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**ARE FEMALES MORE HELPLESS THAN MALES?  
AN OBSERVATIONAL AND ATTRIBUTIONAL ANALYSIS  
IN MATHS AND ENGLISH**

A thesis presented in partial fulfilment of  
the requirements for the degree of  
Master of Arts in Psychology  
at Massey University

Gillian Naomi Hawke

1993

## ABSTRACT

The present study investigated the under-achievement and participation of females in mathematical areas within the context of the attribution theory. Gender differences for causal attributions and achievement-related beliefs were investigated in Maths and English, employing a methodology which allowed for the subjective construction of the situation by the student. Subjects were 97 from five Maths and English students (50 males and 47 females). Overall, there were no consistent gender differences in attributions for success and failure in Maths and English. Although males perceived themselves as more competent in Maths, there were no gender differences in achievement-related beliefs. However, females displayed more mastery-oriented cognitions in English .

Additionally, the relationship of gender and teacher-student interactions in Maths and English classrooms were investigated, in an attempt to conceptualise the role they have in sustaining gender related behaviours. It was hypothesized that males and females were being treated differently in Maths and English, which in some way affects their attributions for achievement outcomes, and subsequent achievement-related beliefs. Four classrooms (two Maths and two English) were observed for five hours each. Contrary to predictions, there were few significant differences in the contingencies of evaluative feedback given to students, with respect to its frequency, its typical referents, and the specificity of its use.

The results were discussed in terms of their relationship to other studies, and the implications for past and future methods of studying students' causal attributions in mathematical and verbal achievement situations. Alternative mechanisms by which females' self-derogating beliefs might inhibit their participation and achievement in maths-related areas were also considered.

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## CHAPTER 1

### INTRODUCTION

#### **GENDER DIFFERENCES IN EDUCATIONAL PARTICIPATION AND ACHIEVEMENT**

For whatever reasons, few mathematicians are women. A plethora of research exists which documents discrepancies between males' and females' mathematical achievement. Although there are few gender differences in mathematical ability at the primary school level (Tittle, 1986), by secondary school, males are frequently outperforming females on maths achievement tests, especially those which involve problem solving (Gold, 1990; Hyde, Fennema, & Lammon, 1990; Fennema, Peterson, Carpenter, & Lubinski, 1990; Linn & Petersen, 1985). Moreover, research continues to show that females opt to take fewer advanced Maths courses than males (Elmore & Vasu, 1986), exhibit lower expectations for success and lower estimates of their competence in Maths (Fennema, 1985), have a more negative personal belief system pertaining to Maths, and a greater attrition for females than males in entry to mathematically-related careers (Fennema et al., 1990).

Many assert that gender differences in cognitive abilities are accountable for this disparity, as it is argued that females perform better than males in verbal areas, and males have a superior mathematical ability (Dweck & Licht, 1980). However recent analyses show that previous cognitive gender differences in verbal ability, spatial visualisation, and mathematical computation and concepts have declined, and no longer exist (Jacklin, 1989; Linn & Hyde, 1989). Thus, it appears that any under representation of women in mathematical areas is much larger than any found in other cognitive skills.

Initially, the majority of psychological research which sought to explain the educational, occupational, and social status of women concentrated mainly on the

study of individual differences, and the search for biological explanations of such differences (Tittle, 1986). Recently however, the emphasis has changed, with the research focus being not on the different biological features of the two sexes, but rather, the social interactions during which individuals construct gender related perceptions and responses (Jacklin, 1989).

Of particular relevance to the present study is the quantity of educational research afforded to exploring the ways in which the school experience may facilitate the realisation of gender related differences in achievement, and further contribute to the sexual division of labour in adulthood. Sex differences have primarily been attributed to gender related differences in experiences, including education, and recent research contributes to a better understanding of the characteristics of these experiences (Tittle, 1986).

In order to conceptualise and illustrate the issues fundamental to the present study, recent New Zealand statistics in this area will be presented. Table 1 displays the subjects taken by males and females at secondary school. It is clear to see that females prefer to study language, humanity, domestic and arts subjects, whereas males tend to concentrate more in the "hard science" and technical areas. Interestingly, the numbers of males and females studying English differs only slightly. However, more males take both Maths, and Maths with statistics. This pattern of subject differentiation greatly limits females' choices for further education, and many career opportunities (Loveridge, 1986).

Table 2 indicates that the subject specialisation observed in university, mirrors the distribution of males and females in the same areas at secondary level. Females are consistently obtaining more degrees in humanities and languages than males. Not surprisingly, university mathematics and computer graduates are predominantly male, with the numbers of Doctorates and Masters awarded to males far exceeding those obtained by females.

Table 3 presents the major occupations of New Zealanders, over 25 years old. It is evident from this table that females are still entering jobs which have been stereotypically defined as appropriate for females (clerical, sales and service workers), and males dominate the field in legislation and administration, trade workers, machine operators and assemblers, and agriculture and fishery workers. It is interesting to observe that the number of professional females exceeds the number of professional males. This is probably a function of this category including Health Professionals (e.g., nurses, midwives, dentists, doctors etc.) and Teaching Professionals (e.g., early childhood educators; primary, secondary, and tertiary teachers; special needs teachers).

Data presented in these tables demonstrates that there are clearly discrepancies between males' and females' educational participation and achievement in the New Zealand contemporary education system. Although the data suggests gender differences in many subject areas, the focus of the present study is on the biases observed in Maths (traditionally a masculine domain) and English (traditionally a feminine domain), as literature documents that unequal participation and achievement is greatest in areas which are typically perceived to be sex-typed.

Table 1

*Subjects Taken by All Secondary Pupils At 1 July 1990.*

Subject	Males	Females	Total
<b>English</b>	<b>112 510</b>	<b>112 865</b>	<b>225 375</b>
Language	8 874	10 596	19 470
French	9 854	19 110	28 964
German	2 856	6 152	9 008
Japanese	5 017	7 425	12 442
Chinese	0	2	2
Spanish	65	203	268
Russian	91	86	177
Indonesian	68	82	150
Pacific Languages	87	105	192
Latin	1 856	1 372	3 228
Classical Studies	1 486	3 102	4 588
Language Studies	487	328	815
Maori Studies	4 048	3 430	7 478
Cultural Studies	19	6	25
Social Studies	53 162	51 135	104 297
History	10 813	13 580	24 393
Geography	20 790	19 433	40 223
<b>Mathematics</b>	<b>104 067</b>	<b>97 325</b>	<b>201 392</b>
<b>Statistics</b>	<b>6 783</b>	<b>5 329</b>	<b>12 112</b>
Science	74 802	70 440	145 242
Earth Science	33	5	38
Biological Science	10 130	15 569	25 699
Environmental Studies	82	124	206
Human Biology	944	2 058	3 002
Chemistry	9 010	6 983	15 993
Physics	13 889	4 900	18 789
Physical Science	994	438	1 432
Art (Core)	22 977	21 667	44 644
Art (Special)	11 764	13 467	25 231
Art History	1 176	2 955	4 131
Art Practical	3 609	4 507	8 116
Music (Core)	25 199	24 980	50 179
Music (Special)	4 311	5 441	9 752
Drama	4 348	5 815	10 163
Physical Education	87 440	82 527	169 967
Technical Drawing	38 674	11 330	50 004
Workshop Craft	30 528	7 311	37 839
Engineering Shopwork	7 045	678	7 723

Source: 1991 Educational Statistics of New Zealand.

Table 2

*University Degrees Completed by Level of Degree and Main Subject for the Year Ending with the Graduation Ceremony in 1990.*

Subject	Doctorate		Masters		Bachelors		Totals	
	M	F	M	F	M	F	M	F
<b>Humanities</b>								
Arts	-	-	1	-	11	22	12	22
Ancient History	-	-	-	-	3	3	3	3
Asian Languages	-	-	-	-	4	16	4	16
Chinese	-	-	-	1	2	4	2	5
Classics	-	1	-	-	5	19	5	20
English	3	5	12	27	118	346	133	378
French	1	1	-	4	10	43	11	48
German	-	-	2	1	11	35	13	36
Greek	-	-	1	1	-	3	1	4
History (Economic)	-	-	1	-	19	8	20	8
History	6	1	11	11	153	173	170	185
Indonesian	-	-	-	-	1	2	1	2
Italian	-	-	-	2	1	7	1	9
Japanese	-	-	-	-	12	19	12	19
Latin	-	-	1	1	-	1	1	2
Linguistics	-	-	1	1	7	10	8	11
Maori	-	-	-	-	5	8	5	8
Philosophy	1	-	8	2	40	15	49	17
Russian	-	-	1	-	4	9	5	9
Spanish	-	-	-	3	1	3	1	6
<b>Sub-total</b>	<b>11</b>	<b>8</b>	<b>39</b>	<b>54</b>	<b>407</b>	<b>746</b>	<b>457</b>	<b>808</b>
<b>Mathematics &amp; Computer Science</b>								
Applied Maths	-	-	-	-	19	6	19	5
Computer Science	3	-	12	2	172	25	187	27
Management Science	-	-	-	-	3	1	3	1
Computing Tech	-	-	2	-	5	2	7	2
Information Systems	-	-	-	-	27	15	27	15
Management Science	-	-	-	-	20	6	20	6
Mathematics	2	1	6	1	100	57	108	59
Operations Research	-	-	6	2	22	12	28	14
Pure Mathematics	-	-	-	-	27	19	27	19
Quantitative Studies	-	-	-	-	1	-	1	0
Statistics	-	-	2	1	6	7	8	8
<b>Sub-total</b>	<b>5</b>	<b>1</b>	<b>28</b>	<b>6</b>	<b>402</b>	<b>149</b>	<b>435</b>	<b>156</b>

Source: 1991 Educational Statistics of New Zealand



Table 3

*Occupation (Major Group) by Sex for Population Resident in New Zealand Aged 15 Years and Over Gainfully Employed in Full-time and Part-time Labour Force.*

Occupation	Males	Females
Legislators, Administrators and Managers	109 893	52 395
Professionals	77 805	89 760
Technicians	88 326	62 382
Clerks	36 075	164 736
Service and Sales Workers (1)	66 690	111 744
Agriculture and Fishery Workers	97 191	40 170
Trades Workers	140 637	8 790
Machine Operators and Assemblers	101 262	30 444
Elementary Occupations(2)	65 373	34 401
Not Adequately Defined	11 820	10 509

Source: 1991 Census, National Summary.

## APPROACHES TO DIFFERENTIAL GENDER PARTICIPATION IN EDUCATION AND EMPLOYMENT

Many researchers speculate possible and probable explanations for these inequities. Three principal theoretical approaches have emerged to explain the under-representation of women in formal education, and professional and executive positions (Fiorentine, 1988). The first is the structural barriers approach which contends that inequities in males' and females' achievement in these positions is a result of sex-discrimination that limits females opportunity. That is, because the female gender may be considered a "discrepant status" women may encounter barriers to their mobility. Available research suggests that regardless of profession, women are not expected to perform as well as men (Frieze, Fisher, Hanusa, McHugh, & Valee, 1978). Thus these prejudicial attitudes can affect the initial hiring and training of women, as well as undermining trust and certainty in their competence (Kanter, 1977).

The second approach is the normative barriers approach. This approach exemplifies the attitude that females fear success, and are anxious in achievement situations because of their anticipation of negative consequences in the form of social rejection or loss of femininity (Horner, 1972). Correspondingly, Linn and Hyde (1989) contend that gender differences in career access are a function of specific cultural and situational contexts.

The third approach, the cognitive differences approach, is of most relevance to this thesis. This approach proposes that gender differences in educational and occupational participation are a consequence of gender differences in achievement-related beliefs. That is, females have lower perceptions of competence and lower performance expectations than males (Eccles, Adler, & Meece, 1984; Parsons, Meece, Adler, & Kaczala, 1982), which results in a lack of confidence in their ability to perform successfully in a variety of achievement situations (Fiorentine, 1988).

Closely allied with this approach is attribution theory, which refers to perceptions and inferences about the causes of one's own behaviour, and that of others.

According to this approach, females lack prerequisite confidence in their abilities. Consequently, successes are attributed to "external" or "unstable causes such as luck, and failures to "internal" or "stable" causes such as lack of ability (Weiner, Frieze, Kukla, Reed, Rest, & Rosenbaum, 1971). This attributional pattern, which discounts success while affirming failures, results in females choosing not to enter into and persist with, or perform well in, a wide range of achievement tasks (Fiorentine, 1988).

The purpose of the present study is to examine the nature of gender differences in achievement within the context of the cognitive approach, drawing significantly on the contribution of attribution theory. Specifically, this research will focus on the type of task (i.e., the perceived sex appropriateness of a task) as a determinant of gender differences in attribution and expectation. In search of an explanation for these differences, an observational study was also conducted.

This thesis begins with a comprehensive account of the attribution theory and Weiner's three dimensional taxonomy for explaining success and failure. The concept of learned-helplessness will also be addressed in this section. The behavioural consequences of students' attributions will be detailed, and it will be illustrated how disparate responses to success and failure are associated with very different constellations of achievement cognitions. How these cognitions mediate student's expectations for future outcomes of behaviour, and subsequent achievement strivings will also be discussed. The next section will examine the available literature on cognitive factors that inhibit achievement in females, focusing in particular on the gender differences in causal attributions, and future expectancies.

The subsequent section will then examine one explanation of why success and failure may have a more negative implication for females than males. Teacher-student interactions, and the role they play in sustaining gender related behaviours will be briefly examined. Predominantly, literature which details how feedback given to a

student by their teacher can acquire different meanings depending on the student's sex, and consequently result in different attributions and expectations, will be explored extensively.

The influence that the perceived sex appropriateness of a task has on attributions and subsequent cognitions will be outlined in the next section; and literature, which suggests that females' self-derogating attributional biases are more prominent in subject areas in which males are believed to be more competent than females, reviewed. This will also include some speculation on how differential patterns of feedback received by students in Maths and English may affect causal reasoning. Finally, the relationship between perceived ability, expectancies for future performance, and attributions will be addressed.