In	Correl	Sig T
Psychoticism	- .3781	- .3781	.0004
Neuroticism	.3179	.2788	.0003
Lie scale	.3168	.3369	.0013

Table 10.12
Predictors of Femininity, Females

Variable	Beta In	Correl	Sig T
Lie Scale	.2881	.2881	.0024
Psychoticism	- .2589	- .2581	.0079
Financial reasons	- .2256	- .1000	.0441

IV. Undifferentiation

This analysis managed to find 27% of the variance in the male group, 17% in the total group, but only 6% in the female group. The same three predictor variables were selected for both the total group and the male group. One different variable was significant for the female group.

Being undifferentiated was associated with lower levels of global self esteem and extraversion, and comprehensive education 11-16 years. This profile was the same for the male group. The only predictor variable for females who were undifferentiated was control, suggesting they felt they had greater control over outcomes related to achievement.

These profiles of undifferentiation were opposite to the profiles of androgyny. These results are tabulated below in tables 10.13 to 10.16 that follow.

Table 10.13
Regression: Undifferentiation

	All cases	Males	Females
Multiple R	.4344	.5485	.2731
Adjusted R^2	.1729	.2740	.0621
F (Eqn)	11.939	11.190	5.962
Significance F	.000	.000	.017

Table 10.14
Predictors of Undifferentiation, Total group

Variable	Beta In	Correl	Sig T
Global self Esteem	- .3142	- .3142	.0037
Sing Sex Ed 11-16	.2204	.2266	.0043
Extraversion	- .2188	- .3139	.0057

Table 10.15
Predictors of Undifferentiation, Males

Variable	Beta In	Correl	Sig T
Global Self Esteem	- .4335	- .4335	.0035
Sing Sex Ed 11-16	.2750	.3284	.0053
Extraversion	- .2139	- .3518	.0409

Table 10.16
Predictors of Undifferentiation, Females

Variable	Beta In	Correl	Sig T
Total control	- .2731	- .2731	.0170

Note: Sing Sex Ed=single sex education
Correl=correlation

V. Non-typical sex roles

We were interested in whether the predictors of androgyny and femininity in men were the same as the predictors of androgyny and masculinity in women? The discriminant analysis had suggested that when compared with people who adopted more typical sex role behaviour, there were some similarities.

The regression analysis accounted for only 2% of the variance in the total group. When males and females were analysed separately, 7% of the variance in the male group was found, and 7% of the variance in the female group. In each case, only one different predictor variable was significant.

For the group as a whole, A non typical sex role was associated with less perceived control over achievement outcomes. For men the significant factor was being low on psychoticism, and for women, being low on the lie scale. This suggested that different variables were associated with androgyny and opposite sex typed roles, even though there might be similarity between the groups.

These results are tabulated below in tables 10.17 to 10.20.

Table 10.17
Regression: Non-typical sex role behaviour

	All cases	Males	Females
Multiple R	.1624	.2914	.2909
Adjusted R^2	.0201	.0735	.0723
F (Eqn)	4.227	7.425	6.842
Significance F	.041	.008	.011

Table 10.18
Predictors of Non-typical sex role behaviour, total group

Variable	Beta In	Correl	Sig T
total control	.1624	.1624	.0415

Table 10.19
Predictors of Non-typical sex role behaviour, males

Variable	Beta In	Correl	Sig T
Psychoticism	.2914	.2914	.0079

Table 10.20
Predictors of Non-typical sex role behaviour, females

Variable	**Beta In**	**Correl**	**Sig T**
lie scale	- .2909	- .2909	.0108

Comments

1. There was broad agreement between the regression analysis and discriminant concerning the predictors of androgyny, for the total sample and for the men. Grammar

school education and high levels of global self esteem were the two most significant factors. This analysis also suggested extraversion. There were no predictor variables in common as far as the female androgynous group were concerned. High levels of extraversion, and less perceived control over outcomes suggested by the regression analysis were not discriminating variables in the former analysis.

2. This analysis confirmed the lie scale, psychoticism and choosing subjects because they were necessary, as important predictors for masculinity for the entire sample and males and females when treated separately. Not being neurotic was also suggested by the regression analysis.

3. The regression analysis, not unexpectedly, suggested as predictors for femininity and being undifferentiated, variables that were the opposite of those that predicted for androgyny and masculinity respectively.

4. When the androgynous men and women, feminine men and masculine women were treated as one outcome, the only predictor was less perceived control over outcomes. When feminine men and masculine women were treated separately, the predictors were being low on psychoticism and low on the lie scale respectively. None of the family variables identified in the discriminant analysis WAS selected,

although each of the three variables identified in this analysis was among those chosen in the corresponding discriminant analyses.

D. Regression Analysis: Non-stereotypical Educational Choice

Regression was used to investigate further the reasons for non-stereotypical choices. Although the androgyny variables had not been selected as discriminating variables in the discriminant analysis, masculinity and femininity were included in the pool along with the other variables to see if there were any independent effects. The 13 variables were as follows:

Family

Influence of mother, father in a professional occupation, father in a skilled non manual occupation, number of brothers, number of sisters.

Personality

Masculinity, femininity, psychoticism.

Reasons for choices

Ability, necessity, financial considerations, and career possibilities as reasons for choice, time choices were made.

In the total group, 11% of the variance was explained by three variables. 37% of the variance was explained in the male group using 5 variables, and in the female group, 1 variable accounted for 14% of the variance.

As a group, non-stereotypical choice was associated with having fathers in non manual skilled occupations, not having necessity as a reason for subject choice, and making subject choices later rather than earlier.

In this analysis, time of decision was not found to be significant for the men who chose languages. There were however, the additional factors of influence of mother, femininity and perceived ability to do the subject being positively associated with male language choice.

The only significant predictor of female science choice was career possibility as a reason for choice.

These results are tabulated in tables 10.21 to 10.24 that follow below.

Table 10.21
Regression: Non-stereotypical subject choice

	All cases	Males	Females
Multiple R	.3548	.6430	.3853
Adjusted R^2	.1089	.3749	.1370
F (Eqn)	7.393	10.714	12.904
Significance F	.000	.000	.001

Table 10.22
Predictors of Non-stereotypical subject choice
total group

Variable	Beta In	Correl	Sig T
Skill. non man. father	- .2341	- .2341	.0042
Necessity as reason	.2209	.2133	.0091
Time of decision	- .1520	- .2058	.0490

Table 10.23
Predictors of language choice by men

Variable	Beta In	Correl	Sig T
Necessity as reason	.4377	.4377	.0000
Skill. non man. father	- .2935	- .2877	.0003
Perceived ability	- .2441	- .2215	.012
Influence mother	- .2187	- .2370	.018
Femininity	- .1873	- .3359	.045

Note: skill.non man.= skilled non manual
correl= correlation

Table 10.24
Predictors of science choice by women

Variable	Beta In	Correl	Sig T
Career possibility	- .3853	- .3853	.0006

Comments

When all the non-stereotypical choices were considered together as an outcome, this analysis was in agreement with the discriminant analysis in identifying three of the variables previously chosen: skilled non manual father, time of decision, and necessity as a reason for choice. Other variables used in discriminant were identified when the male and female groups were treated separately, (influence of mother, femininity, perceived ability), but psychoticism was not one of these.

E. Regression: Achievement

Regression was used to examine this outcome because the discriminant analysis had not been efficient in predicting membership of the five different classes of degree. It also seemed more appropriate to use regression to investigate the predictors of achievement for the small sub groups; male language choice, female science choice.

From an initial pool of 33 predictor variables, 12 were selected in the analyses of the total sample, the sample of men, the sample of women, the science group, the language group, the male language group and the female science group. These were as follows:

Family

- number of siblings
- father in a skilled non manual occupation

Education

- school type 11-16,
- number of 'A' levels passed,
- average 'A' level grade,
- average 'O' level grade.

Personality

- the lie scale,
- specific self esteem,
- academic self esteem,
- global self esteem.

Reasons for choice and aspirations

- interest,
- school pressure

Final examination results on a 5 point scale was the dependent variable. Two variables, specific self esteem and average 'O' level grade, explained 24% of the

variance in the total group. The same two variables explained 32% of the variance in the male sample. Five variables, specific self esteem, being low on the lie scale, the number of 'A' levels passed, academic self esteem and school pressure as a reason for subject choice, explained 37% of the variance in the female sample.

Table 10.25
Regression: Achievement

	All cases	Males	Females
Multiple R	.5035	.5805	.6443
Adjusted R^2	.2440	.3202	.3733
F (Eqn)	26.339	20.075	9.935
Significance F	.000	.000	.000

Table 10.26
Predictors of Achievement: Total sample

Variable	Beta In	Correl	Sig T
Specific self esteem	.4552	.4552	.000
Average '0' level grade	.2220	.3190	.002

Table 10.27
Predictors of Achievement: Males

Variable	Beta In	Correl	Sig T
Specific self esteem	.5180	.5180	.0000
Average 'O' level grade	.2681	.3652	.0054

Table 10.28
Predictors of Achievement: Females

Variable	Beta In	Correl	Sig T
specific self esteem	.3929	.3929	.0633
the lie scale	-.3326	-.3517	.0002
number of 'A' levels	.2588	.3304	.0148
school pressure	.2398	.2796	.0126
academic self esteem	.1966	.3332	.0020

Two variables, specific self esteem and average 'O' level grade, explained 46% of the variance in science achievement. Language achievement was harder to predict, average 'A' level grade and interest in the subject accounting for just 13% of the variance. Tables 10.29-31 summarise these results:

Table 10.29
Regression: Science/ Language Achievement

	All cases	Science	Lang.
Multiple R	.5035	.6931	.3884
Adjusted R^2	.2440	.4631	.1324
F (Eqn)	26.339	27.736	8.174
Significance F	.000	.000	.001

Table 10.30
Predictors of Achievement: Science

Variable	Beta In	Correl	Sig T
specific self esteem	.6522	.6522	.0000
average '0' level grades	.2446	.4086	.0143

Table 10.31
Predictors of Achievement: Languages

Variable	Beta In	Correl	Sig T
average 'A' level grade	.3280	.3280	.0014
interest as reason	.2084	.2248	.0329

When the achievement of the men in languages was considered separately, two additional predictors were chosen, school type 11-16 and number of siblings. The four variables accounted for 46% of the variance.

When female achievement in science was treated separately, 89% of the variance was explained by 3 variables, specific

and global self esteem and not having a father in a skilled non manual occupation. It should be remembered that this group was very small, and such findings would need to be validated in a larger study.

Table 10.32
Regression: Achievement in Non-stereotypical Areas

	Non-stereotypical		Stereotypical	
	M.lang	Fem.Sc	M.Sc	Fem Lang
Multiple R	.7326	.9612	.6996	.5466
Adjusted R^2	.4681	.8985	.4677	.2631
F (Eqn)	7.822	36.403	22.526	8.380
Significance F	.000	.000	.000	.000

Predictors of Achievement: Male Language
table 10.33

Variable	Beta In	Correl	Sig T
average 'A' level	.4408	.4408	.0005
school type 11-16	-.3592	-.3111	.0081
interest as reason	.3310	.1267	.0186
number of siblings	.3488	.1267	.0196

note: M.lang=male language, Fem.Sc=female science
M.Sc= male science, Fem Lang= female language

Predictors of Achievement: Female Science
Table 10.34

Variable	Beta In	Correl	Sig T
specific self esteem	.7895	.7895	.0001
skilled non-man. father	-.4846	-.5148	.0080
global self esteem	.3057	.6808	.0209

Summary and comments: regression analysis on achievement

1. The predictors of achievement across the whole sample, and for men, supported previous research about past achievement, particularly '0' levels. Contrary to our hypothesis, neither androgyny nor its components were important for this sample. This analysis was more efficient than the discriminant analysis, in that only two variables were selected.

2. Predicting women's achievement was less efficient in that more predictors were necessary. 'A' levels rather than '0' levels were important, and all round self esteem as well as specific, confirming the outcome of the discriminant analysis. One can speculate that 'pressure from school' could be interpreted as 'encouragement' and be contributing to self esteem. Scoring lower on the lie scale could be suggesting a more masculine than feminine trait.

3. Achievement in science was easier to predict than achievement in languages. The variables that predicted for science achievement were the same as those that predicted for the sample as a whole and men when treated separately. These two variables, specific self esteem and average 'O' level grade, accounted for 46% of the variance. The results suggested that those who chose languages were much less homogeneous as a group than those who chose science.

4. It was however possible to find 46% of the variance in language achievement when men were treated separately. The two variables that predicted for women being important, with two further variables being selected, suggesting that grammar school education 11-16, and having a greater number of brothers and sisters were important. This latter variable other previous research had suggested might be important in non-stereotypical choice. It is difficult to comprehend a direct link with achievement.

5. The achievement of the women in science was almost entirely explained by three variables, suggesting high levels of global and specific self esteem, and not having a father in a skilled non manual occupation. This latter variable was a positive predictor of non-stereotypical choice in the discriminant analysis, suggesting a

condition that would make choice more likely, but success less likely. As the sample size was so small and the other analyses had suggested lack of homogeneity in the group, further studies would be needed to explore this idea further.

XI. Summary, Comments and Conclusions

This concluding chapter summarises the results of the different statistical analyses. These are considered in the light of the research questions which were posed at the beginning of chapter VII. Some tentative conclusions are drawn, together with suggestions for future research, and policy and social implications of the findings.

I. Psychological Androgyny

1. Introduction

A major proportion of this research was devoted to the concept of psychological androgyny. The questions that were addressed were about the nature of the androgynous personality, its correlates and antecedents, and whether or not androgyny were a predictor of academic achievement and/or non-stereotypical choice in higher education. Possible gender differences with regard to these questions were also investigated.

2. Previous research

The previous research in this area was summarised in chapter V. Androgyny is seen as an ideal. The androgynous

person will have a wider range of repertoires of behaviour than the strongly sex typed person. There is disagreement as to whether it is the masculine component or the feminine or both equally that affect behaviour. It is argued that men and women may be similar in not being sex typed, but they may still be different in important other respects.

The antecedents of androgyny appear to be differential parenting patterns for men and women, generally strong role models from the parent of the same sex, and reinforcement for behaviour from the parent of the opposite sex. Sibling family structure, and a stimulating intellectual home environment may also be important. There appear to be sex differences in the development of androgyny and it is further recognised that whereas it may be easier for a man to adopt feminine characteristics, there is less reward for this than for a women to be more masculine. It is also suggested that androgyny may have more beneficial effects for women than men.

Associations have been found between androgyny and ability, and a range of personality characteristics such as self esteem and psychoticism. A link has also been found between androgynous women and control over outcomes, particularly with regard to achievement in non-

stereotypical areas. Androgyny has been found to predict achievement in women, and non-stereotypical career choice.

3. Research questions, hypotheses and results

As a result of the pilot study and the ideas suggested by previous researchers, this research attempted to answer the following questions with regard to androgyny for a sample of students at university taking degree courses in EITHER sciences OR languages.

(a) What are the characteristics of the androgynous personality? How is it related to variables such as self esteem and psychoticism and ability? Are there sex differences? Is the process of becoming androgynous different for men and women.

The precipitating factors in becoming androgynous did appear to be different for the men and women in this sample. They were similar, however, in that those high on androgyny were less likely to have a father in a scientific occupation. More similarities were found, and some tentative associations confirmed, when the androgynous and opposite sex typed were considered together - that is androgynous and feminine men, and androgynous and masculine women. As a whole, this group

were more likely to have been brought up by their mothers alone.

Androgynous women, compared with the other three groups, were more likely to have mothers who were employed, whereas androgynous men were more likely to have mothers who were not employed. Androgynous and feminine typed men were more likely to have been brought up by their mothers alone.

Position in family, being a first or only child, a factor that other researchers had found significant, was not significant in any regression analysis for the androgynous group alone, but was a discriminating variable for women who were androgynous. It was also significant for androgynous and opposite sex typed of both sexes, indicating they would be older than their siblings

Unlike previous research, no significant associations between sibling family structure and androgyny were found, but there was a non significant association between the number of sisters and androgyny. This was a significant factor for the androgynous and opposite sex typed group.

The possible importance of school type in the development of androgyny had not been stressed by previous

researchers. In this study, all the analyses suggested the importance of grammar school education 11-16 years, compared with comprehensive schooling, for both androgynous men and women, and androgynous and masculine women. There was a suggestion that comprehensive education for 16-19 year old students was associated with androgyny in men, while single sex, grammar school education was associated with androgyny in women.

For the limited number for whom the information was available, this study supported previous findings that associated androgyny with ability.

This study also confirmed that androgyny, for both sexes, is associated with high levels of global self esteem. There were non significant associations with academic and specific self esteem. All androgynous subjects were more extravert than other types, and were likely to be more stable.

A strong negative association, not mentioned in any previous research was found between androgyny and the lie scale. When androgynous women were considered separately, however, there was a positive association, but those categorised as masculine scored lower. All cases

categorised as masculine scored lower on the lie scale, and those categorised as feminine scored higher.

Psychoticism, found in earlier research to have associations with androgyny, was found in this study to have different effects for men and women. Higher levels of psychoticism, or non conformity, was a discriminating factor for androgynous women, (and androgynous and masculine women) and lower levels for androgynous men, (and androgynous and feminine men), both when the high androgynous group were being compared with a low androgynous group, and when those categorised as androgynous were compared with the other three groups. Higher levels of psychoticism were shown in the regression analysis to be an important predictive factor in masculinity for all cases.

It has been suggested that androgyny is a good thing, because it is maintained, androgynous people are more flexible in their behaviour. This research did not attempt to measure flexible behaviour. It was found however that androgynous people, particularly the women and those women categorised as masculine, felt they had less perceived control over outcomes related to achievement. In fact, less perceived control over outcomes was a significant factor for all non typical sex role behaviour.

It could be argued that attributing control to external rather than internal factors implies less rigidity and more flexibility in attitude, if not behaviour. On the other hand, other research had suggested that the androgynous person would have more control over achievement outcomes, so in this respect these findings are different.

Androgyny has been associated with various outcomes. This study was particularly concerned with achievement and non-stereotypical educational choice. These outcomes are discussed below. Other findings from this study were that androgynous people, and those categorised as opposite sex typed, do not make subject choices based on necessity. Androgynous men and the larger group of androgynous and opposite people were influenced by financial reward, and the androgynous group as a whole, and the androgynous women, had a home and family as a future goal. Higher levels of masculinity in women were also associated with wanting financial reward.

(b) Is psychological androgyny related to non-stereotypical choices in higher education?

It was hypothesised that if there were similar factors for men and women making such choices, androgyny or opposite

sex role typing would be one of those factors, and this might be because they had greater control over achievement outcomes, as discussed above.

Given the 'masculine' nature of science, one could assume that there would be some correspondence between choice of science and higher levels of masculinity for both sexes. One would also expect higher levels of femininity to be associated with language choice.

Femininity did appear to be one of the predictors of language choice by men, but no relationship was found between masculinity and choice of science by women. A slightly larger percentage of women taking science (16.7%) were masculine compared with the 14.7% who were taking languages. Nor were any significant effects found for the relationship between androgyny, that is masculinity and femininity combined, on non-stereotypical choice. See section below on Choice for more discussion.

(c) Is psychological androgyny related to academic achievement? It was hypothesised that androgynous persons, whatever their field, would be high achievers.

There did not appear to be a link between androgyny and achievement, although no-one classified as androgynous failed. The higher achieving group (on degree results) in the discriminant analysis were higher on masculinity than femininity, but these variables were not selected in the analysis. It would appear that ability rather than achievement is significant, although androgynous women were likely to have a greater number of 'A' levels compared with other groups, thus lending support to some previous research. Androgynous and feminine typed men had fewer 'A' levels.

II. Non-stereotypical choices in higher education

1. Introduction

Over 70% of the sample chose courses that conformed to the stereotype, and under 30% chose to be different. Four fifths of these were men taking language courses, and approximately one fifth were women taking science. The very small size of this latter group made it difficult to reach any useful conclusions that could be generalised to a larger population.

2. Previous research

Other researchers, referred to in chapter III, have in the main concerned themselves with the reluctance or inability of women to choose science courses, and therefore much of the quoted material is not necessarily applicable to men and language choices. This research was concerned with all non-stereotypical choices and reasons for making them rather than avoiding them.

Other research suggests that the majority of people follow stereotypes. Contrary choices can cause internal conflict. This suggests that a special personality and supportive conditions are therefore required in order to overcome pressure and not succumb to mental distress. Self-confidence, psychoticism (non-conformity or tough

mindedness), and high levels of specific aptitudes in the chosen field would seem to be necessary. Such characteristics might be produced by different models of parenting, reinforcement from appropriate role models, specific family structures and supportive home and educational environments.

3. Research questions, hypotheses and results.

(a) What are the personality characteristics of women who choose science? How do these differ from those who make stereotypical choices, and men who choose science. How does family background and educational opportunity influence the decisions?

It was hypothesised that women who chose science would be more likely to be androgynous or categorised as masculine, have high levels of self esteem and psychoticism, feel they were more in control over outcomes related to achievement, have higher levels of ability than men who chose science, and have mothers who were in paid employment.

As this group comprised 13 cases only, and appeared not to be very homogeneous, it is not surprising that the results were rather inconclusive. It was difficult in the discriminant analysis to classify this group correctly,

although, interestingly, many of the cases wrongly classified were put in the group of men choosing languages.

In many respects this group had much in common with the men who chose science. (See appendix for outline of a science profile). Contrary to the hypothesis, and like the men who had chosen science, the women did not have working mothers, although 50% were brought up by their mothers alone. Their fathers came from occupational groups 1 and 2, and they had more brothers compared with people choosing languages.

Like the men, they were more likely to have been educated in a mixed comprehensive school from 11-16. This could be a sampling characteristic. Compared with the language students, they had more 'A' levels, higher grades at 'A' level, and higher scores on all the ability measures except the verbal test. They were different from the typical science profile in that they had higher 'O' level grades than the other three groups, thus lending some support to the hypothesis that girls would have a better record of achievement at the critical time. On the other hand they appeared to be no brighter on the ability scales than the men opting for science.

All the science students had higher levels of self esteem than the language students, and were generally more stable. The women were different from the men in that they tended to be extravert rather than introvert. Although the science group as a whole had a higher level of psychoticism, this was not a significant factor for the female science group when considered alone.

There was no significant link between either androgyny or masculinity and science choice by women, but as a group they had slightly lower levels of femininity than women who chose languages, and a slightly larger percentage were categorised as masculine compared with the women who chose languages. For the science group as a whole, high levels of masculinity were significant.

Greater control over achievement outcomes was also significant for the science group when compared with the languages group, lending some support for the hypothesis, although it was not a significant factor for the women when considered as a group by themselves.

All the science group tended to make career choices earlier than usual in their school career, to choose subjects out of necessity, and to have definite plans with respect to employment. In addition, financial prospects as

a reason for choice was a significant factor for the women, as was wanting a career, and pressure from the school. If this is regarded as encouragement, it lends support to the hypothesis that a supportive educational environment is helpful.

The conclusion one comes to, therefore, is that the women who chose science were in many respects very like the men who chose science. They were different in not being like the women who chose languages. Similarly, as described below, the men who chose languages had much in common with the women who did.

A factor in all the non-stereotypical choices that made those groups different from the others was the timing of the choices, which tended to be later than normal in the school career. Moreover, both the women taking science and the men taking languages had a significantly higher number of parents who were classified as skilled non-manual, compared with the other groups. Interest in the subjects was another motivating factor for both.

(b) What are the personality characteristics of men who choose to study languages? How do these differ from men who make more stereotypical choices, and women who choose languages. How do these non-stereotypical choices relate

to family background, previous achievement and educational opportunity?

It was hypothesised that men who chose languages would be more likely to be androgynous or categorised as feminine, would have marked language ability, and would be likely to have been brought up by their mothers alone.

As with women and science choices, men choosing languages had many things in common with women choosing languages. The typical profile is outlined in appendix 11.1.

Like other language students, they had mothers in paid employment, more sisters than science students, and were likely to have been brought up by their mothers alone. This supports our hypothesis although it was not a significant factor when the male language group were considered alone. Language students tended to have fathers from occupational group 3.

Choice of languages was associated with single sex grammar school education from 11-16, and for the boys choosing languages, single sex education 16-19. The group as a whole did better on the verbal ability test than the science group, and had fewer 'A' levels and lower average grades. There was no evidence that the boys choosing

languages had greater language ability then the girls, but there is some support for the hypothesis in that they were better than the science group. Moreover, they had greater belief than those choosing science, as did all people choosing languages, in their own perceived ability which they gave as a reason for their choice.

The men were different from the women choosing languages in that they were neurotic introverts rather than neurotic extraverts. All the language students had less perceived control over outcomes, were high on femininity and low on all the self esteem measures.

The language group as a whole made their career choices later than normal, chose their subjects out of interest, had uncertain career plans, and had home and family as a future aspiration. A significant factor in the regression analysis for the men making language choices was that necessity was not a reason.

There is therefore some support for our hypotheses. Men choosing languages do have higher levels of femininity. In fact compared with men choosing science there was a greater proportion of androgynous and feminine typed men.

They did have language ability but were no better than women choosing languages, although perhaps confidence in their perceived ability was the important factor.

It was confirmed that they were more likely to have been brought up by their mothers alone, this being the case for all the language group.

(c) What do people making non- stereotypical choices have in common. Are there similar factors in their family backgrounds and educational environments?

The difficulty with this research was the fact that the male language group was much bigger than the female science group and any findings are likely to be biassed towards the former.

Fifty percent of those in the combined group had fathers in skilled non-manual occupations, whereas most of the stereotypical group had fathers from either professional or intermediate occupations. This was a significant factor in all the analyses.

Psychoticism, which did not appear significant when the two non-stereotypical groups were considered separately, was a discriminating variable when compared with the

stereotypical groups. This lends support to the hypothesis that being non conformist in attitude helps one to be different in this respect.

Interest in the subject, perceived ability, pressure from the school, and financial prospects were all reasons that were significant in the different analyses. Necessity was not a reason for choice. The timing for decision making was important, all the non-stereotypical choices being made at a normal time or later than usual.

III. Achievement

1. Introduction

In the literature, 'achievement' is often used to denote 'attempt', particularly with regard to gender differences. In this research achievement with regard to the individual is the actual result or grade, and for a group either the mean grades or the passes expressed as a percentage of entries.

Achievement measures were used as dependent variables a) because of the hypothesised link between androgyny and achievement, and b) because of the interest in gender achievement in non-stereotypical areas.

The measures used were a) past achievement, ie: 'O' level and 'A' level results. These were both predictors and measures used to confirm or not differences in gender, and b) degree results, categories or a 5 point scale, as the dependent variables in the major analyses.

2. Previous research

Other researchers often give the impression, because of ambiguities of definition, that the 'achievement' of women in non-stereotypical areas is less good than that of men. However, a survey of the data available indicated that in

the U.K. generally, girls do as well as boys overall. The pass rate at 'O' level, was higher than for boys, although the gap was narrowing. Girls did however obtain few 'O' level passes. Since 1971, the pass rate at 'A' level has been better for the boys, and they have achieved passes in more subjects. At university, as a percentage of entries, women have obtained more 2.1 degrees. Men have obtained more firsts, lower seconds and thirds.

Nationally, there are marked gender differences in entry to subjects, but they are less marked in achievement. For example, in 1984, the pass rate for 'A' level physics was approximately the same for both girls and boys. The girls however did achieve a marginally better pass rate in 'A' level French. If achievement is an indicator of ability, there is little substance to the claim that gender differences in choice or entry to non-stereotypical areas are based on lack of ability.

In this sample, the observed gender differences were similar to the national statistics just described. As a group the sample were overall higher achieving than the average school leaver. Boys obtained a greater number of 'O' level passes, the girls obtained a higher mean score. At 'A' level, the boys obtained the higher mean score, the girls a greater number of passes. The science group,

compared with the language group obtained more and better 'A' levels. There were no sex differences in this respect.

3. Research questions, hypotheses and results

(a) What are the personality characteristics of high achieving men and women? Is psychological androgyny a predictor of academic achievement? Are there gender differences in achievement at degree level?

This sample showed a similar pattern of achievement at degree level to the national picture. There were no significant sex differences. The women obtained more 2-1's, the men more firsts, but this was also a science/language difference. There were neither significant differences between the achievement of the men and women who had taken science, nor between the men and women who had taken languages.

In general, family variables were not important predictors of achievement, although no 'only' children failed.

All the ability measures, and prior achievement, that is number of passes and average grades at both 'O' and 'A' level were important. There were no important sex differences in this respect. Grammar school education from 11-16, and comprehensive schooling from 16-19 were

significant for both sexes, and for the boys, a mixed school from 11-16.

For the sample as a whole, a number of personality measures were good predictors. These were specific and academic self esteem, having less control over achievement outcomes, attributing success to external factors, scoring less on the lie scale, and lower on psychoticism. There were gender differences, the only important predictors for the men being external attributions for success, specific self esteem, and being low on psychoticism. The predictors for the women were the self esteem measures and being low on the lie scale.

As previously mentioned, androgyny did not appear to be a factor in achievement, but no-one classified as androgynous failed. There were, however, correlations for all subjects between higher levels of masculinity and lower levels of femininity and achievement.

In the regression analysis, female science achievement and male language achievement were treated separately. As mentioned earlier, the small sample sizes, particularly the female science group, need to be taken into account when attaching importance to results. Global and specific

self esteem were selected as predictors for the women, and grammar school education 11-16 years for the men.

IV. Comments and Recommendations

1. Androgyny

Family background

This research confirmed previous findings that family background was important in the development of androgyny, but different family variables had different effects/importance according to gender. It gave support to the idea that appropriate role models from the same sex parent, and approval and reinforcement from the opposite sex parent influenced development. For example, not having a mother who was employed was significant for androgynous men, whereas having a mother in employment was significant for androgynous women.

There was some confirmation for the importance of childhood experiences. Although position in family and number of siblings had been linked to androgyny, these findings were inconclusive, only being significant for women, and for androgynous and opposite sex types as a group. These are factors which could be explored further.

An interesting finding was that for both sexes there were many similarities regarding antecedents, correlates and outcomes between androgyny and opposite sex typed behaviour. This suggests that the effects were those of masculinity and femininity operating separately on the

opposite sex, rather than any interaction effect. This is also an area to explore further.

Education

Type of school, whether single sex or mixed, grammar or comprehensive was important and this changed at different educational levels. If one can generalise to other populations, and if androgyny is regarded as an 'ideal' goal, there are implications for parents when choosing schools.

For both sexes, a grammar school during the first 5 years of secondary education, was associated with androgyny. The main gender difference was that androgyny in women was associated not only with a grammar school from 16-19, but also single sex education. Androgyny in men was associated with comprehensive education 16-19.

It could be that the ethos of the grammar school, and particularly the girls only school at sixth form level, is more conducive to the development of androgyny in girls, while the mixed comprehensive favours androgynous development in boys. One might speculate that girls need role models and boys need the feminine influence!

Longer term, the implications for teacher training are that whatever the type of school, balanced development should be enabled.

Personality

There were no surprising results regarding the correlates of androgyny. Links with ability, self esteem, extraversion and stability were confirmed. A mistaken assumption was that if androgyny meant greater flexibility, and if androgyny and ability were correlated, then androgynous people would be high academic achievers. For this sample, this was not the case. Nobody who was androgynous failed, but it was the strongly masculine typed who were the highest achievers. There was a link between achievement and androgyny in women taking 'A' levels, confirming other research, but it appeared that masculinity was the important factor, again confirming some previous research.

There are a number of possible explanations. From a psychoanalytical point of view, androgyny is about internal adjustment and balance. The androgynous person has the ability to do well, but is not driven to be a high achiever, in the same way that a strongly sex typed person might be, because they are striving to resolve inner imbalance through excelling in the external world. There

is a greater association between masculinity and achievement than femininity, but this is surely to do with definition and the stereotypical view of masculinity. These are also ideas that could be explored further.

Contrary to previous research, less control over outcomes related to achievement was associated with non typical sex role behaviour for both sexes. This might also be explained by the notion of greater internal balance outlined above. There is less need to feel in control of outcomes.

The fact that the lie scale and psychoticism seemed to operate differently for men and women with respect to androgyny, was probably to do with the mediating effects of masculinity and femininity on women and men respectively.

Behavioural outcomes

Numerous behavioural outcomes have been associated with androgyny. The hypothesis in this research was that androgyny would be related to non-stereotypical career choices. Links were found both between femininity and language choice by boys, and slightly higher levels of masculinity and science choice by girls. Because of the small sample size, however, of the girls who had chosen

science, the results were inconclusive. The suggestion is that if girls choose a masculine subject, they need to be like the boys who make that choice, including more masculine. Similarly, boys making feminine choices, need to be more feminine. Other considerations are commented on in the next section.

2. Non-stereotypical educational choice

All comments in this respect are tentative given the small size of the female science sample, and the consequent imbalance between the two non-stereotypical groups. 30% of this sample made non-stereotypical choices. We have to consider whether it would be desirable for the percentage to be increased to 50%. Ideally, the economy would benefit if the workforce were flexible enough to respond to changing demand and supply as regulated by demographic changes.

Women choosing science shared many of the characteristics of the men taking science, confirming previous research. Like the men, a comprehensive mixed school 11-16 was significant. This may be something to do with science facilities in a mixed environment being better, which has implications for policy.

They differed in that they had higher 'O' level grades, were more extravert, felt they received encouragement from school when making their choice, and had a career and financial reward as motives. All the scientists had better examination grades on average than the linguists. The implication is that girls choosing science need to prove they are capable, or perhaps feel confident that they can operate in a male environment, and be really motivated to succeed.

Similarly, men who chose languages shared many of the characteristics of the women who had chosen languages. They differed in that their choice was associated with single sex education 16-19, they were more introverted, they made their choices later than normal, and did not make choices out of necessity.

The implication as far as schooling is concerned is that it is easier for boys to make a 'feminine' choice in a single sex environment. For both sexes a single sex grammar school 11-16 was associated with language choice. This is possibly to do with the ethos and culture of grammar schools where historically modern languages and classics have been valued.

All the linguists believed they had ability. This must in part be influenced by reinforcement from the school.

As hypothesised, some correspondence was found between the two non-stereotypical groups, but it should be stressed that the findings were biassed towards male language choice, and need to be validated in a more balanced study.

Assuming some validity, the results suggest that non-stereotypical choices are related to having a father in a skilled non-manual occupation, and higher levels of psychoticism. Choices were made later than normal, were not related to necessity, and were based on interest, perceived ability, and motivated by financial reward. Encouragement from the school was also a factor.

Taking into account all the above comments about non-stereotypical choice, there are a number of implications. It would seem that stereotypes are less firm in certain socio-economic groups. The school also has an important role to play in providing encouragement for unusual choices, by making it possible for decision making to be delayed. Less early specialisation, even if students feel they have a bias of ability, would mean more conviction later on. Schools also need to provide encouragement and

support. Further and Higher Education institutions need to allow those who have inappropriate prior qualifications because of early decision making, access to their chosen courses. In these cases, measures of ability and potential may be better indicators of ability to succeed on a course than records of past achievement.

3. Achievement

For this sample, family variables were not generally related to achievement. It should be remembered, however, that the sample CONSISTED OF undergraduates at London university, and in terms of prior achievement were already selected and therefore the sample was biassed.

An exception was that the number of siblings was related to male language achievement. Another suggested link, in line with other research, was being an only or oldest child. No other family variables were found to be related to achievement for either sex or subject.

As expected, ability and prior achievement were related. There was also a positive association for both sexes between grammar school education 11-16, (mixed for the boys) and comprehensive education 16-19. This finding does not agree with some educational opinion that girls do

better in single sex schools. The predictors of achievement in non-stereotypical areas were no different.

The self esteem measures which related to academic work, were not surprisingly, positively associated with achievement. As discussed above, androgyny was not important, but there was a non significant association with masculinity. Being low on psychoticism, particularly for the men, and being low on the lie scale, particularly for the women, were also predictors. These effects were probably due to increased levels of masculinity. (See comments that follow).

There was no evidence that girls were significantly better or worse than boys in achieving in their chosen subjects.

4. Suggestions for further exploration

There were a few predictor variables that had relevance for all three outcomes, and where either there had been little previous research in this connection, or the results of this research were surprising or ambiguous.

(a) Role of Psychoticism

Previous research had suggested associations between psychoticism, or non conformity, and all three outcomes. In summary, this study suggested a positive correlation

with androgyny overall, a negative association with men who were androgynous or feminine, and a positive association with women who were androgynous or masculine. This is probably explained by the positive association with masculinity and the negative association with femininity.

The fact that psychoticism was found to be positively associated with choice of science by all subjects, and with science choice by women, and language choice by men suggests that the concept that is being measured is, as has been suggested non conformity when applied to a normal rather than a clinical population.

It was found to be negatively associated with achievement; this might also be explained by the moderating effect of masculinity.

(b) Role of the Lie scale

This was found to have a negative association with androgyny, and with male androgyny, and the androgynous and opposite sex types as a group. It was positively correlated with female androgyny and the group of androgynous and masculine women. It was negatively associated with masculinity and positively associated with femininity.

Being low on the lie scale was associated with achievement overall and with achievement by women. This presumably is because achieving women have slightly higher levels of masculinity?

This variable was not found to be associated with no-stereotypical choice,

(c) Importance of educational experience

There were significant associations between school type and the different outcomes, which need to be replicated in further studies, in case these effects were caused by the characteristics of this particular sample.

Grammar school education 11-16 appeared to be associated with androgyny overall, androgyny in men, and androgyny and masculinity in women. It was also associated with achievement, particularly male achievement, and language choice.

A mixed school 11-16 was also associated with male achievement, and with science choice. A single sex school was associated with language choice. A comprehensive school 11-16 was associated with science choice.

A comprehensive education 16-19 was associated with male androgyny, achievement, particularly male achievement. A grammar school 16-19 was associated with female androgyny. A mixed school tended to lead to science choice, and a single sex school to language choice by men.

No school type was found to be associated specifically with female achievement. As achievement for all, however, was associated with grammar school education 11-16, and as girls choosing science had better 'O' level grades than other groups, the above findings would suggest that if it were policy to enable more girls to do science, a mixed grammar school 11-16, and a comprehensive mixed environment from 16-19 would be preferred.

If it were policy to encourage more boys to take languages, a single sex grammar school 11-16, followed by a single sex comprehensive 16-19 would be preferred.

One could speculate as to why a particular educational environment should encourage the development of androgyny, lead to higher achievement, or facilitate particular subject choices. Some of the possible reasons for these associations, and the implications that follow, have been discussed above.

d) Perceived control over outcomes related to achievement

Previous research had indicated that androgynous people and those making non-stereotypical choices would have more control over outcomes. This study had contrary findings.

Less control over outcomes was found to be related to androgyny and opposite sex type in both sexes. It was also related to language choice in general, and achievement.

Having more control over outcomes was found to relate to science choice.

It has already been suggested above that greater internal balance, and more flexibility, might imply less need for control over one's environment. This is an area that could be explored further.

5. Recommendations

In spite of the shortcomings of the sampling process and the problems of imbalance this produced, some questions have been answered, and previous research supported. Some of the research questions have been answered inconclusively. Other interesting questions have been raised that could be explored in further research.

Assuming that all three research outcomes are desirable, and given that these findings have some validity, certain matters of educational policy need to be re-examined and evaluated. In spite of the many initiatives that have been introduced in recent years, it is clear that changes in attitudes are difficult to achieve, and the educational system is still contributing to inequality of opportunity between the sexes by not positively encouraging balanced development and choice.

Specifically, the following measures would help to change the ethos of schools and colleges so as to facilitate freedom of choice by both sexes, whatever the type of school. Students would feel supported and encouraged in making non- stereotypical choices by:

a) The provision of equivalent facilities in single sex and mixed schools for both languages and science.

b) Greater emphasis being placed, when training teachers, lecturers, counsellors and careers advisers, on equal opportunities' matters. Providing the physical facilities and re-structuring time-tables is not sufficient. It is important to create a supportive environment, and this depends to a very large extent on people's attitudes being

flexible, and those who are in positions of authority and influence being appropriate role models.

c) The delay of early specialisation in schools so that students make decisions about their future lives and careers at a time when they have a greater sense of who they are, and have perhaps dispelled some fantasies about school subjects and their own ability to achieve or not.

d) Provision of opportunities in Further and Higher Education for students to reconsider earlier decisions, and to gain access to courses on the basis of potential rather than prior achievement.

Appendix to Chapter VI

6.1. Androgyny Scores and 'A' level Choices

Sex	Course	M. Score	F. Score	Cat
M	Phys Math Chem	3.5	3.25	M
M	Phys Math Comp Elec	3.8	4.7	A
M	Phys Math Chem	4.0	3.6	M
M	Phys Math Chem	2.55	3.8	U
M	Phys Math Elec	3.45	3.9	M
M	Phys Math Comp	3.10	4.10	U
M	Phys Math Chem	3.1	3.1	U
M	Phys + no info	3.4	5.05	A
M	Phys Elec	3.65	3.3	M
M	Phys + no info	4.65	4.4	A
M	Phys Math Des & T	3.35	3.5	U
M	Phys Math Chem	3.6	3.05	M
M	Phys Elec	3.4	3.35	M
M	Phys + no info	2.65	4.3	F
M	Phys Math Chem	3.0	4.8	F
M	Phys Math Chem	3.9	4.05	A
M	Phys Math Furth M	2.8	4.35	F
M	Phys Math Chem	3.9	3.5	M
M	Phys Math Furth M Chem	2.55	4.85	F
	N=19 $\bar{X}$=	3.6	3.94	
M	Fr Eng Russ	3.2	4.3	F
M	Fr Eng Econ	4.3	5.3	A
M	Fr Eng Lat	2.7	3.8	U
M	Fr Eng Art Hist	3.55	4.35	A
M	Fr Eng Lat	2.75	4.3	F
	N=5 $\bar{X}$=	3.3	4.41	

M = masculinity, F = femininity, Cat = sex role category

Androgyny Scores and 'A' level Choices

Sex	Course		M. Score	F. Score	Cat
F	Phys Chem Bio Art		4.15	4.55	A
F	Phys Chem Bio		4.35	3.7	M
F	Phys Bio Geog		3.5	4.3	A
F	Phys Chem Bio		3.15	4.5	F
	N= 4	$\overline{X}$=	3.79	4.26	
F	Fr Theatre		3.00	3.7	U
F	Fr Eng Econ		2.85	3.9	U
F	Fr Econ Geog		2.75	4.55	F
F	Fr Bio Geog		3.20	4.20	F
F	Fr Soc		4.25	4.9	A
F	Fr Eng Econ		2.7	5.55	F
F	Fr Eng Hist		2.9	4.15	F
F	Fr Eng Bio		4.2	3.45	M
F	Fr Eng Russ		3.4	4.3	A
F	Fr Eng Hist		3.15	4.7	F
F	Fr Eng Soc		3.9	4.35	A
F	Fr Eng Drama		3.1	4.4	F
F	Fr Germ Hist		2.3	4.25	F
	N= 13	$\overline{X}$=	3.2	4.3	

Note: M = masculinity F = femininity
Cat = sex role category

Appendix to Chapter VII

7.1. Personal Questionnaire

PERSONAL INFORMATION CONFIDENTIAL

1. Personal Details

Name ..... Tel No .....
(for contact re questionnaire results)

Age .....

Date of birth .....

First language .....

2. Education (tick all appropriate categories)

Type of secondary school	11-16	16-19
Sec Modern	.....	.....
Grammar	.....	.....
Comprehensive	.....	.....
Independent	.....	.....
State	.....	.....
Mixed	.....	.....
Boys only	.....	.....
Girls only	.....	.....
Boarding	.....	.....
Day	.....	.....

Anything else not covered by the above categories

.....

3. Family

Father's occupation .....

Mother's occupation .....

Brothers (if any) 1. Age ..... Occupation .....
2. Age ..... Occupation .....
3. Age ..... Occupation .....
4. Age ..... Occupation .....

Sisters (if any) 1. Age ..... Occupation .....
2. Age ..... Occupation .....
3. Age ..... Occupation .....
4. Age ..... Occupation .....

Personal Questionnaire continued

3. Family Cont

Have you been brought up mainly by

1. Mother .....
2. Father .....
3. Both .....
4. Someone else .....

Please specify .....

4. Subject Choice

(a) When did you first consider studying Physics/Engineering/Languages

	Tick one
Primary School	....
Secondary School 1 - 3rd year	....
4th year	....
5th year	....
1st year 6th	....
2nd year 6th	....
Some other time (Specify)	.....

(b) Why did you choose to read Physics/Engineering/Languages

(Tick all appropriate categories)

You have ability	.....
You enjoy the subject	.....
You need the qualification in order to do a particular job	.....
Pressure from home	.....
Pressure from school	.....
Any other reason	.....

(c) If you could make the decision all over again would you still read Physics/Engineering/Languages

YES/NO

Personal Questionnaire continued

(d) If NO, what would you do instead?

Tick one

Read for a different full-time degree .....

Specify .....

Some other full time higher education, non degree qualification .....

Specify .....

Professional, on job, training .....

Specify .....

Employment without training .....

Specify .....

Don't know .....

5. Qualifications on entry to degree course

(a) O level subjects

Subject	Grade	Subject	Grade
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

A level subjects

1.	.....	3.....	.....
2.	.....	4.....	.....

Alternative qualifications to A level. Please specify

....

....

Personal Questionnaire continued

6. What do you intend to do immediately after your degree?

   a) Don't know .....

   b) Higher degree .....

   c) Job .....

   d) Something else .....

   If d) please specify .....

7. If you perform well in your degree course, it would most likely be because:-

   Tick one a) of your basic ability

   b) you worked hard

   c) the teaching was exceptionally good

   d) you had good luck

8. What do you hope to be doing in 10 years time?

   .....
   .....
   .....

9. Subjects/courses this year 1982/83 Year of study 1/2/3/4

   Compulsory ..... Elective .....

   ....

   ....

   ....

10. Which class of degree will you most likely get?

    Tick one a) First Class d) Third Class

    b) Upper Second e) Fail

    c) Lower Second

11. If you perform badly in your degree course, it will most likely be because:-

    Tick one a) of your basic inability c) the teaching was exceptionally bad

    b) you didn't work hard enough d) you had bad luck

7.2. Global and Academic Self-esteem

Put a tick in the appropriate box to show how you feel about yourself.

	Strongly agree	Agree	Disagree	Strongly disagree
I feel that I'm a person of worth, at least on an equal plane with others				
All in all, I am inclined to feel that I'm a failure				
I feel that I have a number of good qualities				
I am able to do things as well as other people				
I feel I do not have much to be proud of				
I take a positive attitude towards myself				
On the whole, I am satisfied with myself				
I wish I could have more respect for myself				
I certainly feel useless at times				
At times I think I am no good at all				

Select the one statement which comes closest to describing yourself

I am a student who:

1. must study somewhat hard to pass but can get C's if I really work ☐
2. doesn't really study hard to pass but can get C's and some B's if I really work ☐
3. can get B's and C's without studying and A's if I really work hard ☐
4. can get B's easily and with a little work mostly A's ☐
5. always have been able to get A's and some B's without working hard ☐

7.3. Androgyny Questionnaire

NAME ..... Male/Female..... .....

Please consider the following adjectives in relation to yourself. (AS YOU THINK YOU ARE, NOT HOW YOU WOULD LIKE TO BE).
Tick one response that is appropriate in each case. Do try to be honest

	Not at all 1.	2.	3	Average 4.	5	6.	Very much 7.
1. Like art and music							
2. Arrogant							
3. Home orientated							
4. Stern							
5. Daring							
6. Feminine							
7. Reckless							
8. Well Groomed							
9. Soft spoken							
10. Appearance orientated							
11. Neat							
12. Nagging							
13. Sensitive							
14. Timid							
15. Strong							
16. Ambitious							
17. Use harsh language							

Androgyny Questionnaire continued

	Not at all 1.	2.	3.	Average 4	5.	6.	Very much 7.
18. Gentle							
19. Coarse							
20. Understanding							
21. Warm							
22. Willing to take risks							
23. Appreciative							
24. Masculine							
25. Dominant							
26. Boastful							
27. Tender							
28. Express emotions							
29. Rational							
30. Hide emotions							
31. Feel superior							
32. Helpful							
33. Achievement oriented							
34. Aggressive							
35. Affectionate							
36. Loud							
37. Assertive							
38. Emotional							
39. Logical							
40. Tactful							

7.4. Eysenck Personality Questionnaire

E.P.Q. (Adult)

Occupation .....

Age ..... Sex.....

INSTRUCTIONS Please answer each question by putting a circle around the "YES" or the "NO" following the question. There are no right or wrong answers, and no trick questions. Work quickly and do not think too long about the exact meaning of the questions.

PLEASE REMEMBER TO ANSWER EACH QUESTION

1	Do you have many different hobbies?	YES	NO
2	Do you stop to think things over before doing anything?	YES	NO
3	Does your mood often go up and down?	YES	NO
4	Have you ever taken the praise for something you knew someone else had really done?	YES	NO
5	Are you a talkative person?	YES	NO
6	Would being in debt worry you?	YES	NO
7	Do you ever feel "just miserable" for no reason?	YES	NO
8	Were you ever greedy by helping yourself to more than your share of anything?	YES	NO
9	Do you lock up your house carefully at night?	YES	NO
10	Are you rather lively?	YES	NO
11	Would it upset you a lot to see a child or an animal suffer?	YES	NO
12	Do you often worry about things you should not have done or said?	YES	NO
13	If you say you will do something, do you always keep your promise no matter how inconvenient it might be?	YES	NO
14	Can you usually let yourself go and enjoy yourself at a lively party?	YES	NO
15	Are you an irritable person?	YES	NO
16	Have you ever blamed someone for doing something you knew was really your fault?	YES	NO
17	Do you enjoy meeting new people?	YES	NO
18	Do you believe insurance schemes are a good idea?	YES	NO
19	Are your feelings easily hurt?	YES	NO
20	Are *all* your habits good and desirable ones?	YES	NO

PLEASE TURN OVER page 1

Eysenck Personality Questionnaire continued

21	Do you tend to keep in the background on social occasions?	YES	NO
22	Would you take drugs which may have strange or dangerous effects?	YES	NO
23	Do you often feel "fed-up"?	YES	NO
24	Have you ever taken anything (even a pin or button) that belonged to someone else?	YES	NO
25	Do you like going out a lot?	YES	NO
26	Do you enjoy hurting people you love?	YES	NO
27	Are you often troubled about feelings of guilt?	YES	NO
28	Do you sometimes talk about things you know nothing about?	YES	NO
29	Do you prefer reading to meeting people?	YES	NO
30	Do you have enemies who want to harm you?	YES	NO
31	Would you call yourself a nervous person?	YES	NO
32	Do you have many friends?	YES	NO
33	Do you enjoy practical jokes that can sometimes really hurt people?	YES	NO
34	Are you a worrier?	YES	NO
35	As a child did you do as you were told immediately and without grumbling?	YES	NO
36	Would you call yourself happy-go-lucky?	YES	NO
37	Do good manners and cleanliness matter much to you?	YES	NO
38	Do you worry about awful things that might happen?	YES	NO
39	Have you ever broken or lost something belonging to someone else?	YES	NO
40	Do you usually take the initiative in making new friends?	YES	NO
41	Would you call yourself tense or "highly-strung"?	YES	NO
42	Are you mostly quiet when you are with other people?	YES	NO
43	Do you think marriage is old-fashioned and should be done away with?	YES	NO
44	Do you sometimes boast a little?	YES	NO
45	Can you easily get some life into a rather dull party?	YES	NO
46	Do people who drive carefully annoy you?	YES	NO
47	Do you worry about your health?	YES	NO
48	Have you ever said anything bad or nasty about anyone?	YES	NO
49	Do you like telling jokes and funny stories to your friends?	YES	NO
50	Do most things taste the same to you?	YES	NO
51	As a child were you ever cheeky to your parents?	YES	NO
52	Do you like mixing with people?	YES	NO
53	Does it worry you if you know there are mistakes in your work?	YES	NO
54	Do you suffer from sleeplessness?	YES	NO

page 2

Eysenck Personality Questionnaire continued

55	Do you always wash before a meal?	YES	NO
56	Do you nearly always have a "ready answer" when people talk to you?	YES	NO
57	Do you like to arrive at appointments in plenty of time?	YES	NO
58	Have you often felt listless and tired for no reason?	YES	NO
59	Have you ever cheated at a game?	YES	NO
60	Do you like doing things in which you have to act quickly?	YES	NO
61	Is (or was) your mother a good woman?	YES	NO
62	Do you often feel life is very dull?	YES	NO
63	Have you ever taken advantage of someone?	YES	NO
64	Do you often take on more activities than you have time for?	YES	NO
65	Are there several people who keep trying to avoid you?	YES	NO
66	Do you worry a lot about your looks?	YES	NO
67	Do you think people spend too much time safeguarding their future with savings and insurances?	YES	NO
68	Have you ever wished that you were dead?	YES	NO
69	Would you dodge paying taxes if you were sure you could never be found out?	YES	NO
70	Can you get a party going?	YES	NO
71	Do you try not to be rude to people?	YES	NO
72	Do you worry too long after an embarrassing experience?	YES	NO
73	Have you ever insisted on having your own way?	YES	NO
74	When you catch a train do you often arrive at the last minute?	YES	NO
75	Do you suffer from "nerves"?	YES	NO
76	Do your friendships break up easily without it being your fault?	YES	NO
77	Do you often feel lonely?	YES	NO
78	Do you always practice what you preach?	YES	NO
79	Do you sometimes like teasing animals?	YES	NO
80	Are you easily hurt when people find fault with you or the work you do?	YES	NO
81	Have you ever been late for an appointment or work?	YES	NO
82	Do you like plenty of bustle and excitement around you?	YES	NO
83	Would you like other people to be afraid of you?	YES	NO
84	Are you sometimes bubbling over with energy and sometimes very sluggish?	YES	NO
85	Do you sometimes put off until tomorrow what you ought to do today?	YES	NO
86	Do other people think of you as being very lively?	YES	NO
87	Do people tell you a lot of lies?	YES	NO
88	Are you touchy about some things?	YES	NO
89	Are you always willing to admit it when you have made a mistake?	YES	NO
90	Would you feel very sorry for an animal caught in a trap?	YES	NO

PLEASE CHECK TO SEE THAT YOU HAVE ANSWERED ALL THE QUESTIONS

7.5. Variables used in the analysis

1. Family Background:

OCPA	father's occupation	1. science 2. lang
OCMA	mother's occupation	3. other 4. no emp
ocpa recoded into		
SCIDAD	employed in science	0. no 1. yes
LANGDAD	employed in languages	0. no 1. yes
OTHERDAD	employed in other areas	0. no 1. yes
STATPA	occ status father	00-10 categories
STATMA	occ status mother	based on the registrar generals classification
statma recoded		0. not employed 1. employed
statpa recoded		1. professional * 2. intermediate 3. skilled,non man. 4. others
statpa further recoded into:		
PROFDAD	professional	0. no 1. yes.
INTDAD	intermediate	0. no 1. yes
SKLNMDAD	skilled non manual	0. no 1. yes
UNEMDAD	not employed	0. no 1. yes
INFL	parent responsible for upbringing	1. mother alone 2. both 9. father/ other
infl recoded into		
MUMINFL	influence mother	0. no 1. yes
BROS	N. of brothers of subject	
SIS	N. of sisters of subject	
SIBS	N. of siblings	
POS	position in family	1 - ?
pos recoded into		
NEWPOS		1. only 2. oldest 3. last 4. middle

2. Education, Achievement and Ability

OL01- OL43	subject grades	0. F 1. E 2. D 3. C 4. B 5. A
NOOL	N.of passes at '0' level	
nool recoded into		
OLPASS	3 categories	1. low 2. medium 3. high
AVOL	average '0' level grade including failures	
avol recoded into:		
AVOLCAT	3 categories	1. low 2. medium 3. high

AL01-AL26	subject grades	1. F 2. O 3. E 4. D 5. C 6. B 7. A
ALSCORE	N. passes at 'A' level	
alscore recoded into:		
ALCAT	3 categories	1. low 2. medium 3. high
AVAL	average 'A'level grade including failures	
aval recoded into:		
NEWAVAL	3 categories	1. low 2. medium 3. high
EXAM	degree results	1. fail 2. pass/3 3. 2:2 4. 2:1 5. first
exam recoded into:		
EXAMCAT	3 categories	1. low 2. medium 3. high
EXAMSEX	exam categories by sex:	1. high male, 2. low male 3. high female 4. low female
EXAMDEG	exam cats. by degree:	1. high science, 2. low science 3. high language 4. low language
ED1,ED5	11-16, 16-19 education	0. indep. 1. state
ED2, ED6		0. gramm. 1. comp
ED3, ED7		0. s. sex 1. mixed
ED4, ED8		0. day 1. board
A subset of 48 took ability tests:		
CST	abstract reasoning	range 1-20
GATV	verbal ability	
GATN	numerical ability	
GATP	perceptual ability	
SH	spatial ability	
MAT	mechanical ability	
S1	clerical speed & accuracy	
S2	flexibility	
S3	inner confidence	
S4	outer confidence	
S5	manual speed	
S6	manual skill	

3. Personality

Androgyny measures

AVMASCA	masculinity score	range 1-7
AVFEMA	femininity score	range 1-7

categories derived from avmasca & avfema using median split:

ANDCATA		1. androgynous
		2. masculine
		3. feminine
		4. undifferentiated

andcata by sex:

ANDSEX		1. male androgynous
		2. fem. androgynous
		3. male masculine
		4. female masculine
		5. male feminine
		6. female feminine
		7. male undiff.
		8. female undiff.
SEXTYPE	derived from andsex	1. androgynous
		2. opposite
		3. stereotypical
		4. undifferentiated
TYPICAL	from sextype (1 + 2)	1. non-stereo.
	(3 + 4)	2. stereotypical

continuous measures of sex role :

ANDA	androgyny	range 1-72
MA	masculinity	
FA	femininity	
UNDA	undifferentiation	

above recoded into

ANDACAT	3 categories	1. low 2. medium
MACAT		3. high
FACAT		
UNDACAT		

Measures derived from the EPQ

EPQN	neuroticism	range 1-23
EPQE	extraversion	range 1-21
EPQL	lie scale	range 1-21
EPQP	psychoticism	range 1-28

above recoded into 3 categories: 1. low 2. medium 3. high

NEURO	neuroticism
OUTER	extraversion
FAKE	lie scale
PSYCHO	psychoticism

categories derived from epqe and epqn on the basis of means:

EPCAT	neurotic introvert	1. NI
	neurotic extravert	2. NX
	stable intovert	3. SI
	stable extravert	4. SX

Self esteem measures

ESTGL	global self esteem	range 1-40
estgl recoded into 3 categories:		1. low 2. medium
GLOBAL		3. high
ESTSP	specific self esteem	range 4 down to 1
ESTAC	academic self esteem	range 5 down to 1

Attributions re success and failure

ATSUC	attributions re success	range 4 to 1
ATFAIL	attributions re failure	range 4 to 1
Above combined to form a measure of perceived control over outcomes		
ATCON	total control	1. high - 4. low

Other variables to do with degree choice

TIM	Time of decision	1. prmy. 2. sec 1-3
		3. sec 4 4. sec 5
		5. sec 6 6. sec 7+
tim recoded into categories:		
TIM		1. early 2. late
DEG	degree choice	1. science 2. lang
SEXDEG	degree choice by sex	1. male language
		2. female science
		3. male science
		4. female language
SUB	specific subject areas	1. french 2.german
		3. phys 4. m.eng
		5. electrical eng
		6. naval architect.
CHOICE	derived from sexdeg	
	male lang/ fem science	1. non stereotypical
	male science/ fem lang	2. stereotypical

Stated reasons for choice

WHY1	ability	0. no 1. yes
WHY2	interest	
WHY3	necessity	
WHY4	financial	
WHY5	school pressure	
WHY6	career possibility	
WHY7	parental pressure	

Current plans after degree

STUDY	further study	0. no 1. yes
EMPLOY	employment	
TRAVEL	time out/ travel	
DTKNOW	undecided	

Future plans and aspirations

FUT01	financial success	0. no	1.yes
FUT02	happiness		
FUT03	career		
FUT04	home/family		
FUT05	independence		
FUT06	responsibility		
FUT07	self-employed		
FUT08	employed		
FUT09	travel		
FUT10	no aspirations/dont know		

Note: occ = occupation non man = non manual
gramm = grammar school s.sex = single sex
indep = independent prmy = primary school
sec = secondary school

* Parental occupations were allocated to groups based on the registrar general's classification. This takes into account level of occupational skill and employment status. The majority of the fathers were in the following groups:

Professional: eg; judge, economist, civil engineer
Intermediate: eg; author, teacher, sales manager
Skilled non manual: eg; photographer, sales representative, police sergeant
Others: This miscellaneous category included the retired, army ratings, not employed, not known.

There were no unskilled fathers

7.6 Variables that were not used in the multivariate analyses

As a result of the preliminary analyses, a few variables were not considered useful, in any form, as predictors of any of the three outcomes and were dropped from the main analyses.

Family
INTDAD: father in an intermediate occupation
UNEMDAD: father not employed

Education, Achievement, Ability
ED1, ED5: 11-16, 16-19 education, independent or state
ED4, ED8: 11-16, 16-19 education, day or boarding

Variables to do with choice
Current plans after degree:
STUDY: further study
EMPLOY: employment
TRAVEL: time out/travel
DTKNOW: undecided

SUB: specific subject areas

Future plans and aspirations
FUT02: happiness
FUT03: career
FUT05: independence
FUT06: responsibility
FUT07: self-employed
FUT08: employed
FUT09: travel
FUT10: no aspirations/ don't know

Appendix to Chapter VIII
8.1 Correlations between continuous predictor variables and continuous sex role measures.

n = 158

	Anda	Ma	Fa	Unda
Estgl	.3276 p<.000	.1723 p<.016	-.2108 p<.004	-.3143 p<.000
Estac	.1143 p<.080	.0849 p<.148	-.0606 p<.228	-.0563 p<.245
Estsp	.1287 p<.061	.0966 p<123	-.0678 p<.208	-.0633 p<.224
Atsuc	.3252 p<.000	.0537 p<.258	-.0574 p<.244	-.3028 p<.000
Atfail	-.1188 p<.074	-.0252 p<.380	.0504 p<.271	.1382 p<.046
Atcon	.1869 p<.012	-.0475 p<.284	.0326 p<.347	-.2122 p<.005
Epqn	-.0782 p<.185	-.2082 p<.008	.2406 p<.003	.0598 p<.246
Epqe	-.3014 p<.000	.0612 p<.241	-.1143 p<.094	-.3540 p<.000
Epql	-.0883 p<.155	-.3251 p<.000	.3164 p<.000	-.0170 p<.423
Epqp	-.0660 p<.224	.3841 p<.000	-.4069 p<.000	.0162 p<.426

8.2 Correlations between continuous predictor variables, and measures of masculinity, femininity and achievement.

n = 158

	Avmasca	Avfema	Exam
Estgl	.3314 p<.000	.0360 p<.444	-.0268 p<.377
Estac	.1065 p<.095	-.0115 p<.444	.3110 p<.000
Estsp	.1172 p<.079	-.0140 p<.453	.4890 p<.000
Atsuc	.2213 p<.003	.1488 p<.036	.1339 p<.060
Atfail	-.1014 p<.109	-.0488 p<.277	-.0494 p<.284
Atcon	.0806 p<.166	.1613 p<.026	.1541 p<.037
Epqn	-.2091 p<.008	.1603 p<.032	.0473 p<.304
Epqe	.2423 p<.002	.1322 p<.064	-.1328 p.<074
Epql	-.2671 p<.001	.2720 p<.001	-.1690 p<.032
Epqp	-.3178 p<.000	-.3462 p<.000	-.1573 p<.043

8.3 Correlations between ability variables and continuous sex role measures

n = 48

	Anda	Ma	Fa	Unda
Cst	.1170 p<.217	.4579 p<.001	-.4731 p<.000	.0420 p<.390
GatV	.2444 p<.049	.3149 p<.016	-.3521 p<.008	-.1790 p<.114
GatN	.3429 p<.009	.4474 p<.001	-.4513 p<.001	-.1919 p<.098
GatP	.2867 p<.025	.2525 p<.043	-.2360 p<.055	-.1864 p<.105
Sh	.1379 p<.178	.3744 p<.005	-.3583 p<.007	.0227 p<.440
Mat	-.0363 p<.404	.3253 p<.013	-.3291 p<.012	.1668 p<.131
S1	.1944 p<.095	.1449 p<.166	-.1832 p<.109	-.1956 p<.094
S2	-.2517 p<.044	-.0988 p<.255	.0913 p<.271	.2219 p<.067
S3	.1029 p<.248	.3150 p<.016	-.3565 p<.008	-.0327 p<.414
S4	.3126 p<.016	.4118 p<.002	-.3024 p<.019	-.0392 p<.397
S5	.0937 p<.265	-.1896 p<.101	.2057 p<.083	-.1588 p<.143
S6	-.0506 p<.368	-.0267 p<.429	.0615 p<.341	.0848 p<.285

8.4 Correlations between ability variables and measures of masculinity, femininity, and achievement

n = 48

	Avmasca	Avfema	Exam
Cst	.3707 p<.005	-.3943 p<.003	.1906 p<.097
GatV	.3673 p<.006	-.1557 p<.148	.3330 p<.010
GatN	.4882 p<.000	-.2242 p<.065	.3020 p<.018
GatP	.3177 p<.015	-.0609 p<.342	.3437 p<.008
Sh	.3094 p<.017	-.2926 p<.023	.2588 p<.038
Mat	.1893 p<.101	-.3644 p<.006	.3872 p<.003
S1	.2302 p<.060	-.0139 p<.463	.1422 p<.168
S2	-.2048 p<.084	-.0745 p<.309	.0770 p<.302
S3	.2879 p<.026	-.2553 p<.043	.1472 p<.162
S4	.3750 p<.005	-.2087 p<.080	.2870 p<.024
S5	-.0771 p<.303	.2634 p<.037	-.1201 p<.208
S6	-.0688 p<.323	-.0079 p<.479	.0682 p<.322

Appendix to Chapter IX

9.1 Sex roles- Variables used in the discriminant analyses

A. Sex role categories

	Andcata			Andsex	Sextype	Typical		
	T	M	F	T	T	T	M	F
Family								
Sis						x	/	/
Statma	/	/	x	/				
Muminfl						x	x	/
Scidad	/	/	x			/	/	x
Langdad								
Pos	/	/	x			x	x	/
Education								
Ed2	/	x	/			/	x	/
Alscore	/	/	x		x	x	x	/
Deg								
Personality								
Epqn								
Epqe	x	/	/	x	x			
Epql	x	x	x	x		x	/	x
Epqp	x	x	x	x		/	x	x
Atcon	/	/	x	/	x	x	/	x
Estgl	x	x	x	x	x			
Reasons								
Why3	x	/	x	x		/	x	x
Fut01						x	/	/
Fut04	x	/	/	x		/	x	/
Why7								
Pool /	12	12	12	7	19	12	12	12
Select. x	6	4	9	6	4	7	7	5
N. Cases	126	63	64	134	123	123	61	62
% Class.	39.61			29.87	29.87	63.64		

Sex Roles- Variables used in the Discriminant Analyses

B. Continous variables

	Andacat			Macat		
	T	M	F	T	M	F
Family						
Sis				/	/	/
Statma	/	x	/			
Muminfl				/	/	/
Scidad	x	x	x	/	/	x
Education						
Ed2	x	x	x			
Alscore				/	x	/
Personality						
Epql	/	x	/	x	x	x
Epqp	/	/	x	x	x	x
Estgl	x	x	/	x	x	
Reasons						
Why3	/	x	x	x	x	x
Fut01	/	x	/			
Fut04	x	/	x			
Pool /	9	9	9	8	8	8
Selected x	4	7	5	4	5	4
N. Cases	127	65	62	134	70	64
% Classified	63.64			66.88		

Sex roles- Variables used in the discriminant analyses
Continuous variables continued

	Facat			Undacat		
	T	M	F	T	M	F
Family						
Statma	x	x	x	x	x	x
Muminfl	/	/	/	x	/	x
Scidad	/	x	/	/	/	x
Pos	/	/	/	/	x	/
Education						
Ed2				x	x	/
Alscore	/	x	/	x	x	/
Personality						
Epqn	x	x	x	x	x	/
Epqe	/	/	/	x	x	x
Epql	x	x	x			
Epqp	x	x	x	x	/	/
Estgl	x	x	x	x	x	/
Reasons						
Why3	x	x	x			
Pool /	11	11	11	10	10	10
Selected x	6	8	6	8	7	4
N. Cases	134	70	64	131	68	63
% Classified	65.58			64.94		

9.2 Choice - Variables used in the discriminant analyses

	Degree T	Degree M	Degree F	Sexdeg T	Choice T
Family					
Profdad	x	/	x	x	x
Sklnmdad	/	x	/	x	x
Statma	x	x	/	x	/
Bros	x			x	/
Sis	x			/	x
Muminfl	x			/	
Intdad				/	/
Education					
Ed7	x	x	/	x	
Avol	/	/	x	x	
Aval	x	x	/	x	
Personality					
Epqn	x	/	x	x	
Ma	x	x	/	/	/
Fa	x	x	/	x	/
Epqp					x
Atcon	x	x	/	x	
Unda				/	
Reasons					
Why1	x	x	/	x	x
Why2	x	x	x	x	
Why3	x	x	x	x	x
Why6	x	/	/	x	/
Tim	x	x	/	x	x
Fut04	x	/	x	x	
Why4				x	x
Total Pool	19	19	19	17	14
N. Selected	17	11	6	17	8
N. Cases	113	56	57	113	129
% Classified	87.34			68.35	72.31

Note: / pool only, X selected

9.3 Achievement - Variables used in discriminant analyses

	Exam			Examcat		
	T	M	F	T	M	F
Education						
Ed2	x	x	x			
Ed3	/	/	/	/	/	/
Ed6	x	x	x	x	x	/
Avol	x	x	/			
Aval	/	/	/	x	/	x
Alscore	x	x	x	x	x	x
Personality						
Ma	/	/	/			
Fa						
Estac	/	/	/	x	/	x
Estsp	x	x	x	x	x	x
Atsuc	x	x	/	/	x	/
Epql	x	/	x	x	x	x
Epqp	x	/	/	x	x	/
Total Pool	11	11	11	9	9	9
N. Selected	8	6	5	7	6	5
N. Cases	103	50	51	101	49	52
% Classified	40.14			69.01		

note: / pool only, X selected

Appendix to Chapter X

10.1. Sex roles: Variables used in the regression analysis

	Anda			Ma			Fa		
	T	M	F	T	M	F	T	M	F
Pool									
Family									
Statma									
Muminfl									
Scidad	x								
Pos									
Sis									
Education									
Ed2	x	x							
Alscore									
Personality									
Epqn				x	x		x	x	
Epqe	x		x						
Epql				x	x	x	x	x	x
Epqp				x	x	x	x	x	x
Atcon			x						
Estgl	x	x							
Reasons									
Why3				x					
Fut01									x
Fut04				x		x	x		
Pool	16	16	16	16	16	16	16	16	16
Selected	4	2	2	5	3	3	4	3	3

Sex roles: Variables used in the regression analysis

	Unda			Typical		
	T	M	F	T	M	F
Pool						
Family						
Statma						
Muminfl						
Scidad						
Pos						
Sis						
Education						
Ed2	x	x				
Alscore						
Personality						
Epqn						
Epqe	x	x				
Epql						x
Epqp					x	
Atcon			x	x		
Estgl	x	x				
Reasons						
Why3						
Fut01						
Fut04						
Pool	**16**	**16**	**16**	**16**	**16**	**16**
Selected	**3**	**3**	**1**	**1**	**1**	**1**

10.2. Non-stereotypical choice: Variables used in the regression analysis.

	T	M	F
Pool of Predictors			
Family			
Muminfl		x	
Profdad			
Sklnmdad	x	x	
Sis			
Bros			
Personality			
Ma			
Fa		x	
Epqp			
Reasons			
Why1		x	
Why3	x	x	
Why4			
Why6			x
Tim	x		
Pool	13	13	13
Selected	3	5	1

10.3. Achievement: Variables used in the regression analysis.

	T	M	F
Pool of Predictors			
Family			
Sklnmdad			
Sibs			
Education			
Ed2			
Avol	x	x	
Aval			
Alscore			x
Personality			
Estgl			
Estac			x
Estsp	x	x	x
Epql			x
Reasons			
Why2			
Why5			x
Pool	33	33	33
Selected	2	2	5

10.3. Achievement in subject areas: Variables used in the regression analysis.

	Sc	L	ML	FS
Pool of Predictors				
Family				
Sklnmdad				x
Sibs			x	
Education				
Ed2			x	
Avol	x			
Aval		x	x	
Alscore				
Personality				
Estgl				x
Estac				
Estsp	x			x
Epql				
Reasons				
Why2		x	x	
Why5				
Pool	33	33	33	
Selected	2	2	4	3

Note: Sc = science, La = languages,
ML = male language, FS = Female science

Appendix to Chapter XI
11.1 The Science Profile

Family Background

Mothers not in paid employment

Brought up by mother alone

Fathers from occupational groups 1 & 2

More brothers

Education and Attainment

Mixed school

Comprehensive school 11-16

Mixed school 16-19

Higher 'O' level grades

More 'A' levels

Higher grades at 'A' level

Higher on all abilities except verbal (n=48)

Personality

higher on self esteem

higher levels of masculinity

average masculinity

average femininity

more stable

more introvert

stable extravert

higher level psychoticism

more control over outcomes

Outcomes

career choices made earlier

Choose subjects because of necessity

Future plans with respect to employment more certain

Financial prospects as reason for choice

Want career

Pressure from school

nb Women in science as above plus **bold** characteristics

11.2 The Languages Profile

Family Background

Mothers in paid employment

Fathers from occupational group 3

More sisters

Influence of mother

Education and Attainment

Single sex school 11-16

Single sex school 16-19

Grammar school 11-16

Higher on verbal ability (n=48)

Fewer 'A' levels

Lower 'A' level grades

Personality

Less stable

more extravert

neurotic introvert

Less perceived control over achievement outcomes

Higher on femininity

More category A F U

Lower all measures self esteem

Outcomes

ability as reason for choice

Choose subjects out of interest

Future employment plans more uncertain

Want home and family

Career choices later

Necessity not a reason for choice

nb Men in languages as above plus **bold** characteristics

11.3 Combined profile for non stereotypical choice

Family

Skilled non manual father

not being first or only child

Personality

high psychoticism

Education

Number of 'A' levels

Reasons/ Outcomes

interest in subject

school pressure as reason

necessity not a reason for choice

choices made later

financial prospects as reason for choices

ability as reason for choice

Time of decision later

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