



National Library
of Canada

Bibliothèque nationale
du Canada

Acquisitions and
Bibliographic Services Branch

Direction des acquisitions et
des services bibliographiques

395 Wellington Street
Ottawa, Ontario
K1A 0N4

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file - Votre référence

Our file - Notre référence

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Canada

SCIENTIST OR THERAPIST:
IS ONE'S VIEW OF PSYCHOLOGY A MATTER OF VALUES?

by

Heather J. Walters

B.Sc. (Honours Psychology), University of Toronto, 1990

THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

in the

Department of Psychology

©Heather J. Walters 1995

SIMON FRASER UNIVERSITY

April, 1995

All rights reserved. This work may not be
reproduced in whole or in part, by photocopy
or other means, without permission of the author.



National Library
of Canada

Acquisitions and
Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale
du Canada

Direction des acquisitions et
des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file *Votre référence*

Our file *Notre référence*

THE AUTHOR HAS GRANTED AN IRREVOCABLE NON-EXCLUSIVE LICENCE ALLOWING THE NATIONAL LIBRARY OF CANADA TO REPRODUCE, LOAN, DISTRIBUTE OR SELL COPIES OF HIS/HER THESIS BY ANY MEANS AND IN ANY FORM OR FORMAT, MAKING THIS THESIS AVAILABLE TO INTERESTED PERSONS.

L'AUTEUR A ACCORDE UNE LICENCE IRREVOCABLE ET NON EXCLUSIVE PERMETTANT A LA BIBLIOTHEQUE NATIONALE DU CANADA DE REPRODUIRE, PRETER, DISTRIBUER OU VENDRE DES COPIES DE SA THESE DE QUELQUE MANIERE ET SOUS QUELQUE FORME QUE CE SOIT POUR METTRE DES EXEMPLAIRES DE CETTE THESE A LA DISPOSITION DES PERSONNE INTERESSEES.

THE AUTHOR RETAINS OWNERSHIP OF THE COPYRIGHT IN HIS/HER THESIS. NEITHER THE THESIS NOR SUBSTANTIAL EXTRACTS FROM IT MAY BE PRINTED OR OTHERWISE REPRODUCED WITHOUT HIS/HER PERMISSION.

L'AUTEUR CONSERVE LA PROPRIETE DU DROIT D'AUTEUR QUI PROTEGE SA THESE. NI LA THESE NI DES EXTRAITS SUBSTANTIELS DE CELLE-CI NE DOIVENT ETRE IMPRIMES OU AUTREMENT REPRODUITS SANS SON AUTORISATION.

ISBN 0-612-06849-8

Canada

APPROVAL PAGE

Name: Heather J. Walters
Degree: Master of Arts (Psychology)
Title: Scientist or Therapist:

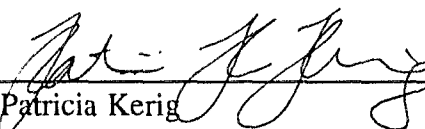
Is One's View of Psychology a Matter of Values?

Examining Committee:

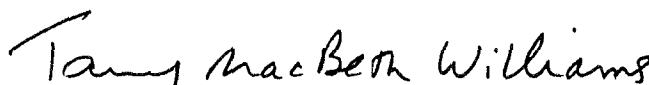
Chair: Dr. Anand Paranjpe



Dr. Meredith Kimball
Senior Supervisor
Associate Professor
Department of Psychology
Simon Fraser University



Dr. Patricia Kerig
Assistant Professor
Department of Psychology
Simon Fraser University



Dr. Tannis MacBeth Williams
External Examiner
Associate Professor
Department of Psychology
University of British Columbia

Date Approved: April 3, 1995

PARTIAL COPYRIGHT LICENSE

I hereby grant to Simon Fraser University the right to lend my thesis, project or extended essay (the title of which is shown below) to users of the Simon Fraser University Library, and to make partial or single copies only for such users or in response to a request from the library of any other university, or other educational institution, on its own behalf or for one of its users. I further agree that permission for multiple copying of this work for scholarly purposes may be granted by me or the Dean of Graduate Studies. It is understood that copying or publication of this work for financial gain shall not be allowed without my written permission.

Title of Thesis/Project/Extended Essay

Scientist or Therapist: Is One's View of Psychology A Matter

of Values?

Author: H. Walters
(signature)

Heather J. Walters
(name)

April 11/95
(date)

ABSTRACT

This study investigated the congruence between participants' own values and the values they perceived to be characteristic of science. It was hypothesized that extent of self/science value congruence would be related to both gender and views about the nature of psychology. One hundred and forty undergraduate and graduate psychology students completed the Science Issues Survey and a scale indicating the extent to which they viewed psychology as a science or as a helping profession. Graduate students indicated their program of enrollment (clinical/experimental) and undergraduates who intended to go to graduate school indicated their intended program of enrollment. Participants also ranked the importance of possible future activities in which they would engage (i.e., research, teaching, or applied work). For all participants, an incongruence between the values of self and science was found. Participants viewed science as justice-oriented while they viewed themselves as care-oriented. Gender, view of psychology, and program were unrelated to self/science value incongruence. Two post-hoc findings were of interest. First, amount of training in psychology (undergraduate/graduate), in combination with gender and with view of psychology, was related to participants' self and science values. Follow-up analyses indicated that both selection and socialization appeared to be related to these effects of amount of psychology training. Second, rankings given to the importance of research as an intended future activity in psychology were related to participants' self/science value incongruence. Although quantitative results indicated that neither gender nor view of psychology were related to the extent of incongruence between self and science values, interviews with twelve of the participants indicated that gender and view of psychology may have been related to participants' epistemological views. Results are related to research on women's attitudes toward science and to the debate about psychology's identity as a science or a helping profession.

TABLE OF CONTENTS

Title Page	i
Approval.....	ii
Abstract.....	iii
Acknowledgements	v
List of Tables.....	vi
List of Figures.....	vii
Introduction.....	1
Method.....	14
Results	20
Discussion.....	47
References.....	59
Appendices	
Appendix A Science Issues Survey.....	66
Appendix B Undergraduate Student Package.....	83
Appendix C Simon Fraser University Graduate Students.....	91
Appendix D University of British Columbia Graduate Students Package.....	99
Appendix E Interviews.....	107
Appendix F Phone Interviews.....	110
Appendix G Table of Means, Standard Deviations and Number of Participants.....	112
Appendix H MANOVA Results of Analysis Using View of Psychology MANOVA Results of Analysis Using Program.....	114

ACKNOWLEDGEMENTS

I would like to thank my senior supervisor, Dr. Meredith Kimball, for her support and feedback and for her gentle nudges at every stage of this research project. For their helpful feedback on previous drafts of this thesis, I would like to thank my second, Dr. Patricia Kerig, my external examiner, Dr. Tannis MacBeth Williams and my friend and colleague, Colleen MacQuarrie. Finally, I would like to thank my husband, Ron, for his feedback, encouragement and his never-ending emotional support.

LIST OF TABLES

	Page
Table 1.	Distribution of Participants by Gender, School, and Education Level... 16
Table 2.	Effects of Order on Self and Science Versions of SIS.....21
Table 3.	Views of SFU and UBC Graduate Students.....23
Table 4.	Views of Undergraduates (With and Without Intention to Go to Graduate School) and Graduate Students31
Table 5.	Correlations Between View of Psychology and Self and Science Values.....34
Table 6.	Values of Self and Science by Program35
Table 7.	Values Self and Science by Gender.....36
Table 8.	Number of Justice-Oriented Decisions by Program and View of Psychology.....38

LIST OF FIGURES

Figure 1.	Self and science values for entire sample.....	25
Figure 2.	Self and science values by gender and level of education	28
Figure 3.	Self and science values by level of education and view of psychology.....	29

Introduction

Despite gains over the previous decade, women are still seriously underrepresented in the sciences both in the workforce and at every educational level. Although in 1991, women made up 55% of the university student population in Canada, only 31% of students enrolled in science programs were women (Statistics Canada, 1994). The percentage of women science students is smaller for more advanced degrees. In 1991, 33% of all undergraduate science students were women, while at the Master's and Doctoral levels, women were represented at a rate of 25% and 17% respectively (Statistics Canada, 1994). Further, within the sciences, women are ghettoized into particular areas. For example, in the life sciences such as biology, 51% of undergraduate students enrolled in 1991 were women. However, in physics, women comprised only 13% of the undergraduate student population (Statistics Canada, 1994). Finally, the representation of women decreases in academic science as rank increases. For example, in 1989, Canadian women received 16% of the doctorates in math and physical sciences, however math and physical science faculties were comprised of only 6% women at that time. Moreover, of the women faculty members, half were at or below the level of lecturer and only 2% had obtained the level of full professor (Industry, Science and Technology Canada, 1991).

That women's participation in science is limited is evident. However, the reasons for this underrepresentation are not as clear. Some have suggested that biological differences between males and females predispose boys to perform better in science than do girls. Arguments based on genetic theories (Bock & Kolakowski,

1973), hormonal theories (Broverman, Klaiber, Kobayashi, & Vogel, 1968) and theories of differences in brain lateralization (Levy, 1972; McGlone, 1981) have attempted to account for the superior performance of males in science. Biological explanations for women's underrepresentation in science can be questioned for a number of reasons. First, gender differences in abilities that are assumed to mediate gender differences in science performance (e.g., mathematics and spatial ability) are actually very small. Estimates of the size of the effect of gender on spatial performance, for example, have ranged from 0.1 standard deviations to about 0.3 standard deviations, accounting for less than 5% of the variance (Linn & Petersen, 1986). Thus, even if differences in spatial ability are caused in part by biological differences between males and females, the differences in ability are so small that they cannot account for women's underrepresentation in the sciences (Fausto-Sterling, 1992). Second, gender differences in these abilities seem to be more influenced by social factors (e.g., experience and encouragement) than by biology (Liben & Golbeck, 1984). Third, there is evidence that gender differences in spatial ability are getting smaller over time as societal attitudes toward women change (Becker & Hedges, 1984).

Explanations addressing the social and psychological issues that limit women's participation in science have more support than the biological arguments. Further, social and psychological arguments prove to be more valuable than the biological arguments because they allow for the possibility of change. According to social and psychological explanations, women's underrepresentation in science is due to pressures

operating at societal, institutional, and individual levels that serve to exclude women from full participation in the sciences. Thus, it is not that women are inherently less capable of being scientists, as adherents to the biological explanations would argue. Rather, through socialization practices of individuals and institutions, women are excluded from the sciences. Research has shown that teachers, guidance counsellors (Bennett & Carter, 1981 cited in Kelly, 1987) and parents (Parsons, Adler & Kaczala, 1982) actively discourage girls from engaging in science-related activities. Further, researchers have found that science teachers pay less attention to girls than to boys and view the work of boys more favourably (Leinhardt, Seewald, & Engel, 1979; Spear, 1987).

Despite this discouragement at the elementary and secondary-school levels, some women enter university wishing to pursue a degree in the sciences. Given that science faculties are predominantly male, there are very few female role models for women science students. Thus, women entering the sciences at university are likely to feel that there is no precedence for their presence in the discipline. Further, young women rightly perceive that combining a science career and family will be very difficult (Kimball, 1989; McIlwee & Robinson, 1992). Although society's attitudes toward parenting are changing, women continue to take on more than half of the family's childcare and housekeeping responsibilities (Belsky, Lang, Rovine, 1985; Belsky, Spanier & Rovine, 1983; Cowan, Cowan, Henning, Coysh, Curtis-Boles & Boles, 1985; Cowan & Cowan, 1988; Haig, 1990). This is clearly a problem for women in all careers, however, it may be perceived as a more insurmountable barrier

for women in the sciences. Science is an extremely competitive field, making temporary withdrawals from the workforce to raise young children very difficult. Further, flexible scheduling and home-based work are virtually impossible in the sciences given that science research is often perceived to be time-pressured and involves the use of special laboratory equipment (McIlwee & Robinson, 1992).

Together with these barriers that operate at the societal and institutional levels, a number of individual barriers reduce women's participation in the sciences. Some have argued that women lack the competitive drive and self-confidence that are required to perform in the sciences (Kelly, 1987). It has been found, for example, that even girls who obtain very high grades in physics underestimate their abilities in this participant and they avoid the course when it is not mandated by their curriculum (Ormerod, 1981). Further, students' attitudes about the usefulness of science have been shown to influence their decisions to continue in the sciences. It has been found that both boys and girls state that interest in a subject and relevance to one's career are important reasons for choosing science. However, boys tend to overestimate the usefulness of science to their careers (e.g., stating that science is important for a career as a lawyer), whereas girls underestimate science's usefulness (e.g., stating that science is not important for a career as a nurse; Kelly, 1987).

Clearly, neither societal nor individual barriers operate in isolation. Societal barriers to women's participation in science serve to undermine women's confidence in their ability to succeed in science and reinforce their beliefs that science is a male domain. These societal barriers then operate at the individual level causing women to

opt out of the sciences, reducing the female presence in science and reinforcing societal attitudes that women cannot succeed in science. The cycle thereby perpetuates itself.

Based on an understanding of these barriers to women's participation in science, a number of programs have been initiated, aimed at addressing different aspects of the problem. Responding to evidence that young women are often unaware of the career opportunities that are available to them in science, many programs have been initiated to increase their knowledge. Organizations such as The Society for Canadian Women in Science and Technology (SCWIST) and the National Science Foundation (NSF) in the United States regularly sponsor career conferences for junior high school, secondary school and undergraduate women to provide information about careers in the sciences and to provide role models of women scientists.

At the undergraduate level, it has been found that the skills women lack most in engineering programs are the hands-on, technical, "tinkering" skills that males develop through childhood hobbies and educational experiences (McIlwee & Robinson, 1992). Based on such findings, a program at Purdue University's Engineering department has been designed to provide this experience through extracurricular hands-on laboratory sessions for women (Stage, Kreinberg, Parsons, & Becker, 1987).

Curriculum modifications have been made which attempt to teach science in ways that are more "female-friendly". These programs aim to teach science emphasizing real-life applications and topics that appeal to girls such as the human body and environmental studies (Smail, 1987). Other curriculum modifications have

attempted to make science more female-friendly by creating a classroom environment that emphasizes co-operation, ethical issues, subjectivity and quality of life (McLaren & Gaskell, in press; Rosser, 1990).

Through such initiatives the number of women scientists has increased and the experiences of girls in science classrooms and of women scientists have improved. These initiatives, however, have not and they alone will not eliminate women's underrepresentation in science. The programs described above take on the problem of women's underrepresentation in science at an individual level, attempting to eliminate individual stereotypes of science as masculine. Curriculum changes attempt to change the packaging of science to make it more appealing to females -- an example of providing a "spoonful of sugar to help the medicine go down" (Bentley & Watts, 1987, p. 90). These intervention programs place the onus for change on women while largely ignoring the science side of the relationship between women and science. In order to heal the rift between women and science we must also address the problems of science.

Our culture has constructed science as symbolically masculine (Keller, 1985; Kimball, in press; Traweek, 1988). The symbolic masculinization of science cannot be attributed solely to the relative absence of women in science. Although women's contributions to most fields often go unrecognized, few disciplines are believed to be as masculine as is science. As Keller (1985) has argued, "To both scientists and their public, scientific thought is male thought, in ways that painting and writing -- also performed largely by men -- have never been." (p. 76).

One specific way in which science can be seen to be symbolically masculine is in its values. The culture of science values rationality, objectivity, and neutrality. Detachment from one's object of study is believed to yield data that are free from bias and are, therefore, believed to be true. Science, constructed in this way, overlaps with our culture's construction of masculinity. Like science, symbolic masculinity is associated with the values of independence, autonomy and rationality (Bakan, 1967; Deese, 1972; Keller, 1992). Alternatively, symbolic femininity is associated with interdependence, connectedness and subjectivity (Friedman, 1993). Thus, these cultural constructions of science serve to define science as masculine while rejecting the feminine as unscientific.

Theories of Moral Reasoning

This symbolic division between rationality, independence and masculinity on the one hand and connection, interdependence and femininity on the other is related to the division that exists in psychology between the two major theories of moral reasoning. These are Kohlberg's (1981) justice-based morality and Gilligan's (1982) theory of a care-based morality.

Kohlberg (1981) believed that, as we develop, we employ an increasingly complex and abstract understanding of the principles of justice and fairness to resolve our moral conflicts. According to Kohlberg's theory, in resolving moral conflicts, the sophisticated moral reasoner is able to distance from immediate punishment and reward contingencies and from the needs, expectations and desires of others. This distance provides the objectivity that is required to resolve conflicts according to one's

moral code.

In contrast to Kohlberg's theory, Gilligan (1982) put forth the care perspective of morality, which, she argued, is a more accurate reflection of women's moral reasoning. In a care-based morality, moral reasoning is characterized by feelings of care, responsibility and responsiveness toward others. In the care orientation, one resolves conflicts "not by invoking a logical hierarchy of abstract principles but through trying to understand the conflict in the context of each person's perspective, needs and goals -- and doing the best possible for everyone that is involved" (Belenky, Clinchy, Goldberger & Tarule, 1986, p.149).

Empirically, gender differences in moral reasoning are neither clear nor consistent. In a meta-analysis of 72 studies which used Kohlberg's measure, Walker (1984) found very few gender differences in moral reasoning. This study has been criticized because, it has been argued, faulty statistics and inappropriate samples were included in the meta-analysis (Baumrind, 1986). This critique notwithstanding, it seems clear that the overall gender differences in moral reasoning that have emerged from empirical research are very small. In some studies, however, clear and consistent gender differences in moral reasoning have been found. When these studies have used Kohlberg's measure, results have indicated more mature moral reasoning for males (Haan, Langer & Kohlberg, 1976). In studies using real-life as opposed to hypothetical dilemmas, both male and female adults have been found to spontaneously reason with both care and justice themes. In two-thirds of participants, however, one orientation dominated -- for men, the dominant orientation was one of justice; for women, care

and justice orientations were used equally (Gilligan & Wiggins, 1988; Lyons, 1983). Wark (1992) found that in personal real-life dilemmas, women seemed to think more in terms of care than did men. In this study, women generated more care-oriented dilemmas than did men and they used care-based reasoning to resolve these dilemmas. Similar findings were obtained by Walker, de Vries, and Trevethan (1987) who found that in real-life dilemmas, women generated more conflicts involving personal relationships, whereas men generated more impersonal relationships conflicts. Within each type of conflict, however, women and men were equally likely to use care-based and justice-based reasoning.

Thus, it can be seen that the empirical findings on gender differences in moral reasoning are unclear. Perhaps the confusion stems, in part, from the fact that different moral reasoning researchers ask different questions. In some studies (e.g., Walker, 1984) the primary research question has been: Are women as capable as men at using justice-based reasoning? In these studies, the scores of women and men on justice-based reasoning tasks are compared and the differences have been small or nonexistent in most studies. Thus, women and men appear equally capable of reasoning in a justice-oriented manner. Other studies (e.g., Gilligan, 1982; Gilligan & Wiggins, 1988) have asked: Are there qualitative differences in women's and men's moral reasoning? The results of these studies show that men and women are equally capable of using justice and care based reasoning. However, because the real-life moral dilemmas that women are concerned with revolve around issues of care, women think more in care terms than do men. Similarly, men's real-life moral dilemmas revolve more around

issues of justice.

Although empirical support for gender differences in moral reasoning is inconsistent, the values of justice and care are symbolically gendered in our culture (Friedman, 1993). Whether or not there are actual gender differences in moral reasoning, we hold different beliefs about women's and men's moral thoughts and behavior. Ford and Lowery (1986) found empirical support for this symbolic genderization of care and justice using a semantic differential task. In their study, participants rated justice as hard and masculine and they rated care as soft and feminine. The care orientation, with its values of connectedness and relationship is clearly in the domain of the symbolic feminine. Alternatively, the values of autonomy and objectivity in the justice orientation are clearly symbolically masculine. Science, like justice, shares the values of objectivity and autonomy. In this way, the values of justice, science, and masculinity overlap extensively, and simultaneously exclude the values of care and femininity.

It has been shown empirically that the extent to which one perceives the values of science to be justice-oriented has an impact on one's pursuit of science. Worthley (1992) examined the values of students who, upon entry to college, had intended to major in the sciences. She measured the extent to which students' views of self and science were care or justice-oriented. She found that those students who did become science majors (persisters) were more likely than the students who did not continue in the sciences (non-persisters) to perceive a congruence between their own values and those of science. Moreover, males and females achieved this congruence differently.

Male persisters perceived self and science to be strongly justice-oriented. Female persisters, on the other hand, achieved congruence by perceiving science to be only slightly justice-oriented and perceiving self as being only slightly care-oriented. Female and male nonpersisters experienced the most incongruence, perceiving self to be strongly care-oriented and science to be strongly justice-oriented.

Psychology is a particularly appropriate discipline in which to investigate this issue further. In its attempt to understand human behavior, psychology is both a science and a helping profession. The experimental aspect of psychology, modelled on the physical sciences, values objectivity and experimental rigour above all else. In the domain of psychology as a helping profession, however, subjectivity, interconnectedness and responsibility to others are emphasized. As a result of this duality, the field of psychology espouses values which are both justice- and care-oriented. How then is psychology symbolized in our culture? Because psychology seeks primarily to understand human beings, it may be symbolized as feminine. Alternatively, it may be that only certain areas within psychology are symbolized as feminine (e.g., "soft" or clinical psychology) while the "hard" areas (e.g., perception and cognition), with their reliance on experimentation, are symbolized as masculine (Danziger, 1990; Hudson, 1972).

In this study, I attempt to find out more about how psychology is viewed by students training to be psychologists -- is it a science or helping profession or both? Further, I examine the extent to which one's view of psychology is related to a congruence between one's own values and the values that one ascribes to science.

Overview and Hypotheses

The Science Issues Survey (Worthley, 1992) was administered to psychology students to determine the extent to which value congruence was related to the students' views of psychology. Generalizing from Worthley's results, it was expected that psychology students who showed a congruence between their own values and those of science would be likely to perceive psychology as a science. Conversely, students with a value incongruence between self and science would most likely view psychology as a helping profession.

The specific hypotheses for this study were as follows:

- 1) It was hypothesized that there would be an interaction between point of view (self/science) and value orientation (care/justice) with science being viewed as justice-oriented and self being viewed as care-oriented (Worthley, 1992).
- 2) It was hypothesized that there would be a three-way interaction among gender (F/M), point of view (self/science) and value-orientation (care/justice). Two-way interactions contributing to this three-way interaction would show that for self, men would have a moderate justice bias and women would have a considerable care bias. For science, both men and women would show a justice bias, but this bias would be stronger for men than for women.
- 3) There would be a 4-way interaction among gender (F/M), program (Clinical/Experimental), point of view (self/science) and value orientation (care/justice). Among clinical students, it was hypothesized that women and men would view self as care-oriented and science as justice-oriented (i.e., their views of self and

science would be incongruent). Among experimental students, both men and women would have self and science views that were congruent, but they would achieve this congruence in different ways. For men, congruence would be reflected by a considerable justice bias for both self and science. For women, self views would be care biased and science views would be justice biased but both biases would be small.

- 4) Hypothesis four is a replication of hypothesis three in which the independent variable Program is replaced by the variable View of Psychology (subjective rating of psychology as a Science or as a Helping Profession). Similar to hypothesis three, it was hypothesized that there would be a four-way interaction between gender (F/M), subjectivity view of psychology (science/helping profession), point of view (self/science) and value orientation (care/justice). Women and men who viewed psychology as a helping profession would show an incongruence between self and science with self being care-oriented. Men who viewed psychology as primarily a science would show a considerable self and science justice bias. Women who viewed psychology as a science would experience a congruence between self and science with both value biases being small.

Method

Participants

Participants were 140 undergraduate and graduate psychology students. The undergraduate students were majors and honours students in psychology at Simon

Fraser University. The graduate students were graduate students in psychology at Simon Fraser University and at the University of British Columbia. Undergraduates were recruited from third and fourth year classes as well as from the second year statistics class. Participation was requested from graduate students with a letter and questionnaire package distributed to their departmental mailboxes. The return rate for SFU graduate students was 24.3% and for UBC graduate students the return rate was 8.6%. The distribution of participants by gender and education level is shown in Table 1. As can be seen in Table 1, although the ratio of males to females in the study was not equal, it was representative of the ratio of males to females enrolled in psychology.

The mean age of undergraduates was 26.4 years and the mean age of the graduate students was 31.5 years. Most (85.7%) of the participants were Caucasian, 10.9% were Asian and 2.9% were East Indian.

Measures

Science Issues Survey. The primary measure used in this study was the Science Issues Survey (SIS; Worthley, 1992). In this measure of science values, participants were presented with six dilemmas based on contemporary science issues: a) the Challenger launch; b) DNA research; c) medical technologies in patient care; d) academic scientists and the Strategic Defense Initiative (SDI); e) secrecy in aids research; and f) allocation of medical resources to the elderly. In this study, two of the dilemmas were modified slightly to reflect the Canadian context. Worthley's original measure and the modified dilemmas are included in Appendix A.

After each scenario, participants were asked to state how they would resolve

the dilemma in a question requiring an answer of "yes" or "no" (in the Science version, explained later, participants were asked how a scientist would resolve the dilemma). These yes/no questions were worded in such a way that for three of the six dilemmas an answer of "yes" indicated a care-oriented resolution and for the other three, an answer of "yes" indicated a justice-oriented resolution to the dilemma. Six considerations were then presented for each scenario and participants rated the extent to which each of these considerations was important in resolving the dilemma. Each

Table 1

Distribution of Participants by Gender, School and Education Level

	n in Study	% in Study	n in Program	% in Program
Undergraduate				
Female	82	79	869	76
Male	22	21	275	24
Graduate				
SFU				
Female	15	56	72	65
Male	12	44	39	35
UBC				
Female	5	56	65	62
Male	4	44	40	38

consideration was rated on a scale from 1 to 7 with 1 being labelled very unimportant and 7 being labelled very important. For each dilemma, three of the considerations reflected a care perspective in moral reasoning and three reflected a justice perspective. Scores on these items indicated the level of a respondent's endorsement of a care or justice perspective.

Each participant filled out two identical versions of the Science Issues Survey. In the "Self" administration, participants were instructed to read each dilemma, make a decision about how they would resolve the dilemma and then rate each of the 6 considerations from their own point of view. In the "Science" administration, participants were instructed to make a decision and rate each of the considerations as they believed a scientist would.

The SIS has been found to be internally consistent (Worthley, 1992). The four combinations that arise from the different levels of point of view (self/science) and value perspective (justice/care) have high Cronbach's alpha scores across the six dilemmas (all above .79). Further, the SIS has been found to distinguish between students who persisted in undergraduate science and those who did not (Worthley, 1992).

Program (Clinical/Experimental). SFU graduate students were asked to indicate whether they were enrolled in a clinical or experimental program (Appendix C). UBC graduate students indicated whether they were enrolled in clinical, social/personality, biopsychology, developmental, neuroscience, psychometrics, forensic or perception/cognition/environmental (Appendix D). For coding purposes, UBC graduate students

who were not enrolled in a clinical program were considered experimental.

Undergraduate students were asked if they intended to pursue psychology beyond the undergraduate level. If so, they indicated which program they planned to pursue (clinical, counselling, experimental or uncertain) (Appendix B). Clinical and counselling programs were coded as clinical. Undergraduate students who did not plan to go to graduate school in psychology were not included in this measure.

Roles in Psychology. Graduate students and undergraduates who planned to go to graduate school rank-ordered the roles that they saw themselves fulfilling in psychology in the future (research, teaching, applied work or uncertain) (Appendices B,C,D).

View of Psychology. All participants indicated their view of the nature of psychology by placing an X at the point which represented their view on a scale anchored by "Psychology is primarily a science" and "Psychology is primarily a helping profession" (Appendices B,C,D).

Procedure

Undergraduates were recruited in psychology classes. They signed sheets that were distributed around the class and the experimenter phoned them to set up an appointment. Undergraduates were tested by the experimenter in small groups (5-10) in a psychology research room. The procedure took approximately 45 minutes.

Participants first filled out a demographics and general information questionnaire (Appendix B). The Science Issues Survey (Appendix A) was then administered.

Among the undergraduates, 42% completed the "Self" version of the SIS first and 58%

completed the "Science" version first. They then completed the View of Psychology scale (Appendix B).

For graduate students, the questionnaire was distributed to their departmental mailboxes (Appendices C and D). Participants completed it on their own and returned it anonymously to the experimenter. Although half of the questionnaires distributed to graduate students had the self version of the SIS first, of the questionnaires returned by graduate students, 17% had the self version first and 83% had the science version first. Like the undergraduate participants, after completing the SIS, graduate participants completed the View of Psychology scale (Appendices C and D).

After completing the questionnaires, participants completed a form indicating their willingness to participate in a longer interview to further examine issues of values in science and psychology (Appendix B, C, D). Semi-structured interviews were conducted with a subset of 12 participants who had completed the questionnaire package. These participants were randomly selected from all participants who had stated that they would be willing to be interviewed (20 female undergraduates, 13 female graduates, 8 male undergraduates and 5 male graduates). Six of the interviewed participants were undergraduates and six were graduate students. Among both the undergraduate and graduate students interviewed, three were female and three were male. Before and during the interviews, the interviewer, who was the author of the study, was unaware of the participants' responses on any of the questionnaires. Interview questions are included in Appendix E.

Because the interviews were semi-structured, the interview questions served

only as starting points for all interviews. Statements made by participants led to other questions, making each interview different. All interviews were taped and transcribed verbatim.

Participants who were willing to be interviewed but who were not chosen for the longer interviews were given a short phone interview (Appendix F). Phone interviews were not transcribed but notes were taken during the interviews.

Results

Internal Consistency of the Science Issues Survey

Cronbach's alphas for each of the four point of view (self/science) and value orientation (care/justice) combinations showed good internal consistency across the six dilemmas. The alphas for self/care, self/justice, science/care, science/justice were .77, .76, .86, .67 respectively. Because these alpha levels are reasonably high (Cronbach, 1990) and because they are similar to those obtained by Worthley (1992), means were collapsed across all six dilemmas for subsequent analyses.

Order Effects

Order effects were tested by comparing self/care, self/justice, science/care and science/justice means of participants who completed the Science version of the questionnaire first to the means of participants who completed the Self version of the questionnaire first. As shown in Table 2, the order in which the questionnaire was completed did not significantly affect the participants' means. For this reason, the means were collapsed across orders for all subsequent analyses.

Table 2

Effects of Order of Self and Science Versions of SIS

	Self Version First (n=44)	Science Version First (n=60)	t (df=101)
Undergraduates			
Self/Care ^a	5.15 (.64)	5.35 (.63)	1.67 ^b , e.s.=.38 ^c
Self/Justice ^a	4.16 (.78)	4.23 (.88)	0.32 ^b , e.s.=.07 ^c
Science/Care ^a	4.18 (.90)	4.58 (.96)	1.96 ^b , e.s.=.42 ^c
Science/Justice ^a	4.94 (.64)	4.78 (.74)	1.02 ^b , e.s.=.22 ^c
	Self Version First (n=6)	Science Version First (n=30)	t (df=33)
Graduates			
Self/Care ^a	4.73 (.82)	4.86 (.86)	0.46 ^b , e.s.=.15 ^c
Self/Justice ^a	3.8 (.71)	4.2 (.74)	1.72 ^b , e.s.=.57 ^c
Science/Care ^a	4.27 (1.15)	4.47 (.81)	0.58 ^b , e.s.=.20 ^c
Science/Justice ^a	4.79 (.59)	4.62 (.62)	0.86 ^b , e.s.=.29 ^c

^aPossible range of 1-7; 1=very unimportant and 7=very important. Standard deviations are given in parentheses.

^bp>.05.

^ce.s.= effect size.

Simon Fraser University and University of British Columbia Students

As shown in Table 3, there were no significant differences between SFU and UBC graduate students in their views of psychology, or in their self and science values. Therefore, in all subsequent analyses, SFU and UBC graduate students were combined.

Hypothesis Tests

Self/care, self/justice, science/care and science/justice means (shown in Appendix G) were analyzed in two separate repeated-measures multivariate analyses of variance (MANOVA). Separate analyses were conducted because two different operational definitions of participants' attitude toward psychology were used in this study. The two operational definitions were 1) Program (clinical/experimental) and 2) View of Psychology (science/helping profession). In the first analysis, gender, program (clinical/experimental), and level of education (undergraduate/ graduate) were between-participant variables and within-participant variables were point of view (self/science) and value orientation (care/justice). In this analysis, all graduate students (20 females and 16 males) and those undergraduates who indicated that they intended to enter a clinical/counselling or experimental graduate program (56 females and 16 males) were included. In the second analysis, the variable Program (clinical/experimental) was replaced by the variable View of Psychology (science/helping profession). In this analysis, the continuous variable View of Psychology, which was normally distributed, was split at the median yielding a dichotomous variable with Psychology as a Science and Psychology as a Helping

Table 3

Views of SFU and UBC Graduate Students

	SFU(n=27)	UBC (n=9)	t (df=34)
View of Psychology ^a	7.14 (n=25) (3.64)	7.52 (3.71)	0.27, e.s.=.11 ^c
Self/Care ^b	4.73 (.92)	4.97 (.33)	0.76, e.s.=.31 ^c
Self/Justice ^b	3.95 (.75)	4.13 (.69)	0.64, e.s.=.24 ^c
Science/Care ^b	4.29 (1.04)	4.59 (.82)	0.80, e.s.=.30 ^c
Science/Justice ^b	4.66 (.57)	4.97 (.68)	1.37, e.s.=.53 ^c

^a Possible range of 0-17; 0=primarily science and 17=primarily helping profession. Standard deviations are given in brackets.

^b Possible range of 1-7; 1=very unimportant and 7=very important. Standard deviations are given in brackets.

^c $p > .10$

Profession as its two values. All participants who completed the View of Psychology scale (81 female and 22 male undergraduates and 19 female and 15 male graduate students) were included in this analysis. The results of both of these MANOVAs are included in Appendix H.

Hypothesis 1. As predicted in Hypothesis 1, a significant interaction between point of view (self/science) and value orientation (care/justice) emerged (see Figure 1). Science was viewed as predominantly justice-oriented and self was viewed as predominantly care-oriented. This hypothesis was supported both when the variable View of Psychology was employed in the analysis ($F_{(1,127)}=106.9$, $p<.0001$) and when the variable Program was used ($F_{(1,99)}=78.2$, $p<.0001$). Further, in both analyses, the effect size of this interaction was large (0.46 when View of Psychology was used and 0.44 when Program was used).

Hypothesis 2. It was hypothesized that the above interaction would differ for women and men, yielding a three-way interaction among gender, point of view and value orientation. However, this hypothesis was not supported either when View of Psychology was used ($F_{(1,127)}=.01$, $p=.99$, effect size $<.001$) or when Program was used ($F_{(1,99)}=0.63$, $p=0.43$, effect size $=.006$). Thus, discrepancies between views of self and science were similar for women and men.

Hypothesis 3. A four-way interaction among gender, program (clinical/experimental), point of view, and value orientation was also hypothesized. This hypothesis was also not supported ($F_{(1,99)}=.07$, $p=.79$, effect size <0.001).

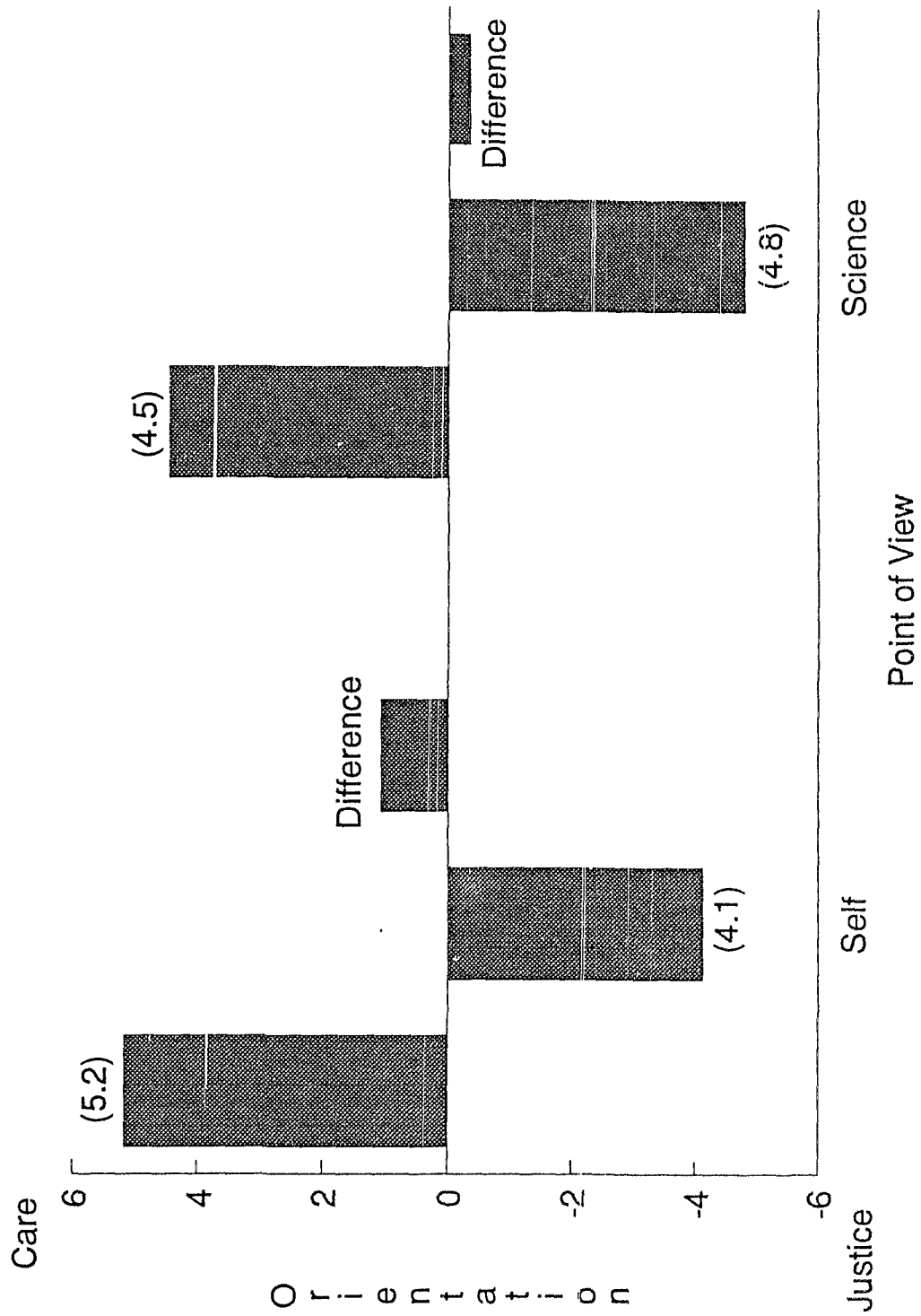


Figure 1. Self and science values for entire sample (analysis using view of psychology rather than program) ($F_{(1,127)}=106.9$ $p<.0001$, effect size=.46).

Hypothesis 4. A four-way interaction among gender, view of psychology (science/helping profession), point of view (self/science) and value orientation (care/justice) was hypothesized (Hypothesis 4). This hypothesis was not supported ($F_{(1,127)}=3.49$, $p=.06$, effect size=.026).

Thus, participants in this study viewed science as more justice-oriented than they viewed themselves. However, as shown by the fact that hypotheses two, three, and four were not supported, this interaction between point of view and value orientation did not differ by gender or by attitude toward psychology (assessed either by participants' program of enrollment or by their scores on the View of Psychology scale). Although not predicted, some interactions involving level of education were significant. As they are of interest, they will be discussed below.

Effects Involving Level of Education

In combination with other variables, a small relationship was found between level of education (undergraduate/graduate) and participants' views of self and science. Two four-way interactions involving level of education emerged, both of which were found in analyses that used View of Psychology rather than Program. The first interaction was among level of education, gender, point of view (self/science) and value orientation (care/justice) ($F_{(1,127)}=5.15$, $p=.02$). The second interaction that emerged was among level of education, view of psychology (science/helping profession), point of view (self/science) and value orientation (care/justice) ($F_{(1,119)}=4.66$, $p=.03$). Both of these interactions must be interpreted with caution because neither was hypothesized a priori and should, therefore, be judged by a more stringent criterion than effects that were previously hypothesized. Further, caution must

be exercised in interpreting these interactions because their effect sizes were very small (0.04 and 0.02 respectively). These cautions notwithstanding, post hoc analyses were conducted to examine each of these four-way interactions.

In conducting post hoc analyses of the four-way interactions, the two-way interactions between point of view and value orientation were seen as indicators of incongruity between self and science values. As shown in Figures 2 and 3, for each four-way interaction there were four combinations that emerged by crossing two between-participants variables, each with two levels (e.g., undergraduate/females, undergraduate/males, graduate/females, graduate/males). Two-way interactions (point of view X value orientation) were compared across the four combinations of between-participants variables that were involved in each four-way interaction. For two-way interactions which were not significantly different from each other, degrees of freedom were combined and compared to the two-way interactions that were significantly different.

The interactions contributing to the four-way interaction among level of education, gender, point of view and value orientation were analyzed first. As shown in Figure 2, there was a stronger interaction between point of view and value orientation for female undergraduates ($F_{(1,79)}=156.97$, $p<.0001$, effect size=.665) than for the other three groups combined ($F_{(1,57)}=51.81$, $p<.0001$, effect size=.476). These interaction effects were significantly different from each other at a level of $p=.002$. Thus, female undergraduates had views of self and science that were more discrepant than the other three groups.

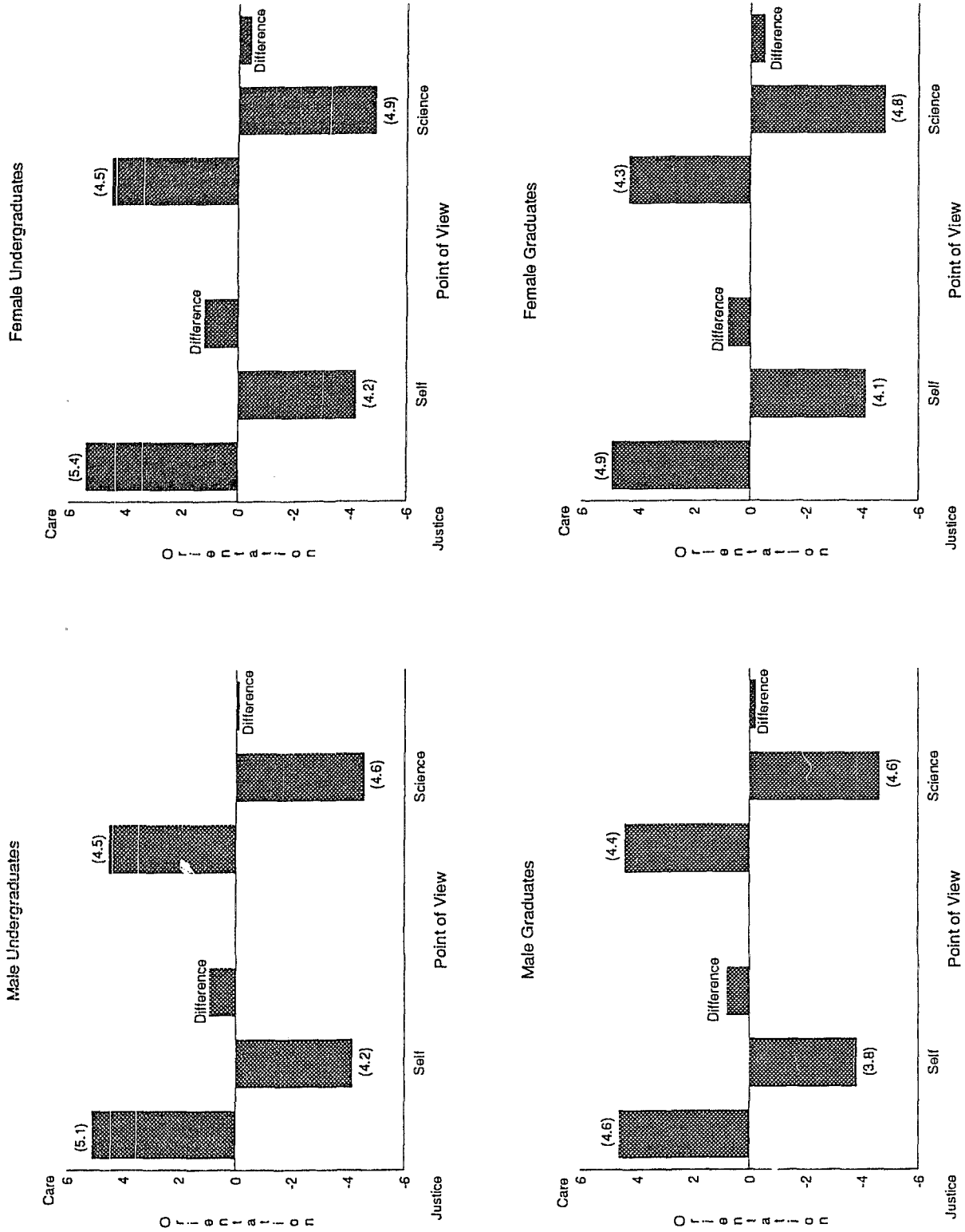


Figure 2. Self and science values by gender and level of education (analysis using view of psychology rather than program) ($F_{(1,127)}=5.15, p=.02, \text{effect size}=.04$).

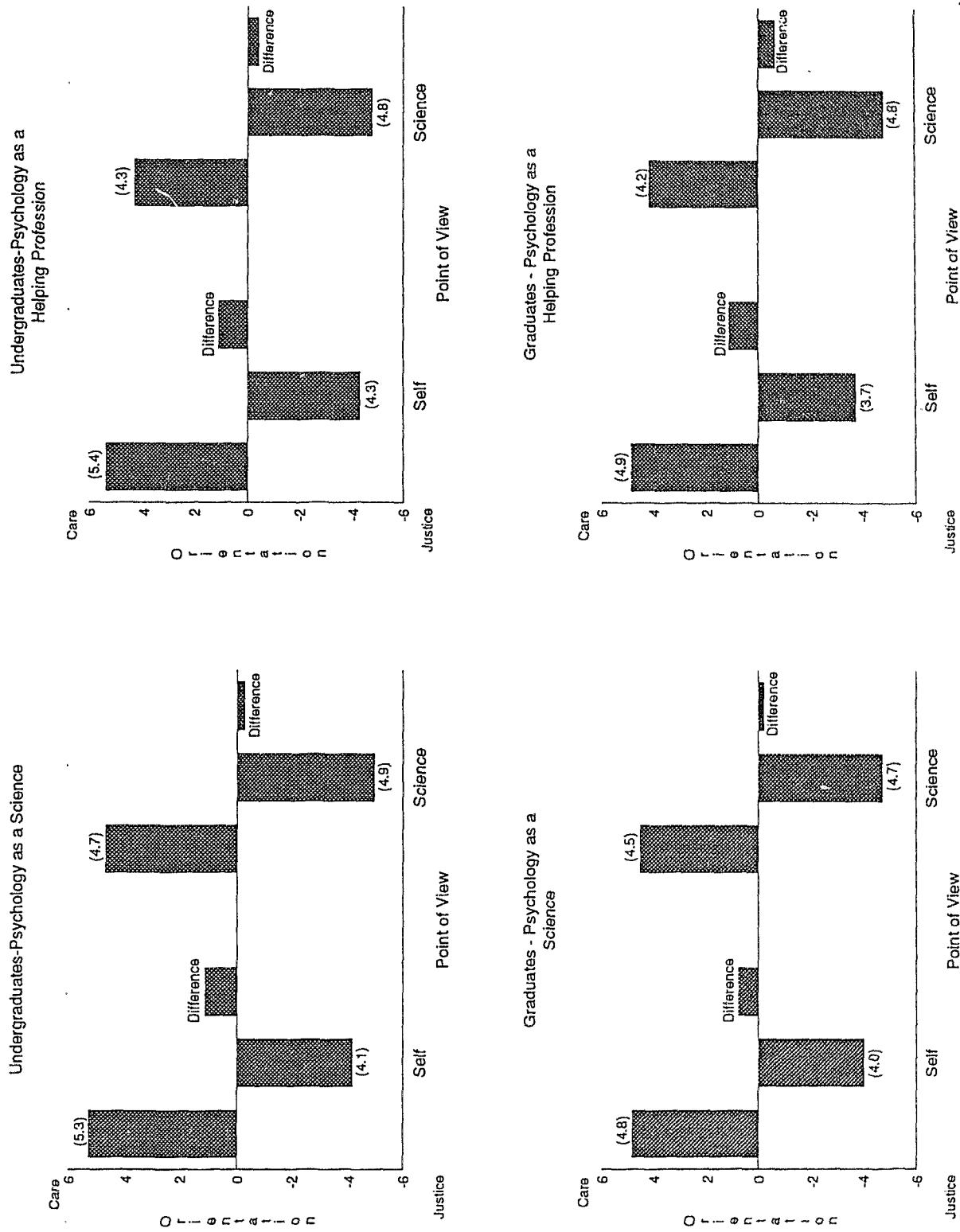


Figure 3. Self and science values by level of education and view of psychology ($F_{(1,119)}=4.66, p=.03, \text{effect size}=.02$).

The interactions contributing to the four-way interaction among level of education, view of psychology, point of view and value orientation also were analyzed. As shown in Figure 3, the four-way interaction was due to the fact that there was a smaller interaction between point of view and value orientation among graduate students who viewed psychology as a science ($F_{(1,25)}=26.56$, $p<.0001$, effect size=.515) than the two way interactions (point of view X value orientation) of the other three groups combined ($F_{(1,109)}=175.64$, $p<.0001$, effect size=.617). This difference was significant at a level of $p<.0001$. Thus, graduate students who viewed psychology as a science had self and science values that were less discrepant than did the other three groups combined.

Thus, it seems that amount of training in psychology, in combination with gender and with one's view of the nature of psychology, may be related to one's self and science values. Because this study was cross-sectional, however, it was impossible to determine the extent to which selection or socialization influenced the effects of amount of psychology training. In order to at least partially separate selection from socialization factors, post hoc analyses of participants' views of psychology, self and science were conducted. In these analyses, graduate students were compared to undergraduates who indicated that they intended to go to graduate school in psychology and to undergraduates with no such intention. From the results presented in Table 4, it would appear that both socialization and selection factors were related to students' views of self, science and psychology. Evidence of the role of socialization factors comes from the finding that graduate students viewed psychology

Table 4

Views of Undergraduates (With and Without Intention to Go to Graduate School) and Graduate Students

	Undergraduates		Graduates
	No Intention to Go to Graduate School (n=30)	Intention to Go to Graduate School (n=74)	(n=36)
View of Psychology ¹	10.1 ^a (2.7)	9.0 ^a (3.65)	7.2 ^b (3.59)
Self/Care ²	5.2 ^a (.57)	5.3 ^a (.67)	4.8 ^b (.82)
Self/Justice ²	4.2 (.83)	4.2 (.88)	3.9 (.72)
Science/Care ²	4.3 (.82)	4.5 (1.02)	4.3 (.99)
Science/Justice ²	4.6 ^a (.68)	4.9 ^b (.71)	4.7 (.61)

Note. Different letter superscripts denote significant differences (see text for level of significance). Standard deviations are given in parentheses.

¹ Possible range of 0-17; 0=primarily science and 17=primarily helping profession.

² Possible range of 1-7; 1=very unimportant and 7=very important.

as significantly more science-oriented ($M=7.2$) than did undergraduates, whether the undergraduates intended to go to graduate school ($M=9.0$; $t_{(1,106)}=2.38$, $p=.019$, effect size $=.49$) or not ($M=10.1$; $t_{(1,61)}=3.48$, $p=.001$, effect size $=.89$). Thus, with more exposure to psychology, students appear to view the field as more science-oriented. Similar results were obtained for self/care scores. Graduate students viewed self to be less care-oriented ($M=4.8$) than did both undergraduates who intended to go to graduate school ($M=5.3$; $t_{(1,58)}=3.55$, $p<.0001$, effect size $=.77$) and those who did not intend to go to graduate school ($M=5.2$; $t_{(1,62)}=2.56$, $p=.01$, effect size $=.62$). Evidence of the role of selection factors comes from the finding that undergraduates who said that they intended to go to graduate school ($M=4.9$) differed from undergraduates with no such intention ($M=4.6$) in their views of science as justice-oriented ($t_{(1,101)}=2.28$, $p=.02$, effect size $=.50$). Thus, it may be that psychology students with more justice-oriented views of science are the ones who choose to go to graduate school. Although not significant, it is puzzling that graduate students viewed science as less justice-oriented ($M=4.7$) than did undergraduates who intended to go to graduate school ($M=4.9$) (effect size $=.28$). It may be that once in graduate school, with increased exposure to research, graduate students recognize that science is not as clearly objective as is normally implied in undergraduate research methods classes.

Further post hoc analyses

A number of post hoc analyses were conducted in order to determine whether there were any other relationships among views of self and science, gender, and attitude toward psychology. To correct for multiple comparisons, alpha was set at .01.

Correlations were conducted to determine the extent to which one's view of psychology (as a continuous variable) was related to self and science values. As can be seen in Table 5, correlations between view of psychology and self and science values were very small and none was significant. Further, as can be seen in Table 6, program was unrelated to self and science values.

To determine the extent to which gender was related to self and science views, t-tests were conducted. The means reported in Table 7 show that gender was related to perceptions of self as care-oriented. As we would expect, females perceived themselves to be more care-oriented than did males. Gender was, however, unrelated to perceptions of self as justice-oriented and was unrelated to perceptions of science as either care or justice-oriented.

As a different indication of self and science values, the resolutions to the dilemmas were analyzed. For each participant, yes/no decisions at the beginning of each dilemma were analyzed by counting the number of justice-oriented decisions that were made. Thus, participants' scores ranged from 0 to 6 depending on the number of dilemmas for which justice-oriented decisions were made. This was done separately for self and science. T-tests were conducted to determine the extent to which one's attitude toward psychology -- assessed by program (clinical/experimental) and view of psychology (science/helping profession) -- was related to the number of justice-oriented decisions that were made. To correct for multiple comparisons, alpha was set at .01.

Table 5

Correlations between View of Psychology and Self and Science Values

	Correlation with View of Psychology
Self/Care	.15
Self/Justice	.09
Science/Care	-.13
Science/Justice	-.07

Table 6

Values of Self and Science by Program

	Clinical (n=72) ^a	Experimental (n=36) ^a	t (df=106)
Self/Care ^b	5.26	4.96	1.97 ^c , e.s.=.39
Self/Justice ^b	4.12	4.13	0.05 ^c , e.s.=.01
Science/Care ^b	4.43	4.44	0.04 ^c , e.s.=.01
Science/Justice ^b	4.87	4.81	0.38 ^c , e.s.=.07

^aIncludes graduate students and undergraduates intending to go to graduate school in psychology

^bPossible range of 1-7; 1=very unimportant and 7=very important.

^cp>.05.

Table 7

Values of Self and Science by Gender

	Males (n=38)	Females (n=101)	t (df=137)
Self/Care ^a	4.88	5.29	3.08 ^b , e.s.=.59
Self/Justice ^a	4.19	4.02	1.11 ^c , e.s.=.21
Science/Care ^a	4.46	4.44	0.14 ^c , e.s.=.02
Science/Justice ^a	4.60	4.88	2.14 ^c , e.s.=.39

^aPossible range of 1-7; 1=very unimportant and 7=very important.

^bp < .01. ^cp > .01.

It can be seen in Table 8 that neither program nor view of psychology was related to the number of justice-oriented decisions that were made.

As a different indication of attitude toward psychology, participants' rankings of the roles in psychology that they wished to perform in the future were analyzed in relation to their self and science values. Only those participants who were in graduate school or who intended to go to graduate school were included in these analyses.

Several MANOVAs were conducted with the rankings of the importance of research, teaching, and applied work as independent variables and self and science values as dependent variables. In these analyses, the use of MANOVA with ranked data was acceptable because the rankings were kept separate from each other (i.e., the rankings given to the importance of research were analyzed separately from the rankings given to the importance of teaching which were analyzed separately from the rankings of applied work). Thus, three separate MANOVAs were conducted, each with only one independent variable: either the rankings given to the importance of research, the importance of teaching, or the importance of applied work. To control for multiple comparisons, alpha was set at .01. In these analyses, there was no relationship between self and science values and the importance that participants placed on teaching ($F_{(2,80)}=1.43$, $p=.25$, effect size=.03) or the importance placed on applied work ($F_{(2,92)}=.42$, $p=.66$, effect size=.01). There was, however, a three-way interaction among the ranking of the importance of research, point of view, and value orientation ($F_{(2,75)}=7.33$, $p=.001$, effect size=.16). Post hoc analyses showed that this three-way interaction was due to differences in two way interactions (point of

Table 8

Number of Justice-Oriented Decisions By Program and View of Psychology

Point of View	Program		t (df=107)
	Experimental (n=37) ^a	Clinical (n=72) ^a	
Self	2.73	2.37	1.61 ^c , e.s.=.34
Science	3.32	3.75	1.87 ^c , e.s.=.38

Point of View	View of Psychology		t (df=135)
	Science (n=69) ^b	Helping Profession (n=68) ^b	
Self	2.56	2.31	1.36 ^c , e.s.=.23
Science	3.54	3.85	1.62 ^c , e.s.=.27

^aIncludes only graduate students and undergraduates who intend to go to graduate school in psychology

^bIncludes all participants who completed the View of Psychology scale

^c $p > .1$.

view X value orientation) between participants who ranked research as the least important role ($F_{(1,26)}=74.56$, $p<.0001$, effect size=.74) that they would fill in the future and those who ranked research first or second ($F_{(1,50)}=57.77$, $p<.0001$, effect size=.54). These interactions were found to be significantly different from each other ($p=.001$). Thus, participants who were most certain that they did not want to be researchers in the future had self and science values that were most discrepant.

The above analyses in general show that, except for the moderate relationship between gender and self/care scores, there was no relationship between gender and self and science values. Further, except for the analyses which used rankings of roles to be performed in psychology in the future as an indication of participants' attitudes toward psychology, there was no relationship between self and science values and attitude toward psychology.

Interviews

Interviews were transcribed and analyzed by the author of this study. In analyzing the interviews, I read through each interview twice. In the first reading, I looked for any statements indicating care or justice themes. In the second reading, I looked for themes other than care and justice. In the second reading, I noticed differences in theories of knowledge which were revealed through participants' views about the nature of science and their beliefs about whether psychology was a science. The theory of knowledge that emerged most clearly at first was one of realism, according to which, knowledge exists independent of the knower and truth can be accessed objectively through the scientific method. Realistic views of knowledge emerged most clearly among males who viewed psychology as a science. I looked for

similarities and differences in theories of knowledge among females and among males who viewed psychology as a helping profession. Realist theories of knowledge did not emerge among males who viewed psychology as a helping profession. Rather these men espoused more relativist and constructivist theories of knowledge. Thus, they believed that knowledge is always influenced by the knower. Those who espoused relativist theories believed that objective knowledge and truth may exist, but our understanding and expression of knowledge is inevitably influenced by our values, language and culture. Those who espoused constructivist theories of knowledge believed that independent, objective knowledge does not exist. Rather, all knowledge is constructed by the knower. In contrast to men, women's theories of knowledge did not appear to differ according to their views of psychology. Most of the women interviewed, whether they viewed psychology as a science or as a helping profession (on the quantitative measure), revealed theories of knowledge that were relativist and constructivist.

The following illustrative quotations demonstrate the above interaction between gender and view of psychology. The males who viewed psychology as a science revealed their realist theories of knowledge through their beliefs that science uncovered objective truth and that knowledge was finite. Related to their realist theories of knowledge, most males who viewed psychology as a science believed that the purpose of psychological research was to investigate fundamentals and universals of human behavior. Believing that there were universals, these participants believed that there was only one truth and, therefore, only one real path to discovering this truth. Thus,

they viewed their area of research as being very important and more fundamental than other areas of psychological research. Two of the four male participants interviewed who viewed psychology as a science commented that their research area was looking for the "kernel" or the building blocks of human behavior.

What I'm looking at is basic mechanisms that determine probably 90%.... over 95% of all human behavior is determined by memory and I'm trying to determine how stuff is transduced, processed, stored, encoded, retrieved and used. I see it as getting at the kernel...of course everybody does but I see mine as getting at the kernel (M,G,E,S¹).

Another male expressed a similar belief:

So we actually define a whole system and as we stand at the present right now, there's only a few, maybe 5 or 10 more good questions to be asked [about this system]...We've got this map and we can draw this map on the board. And once you've drawn out what you've got, there's only a few questions left (M,G,E,S).

Another male who viewed psychology as a science, however, revealed a more relativistic theory of knowledge in the following statement:

I used to think science would find truth. I no longer think science will find truth. It will find good stories that will permit us to explain more data that help us to organize and deal with our world. We're spinning our stories and other people are spinning their stories and whichever story ultimately gets hold of the most data or ultimately gives us the most traction...that's what science does for us (M,G,E,S).

The theme of looking for basic mechanisms did not emerge among the two males who viewed psychology as a helping profession. Instead, both of the men who

¹ M=Male, F=Female; G=graduate, U/I/C=undergraduate intending to go to graduate school in clinical psychology, U/I/E=undergraduate intending to go to graduate school in experimental psychology, U/N=undergraduate with no intention to go to graduate school; C=Clinical (graduate students only), E=Experimental (graduate students only); S=Viewed psychology as a science, H=Viewed psychology as a helping profession.

viewed psychology in less scientific terms, stated that they did not feel that any area of psychology was any more important than any other area. This theme can be seen quite clearly in the following quotations:

I think it all can be interesting, it just depends on how you do it. There's not really any area that I find repugnant or uninteresting. Any area of psychology can be interesting if it's done in an interesting way so I can't really pinpoint any area [that I am least interested in] (M,U/I/E,H).

...so, I didn't want to say there's some area of psychology that I'm least interested in because I'm interested in all areas, but because of limited time I can't explore all areas (M,G,E,H)

It seems, then that these men had somewhat different views depending on whether they viewed psychology as a science or as a helping profession. Among the females, however, this difference did not emerge as strongly. Females who viewed psychology as a science, two of whom were interviewed, believed that there were fundamentals in psychology but they were unsure about how basic these fundamentals were. For them, all areas of psychology (because there were no "fundamentals") were interesting and relevant. They did not hold such strong beliefs that knowledge exists independent of the knower. Accordingly, they believed that there could be many possible truths and, therefore, many possible paths to discovering these truths.

...It's more like chaotic systems. So you can start out with 3 or 4 building blocks and maybe figure out what those are through science, but what happens and what evolves out of that in any given person and at any given time... I don't think that, you know, the prediction part of science. I don't think that we can do that, necessarily all of the time (F,G,C,S).

When I get into anything, it always seems interesting. I was about to say something like Cognitive Psychology and Perception [as an area that I am least interested in] but even when I found myself having to learn it to teach to other students or fellow students, then all of a sudden it's interesting and it's neat and it's cool (F,G,C,S).

Among the four females interviewed who viewed psychology as a helping profession, three stated that the area of psychology that interested them least was statistics and quantitative research methods. Thus, it was not an *area* of psychology that they found uninteresting. Rather, it was an approach to the study of psychology that they did not enjoy.

Based on my experience with research methods (laughs) and my [terrible] mark in that, [the area that I'm least interested in] would have to be statistics. I was never really able to understand the purpose of statistics so I have an aversion to it. (F,U/N,H)

I enjoyed 201 (introductory research methods) but 301 [intermediate research methods] was a bit of hell so I must say the mathematical aspects [interest me least]...not that I'm bad at it but sometimes I find it hard knowing how they can really be applied...it becomes a bit theoretical...the amount of statistics we use and whether or not that's sort of limiting our spheres too much (F,U/I/C,H).

Thus, for these women, as with the women who viewed psychology as a science, all areas of psychology were interesting and relevant.

When participants were asked to discuss the ways in which psychology was a science, a slightly different interaction between gender and view of psychology emerged. The males who viewed psychology as a science (on the quantitative measure of view of psychology) believed that psychology was not scientific enough and the women who viewed psychology as a helping profession judged psychology as being too scientific. Among the women who viewed psychology as a science and the men who viewed psychology as a helping profession, there was more acceptance of psychology as a science.

Two of the four males who viewed psychology as a science believed that the kind of science conducted in psychology was inferior to that conducted in the natural

sciences. This view can be seen clearly in the following quotation:

But either something is science or it isn't science...Do you follow scientific principles or not? Do you control enough variables in order to say something definitive about what you've found. And invariably, psychologists don't as far as I'm concerned. Psychologists don't control enough variables. And that's why I like that saying...It [psychology] is not a science but it's the best we've got (M,G,E,S).

Although these men stated on the questionnaire that they viewed psychology as a science, during the interview they stated that they rejected the view of themselves as psychologists.

When I talk to anybody, if they ask me what I am, I don't say I'm a psychology person, or a psychologist. I say I'm a scientist (M,G,E,S).

...we don't have the Canadian Biological Psychologists Association -- we have Brain and Behavior Cognitive Scientists. So as far as I'm concerned, we should just have our own department and I'd like to see us make up our own organization called something other than psychology. We could call ourselves the Canadian Biologists for Understanding Humans or something (M,G,E,S).

Thus, it seems that some of the males who viewed psychology as a science, did not feel that psychology was doing a very good job at being scientific. Among the women who viewed psychology as a helping profession, three felt that psychology was trying to be too scientific.

...I guess it's the whole idea of empiricism and I think it's gotten a little bit out of hand that psychology has become so hell-bent to prove itself as being a science that it's forgotten some of the more humanistic aspects (F,U/I/C,H).

Others stated similar views:

I'm not at all sure that the kind of rigorous methods that are required in, for instance, cognition, in terms of measuring eye responses or things like that...things that are really quantifiable is going to be...is going to help us get anywhere (F,U/I/C,H).

I really don't know if there's such a thing as objectivity and I think aspects of psychology have certainly tried to make themselves out to be scientific and objective but I'm not really sure that's possible...I don't necessarily think it's a bad thing that we're not entirely objective but I certainly think that it's a bit of a farce to pretend we're scientific (F,U/I/C,H).

Of the three undergraduate women who viewed psychology as a helping profession, two were switching to counselling programs for their graduate work because they believed that psychology was too scientific to aid in their understanding of human beings.

The males who viewed psychology as a helping profession and the females who viewed psychology as a science were more accepting of psychology as a science. They believed that although psychological research is imprecise, it is no less precise than other sciences. Further, they believed that there was a place for the scientific aspects of psychological research even though some believed that psychology is primarily a helping profession. This acceptance of psychology as a science can be seen in the following quotations:

It's just too simple to say "Well physics and chemistry are concrete and psychology is wishy-washy," because it's all very wishy-washy and we don't really have the answers. If we did, then it wouldn't really be science, because that's what science is about -- finding out the answers. So, I think it [psychology] is really not very different from the other ones [sciences]...one thing that discouraged me...was finding out that it [psychology research] is pretty bloody political and that going through this process of answering certain questions involves more than just your

own curiosity...I think I'm becoming more realistic about it and realising its limitations. But, for some reason, I'm okay with it (F,G,C,S).

It [psychology] is a systematic investigation of our world and in that way it's a science (M,G,E,H).

I think it [psychology] is a science because it promotes itself as a science. It justifies itself by being scientific...it also uses scientific methods...So as you get into 4th year you acquire a bit more of that understanding that it's not quite as cut and dry and orderly as it appears to be...It's an amorphous field with all kinds of pressures. So I guess the picture gets more complicated as you go on. Your scientific idealism or whatever that you get in 201 or your methods class gets tempered a little bit....I'm starting to sound bitter (M,U/I/E,H)

Based on the themes that emerged in the interviews, then, there appeared to be an interaction between gender and view of psychology regarding participants' theories of knowledge and reality. Men who viewed psychology as a science held realistic theories of knowledge. Conversely, men who viewed psychology as a helping profession and women, regardless of their views of psychology, viewed knowledge in more relativist and constructivist terms. A slightly different interaction emerged when participants discussed their views about the extent to which psychology was a science. Men who viewed psychology as a helping profession (on the quantitative measure) and women who viewed psychology as a science (on the quantitative measure) believed that, as a science, psychology was doing an adequate job. Conversely, women who viewed psychology as a helping profession and men who viewed psychology as a science did not view the scientific aspects of psychology favourably. The men who viewed psychology as a science (on the quantitative measure) felt that psychology was, in fact, not scientific enough. Women who viewed psychology as a helping profession felt that psychology overemphasized science in its attempt to understand humans.

Discussion

As predicted, an incongruence between participants' views of self and science was found in this study. Consistent with Worthley's (1992) findings, the participants in this study attributed justice-oriented concerns to scientists and care-oriented concerns to themselves. The justice orientation, like masculinity, values objectivity and neutrality. Thus, the finding that science is viewed as primarily justice-oriented is consistent with the view that science is symbolically masculine.

Overall, participants experienced an incongruence between their own values and those of science. Based on Worthley's (1992) findings, it was also predicted that self-science value incongruencies would differ for men and women. It was believed that men, identifying with the symbolically masculine values of justice, would experience less incongruence than women between their own values and those of science. Contrary to this prediction, however, an interaction between gender, views of self and views of science was not found. Men experienced as much incongruence between their own values and those of science as did women.

Based on Worthley's (1992) findings, it was predicted that the extent of incongruence between participants' views of self and science would differ depending on participants' programs within psychology (clinical or experimental) and on their subjective view of psychology (science or helping profession). Neither of these predictions was supported. A number of other analyses also pointed to the fact that participants' programs and their subjective view of psychology were unrelated to their views of self and science. Direct correlations between view of psychology and self and

science value scores were small and nonsignificant. Moreover, mean self and science value scores for participants in clinical and experimental programs were not significantly different. Further, experimental students were no more likely than clinical students to resolve the dilemmas in justice-oriented ways. Similarly, students who viewed psychology as a science were no more likely than those who viewed psychology as a helping profession to resolve the dilemmas in justice-oriented ways. One variable related to self and science value scores, which can be seen to be a reflection of participants' views of psychology, was the ranking given to the importance of research. Participants who ranked research as the least important role that they would perform in the future had views of self and science that were more discrepant than participants who ranked research first or second. Conversely, the importance of applied work and teaching were unrelated to participants' views of self and science.

Because self and science values were found to be incongruent, replicating Worthley's (1992) findings, and because the Science Issues Survey (SIS) was internally consistent in this study, it appears that the SIS was a valid measure of self and science values for psychology students. Thus, the finding that neither gender nor attitude toward psychology was related to self and science values among psychology students suggests that differences may exist between the natural sciences and psychology. It may be that the differences between the results of this study and those of Worthley are due to a difference in the way that the natural sciences and psychology are symbolized. The natural sciences, which place a high value on objectivity and neutrality, are

justice-oriented and symbolically masculine. In contrast to the natural sciences, psychology has elements that are symbolically masculine and symbolically feminine. Areas of psychology such as biological psychology, perception and cognition rely very strongly on experimental methodology and experimental control and are, in that sense, similar to the natural sciences. The applied areas of psychology, however, such as psychotherapy, value connection rather than distance. These areas of psychology, with their care-oriented values, can be seen to be symbolically feminine. Thus, psychology is comprised of elements that are both symbolically masculine and symbolically feminine.

Why, if psychology is comprised of symbolically masculine and symbolically feminine elements, was there no relationship found in this study between attitude toward psychology and self and science values? In part, it seems that attitude toward psychology was not related to self and science values because there was flexibility in participants' views about the nature of psychology. This perceived flexibility can be seen, for instance, in the fact that although there was a significant difference between experimental and clinical students' views of psychology ($t_{(1,62)}=2.85, p=.006$), there was considerable overlap between experimental and clinical students on their View of Psychology scale scores. The responses were normally, rather than bimodally distributed, indicating that many participants did not have strong feelings about the extent to which psychology was primarily a science or primarily a helping profession. Thus, it appears that many of the participants in this study considered both the symbolically masculine and the symbolically feminine components of psychology as

important to varying degrees.

Because of its symbolic gender flexibility, psychology may select for men and women who are more similar to each other than do the symbolically masculine natural sciences. This similarity may be an explanation for the finding that gender was unrelated to self/science value incongruencies.

Because of the symbolic gender flexibility of psychology, there may be more room in psychology than in the natural sciences for students to create compatibility between their own values and the values of their discipline. If, for example, a psychology student found that his or her own values were incompatible with those of science, s/he would not be forced to leave psychology. Instead, s/he could focus his/her attention on a less scientific area of psychology. Further, s/he could stay in the same area of psychology but interpret the area in a less scientific way.

This flexible gender symbolization of psychology is suggested by the very fact that it was possible to ask participants whether they viewed psychology as a science or as a helping profession. It would, for instance, be meaningless to ask physics students whether their discipline was anything but a science. Thus, the fact that it was meaningful to ask participants about their views of psychology attests to the flexible symbolization of psychology. Further, as discussed above, there was a range of responses on the View of Psychology scale. The flexible symbolization of psychology was also suggested by students' views of self and science. For all participants, self and science were viewed differently from each other, however, there was a range of self/science value discrepancies. Some participants had self and science values that

were only slightly discrepant whereas others viewed self and science to be quite incongruent. Because of the flexible gender symbolization of psychology, it seems that there is room for students with these different values.

As further evidence of the symbolic flexibility of psychology, comments were made during interviews indicating that students were aware that psychology was comprised of many different components:

...And I think it [has] become certainly more scientific and precise and thorough as time has gone on... but certainly there's a lot of areas, especially those that are sort of more clinical-oriented such as abnormal psych and therapy based studies...you can't really experiment on people with schizophrenia...(M,U/I/E,H).

...you have the clinical track and the experimental track and the experimental track has been traditionally looking at normal people, normative things about behavior and that kind of stuff. And then there's clinical which has been concerned about abnormal behavior and to me those two things should not be in separate pots. So I would like to see a bridge and that's why I have an interest in the regular psychology that goes on (F,G,C,S).

A clinical graduate student made a comment indicating that she had changed her focus in psychology while she was an undergraduate student:

I was starting to get really frustrated with what they were doing that they were looking at 2 or 3 cells in the locus cirillus or something like that or dopamine systems or they were looking at 3 little cells here to look at whisker responses...And it was like, "Well, how does this relate to human beings?" (F,G,C,S).

This awareness of the various aspects of psychology and the fact that participants indicated having changed between these various areas shows support for the notion that psychology is flexible in its symbolization. This flexibility of psychology, however, is limited given the fact some women undergraduates were going

into counselling because they believed that psychology was too scientific. Further, one male graduate student stated that he believed that as a physiological psychologist, he would be better suited to work in a kinesiology, anatomy or medicine department in the future.

The difference between the findings of this study and those of Worthley (1992) may also be due, in part, to shortcomings with the method of this study. For example, there may have been a problem with the way in which students' attitude toward psychology was tapped. Comments that were made during interviews and that were written on questionnaires suggested that the question designed to obtain students' views of psychology could have been asked in a better way. One graduate experimental student, who indicated that his view of psychology was close to the middle of the scale commented in the interview that he believed that "...psychology isn't a science but it's the best we've got." In contrast, an undergraduate student who completed the scale in a similar manner commented on the questionnaire that she believed that "...psychology is both a science and a helping profession." It is clear that these two views of the nature of psychology are different from one another, however, this difference in views was not reflected by these participants' answers to the View of Psychology scale. Such a problem could have been addressed by constructing two different scales rather than a bipolar unidimensional scale. Thus, participants would have been asked to indicate the extent to which they viewed psychology as a science and the extent to which they viewed psychology as a helping profession.

Further, distinctions based on program of enrollment or view of psychology as

a science or helping profession, may have blurred differences among participants. For instance, rankings of the importance of research were related to views of self and science whereas program and View of Psychology were not. Thus, the rankings of future roles in psychology may have been a better way of tapping attitude toward psychology.

Another potential limitation of this study is one of power. For the hypothesized four-way interactions, assuming the effect being uncovered was small (.10), the power of the tests was only .39 (Cohen, 1988). Thus, there was only a 39% chance of finding such effects if they existed. With more participants, then, it is possible that more hypotheses would have been confirmed. However, two of the three hypothesized effects that were not supported were extremely small. For this reason, it seems unlikely that more power would have changed the outcome of these tests.

One factor which, in combination with gender and with view of psychology, did relate to participants' views of self and science was level of education. It was found that undergraduate females had larger discrepancies between their own values and those that they attributed to science than did either male undergraduates or male and female graduate students. Further, it was found that graduate students who viewed psychology as a science had smaller discrepancies than did undergraduate students (regardless of their view of psychology) or graduate students who viewed psychology as a helping profession. Thus, it seems that with more training in psychology, especially if one views psychology as a science, one's own values become more aligned with the values one attributes to science. Analyses which compared graduate

students to undergraduates who intended to go to graduate school in psychology and those who did not indicated that socialization and selection factors both can account for the effect of amount of training in psychology. Graduate students viewed psychology as more science-oriented and viewed self as less care-oriented than did both groups of undergraduates. These data indicate that with the further socialization in psychology that graduate school provides, students come to view psychology as more science-oriented. Corresponding to this more science-oriented view of psychology, graduate students view themselves as less care-oriented. Selection factors are also indicated given that undergraduates, with intentions to further their training in psychology, differ from those with no such intention. Undergraduates in this study who intended to go to graduate school in psychology viewed science as more justice-oriented than did other undergraduates. Although these data shed some light on the effects of level of psychological training, to more fully distinguish between socialization or selection influences on views of self, science and psychology, a longitudinal study would be required.

As discussed above, data from questionnaires indicated that male and female participants with differing views of psychology did not consistently differ in the values that they ascribed to self and science. However, interview data suggested that gender and view of psychology may have interacted with one another to influence participants' constructions of science and psychology. Males who viewed psychology as a science described science, psychology, and the research process in rather realistic terms. They felt that the area in which they did research or wanted to do research comprised the

"kernel" of human behavior. Areas of psychology in which these participants were less interested were described in terms that ranged from neutral ("interesting but not immediately relevant" -- M;U/I/E;S) to rather negative ("pointless", "dangerous" -- M;G;E;S). Among females who viewed psychology as a science and as a helping profession and males who viewed psychology as a helping profession, these themes did not emerge. These participants viewed science and psychology in more constructivist terms. Although one woman who viewed psychology as a science discussed "building blocks" of behavior, she left room for the possibility that there could be many such building blocks, all of which were useful and important. Some females who viewed psychology as a helping profession believed that psychology relied too much on realistic epistemological views. In search of a more constructivist framework for understanding humans, they had decided to change to counselling programs for their graduate training.

Thus, it may be that views about knowledge and truth (together with views about the nature of psychology) distinguished between males and females better than did the care and justice-oriented values that were tapped in the questionnaire section of this study. Realistic views of knowledge focus on the existence of an external reality which is predetermined and independent of the observer. With this philosophy of knowledge, rationality and experimentation are the only sources of truth (Levy, 1993). There is extensive overlap between the values of justice and those of a philosophy of realism. Both views value objectivity, autonomy and adherence to abstract rules and principles to uncover truth. Thus, both justice and realism can be seen to be

symbolically masculine. Conversely, a constructivist philosophy of knowledge focuses on the human factors involved in creating and understanding truth rather than on analyzing external objects. A constructivist philosophy, with its emphasis on the connection between participant and object would overlap with the care orientation and would, therefore, have a feminine symbolization.

Although the values of constructivism and realism would correspond to the values of care and justice, they are different constructs and would be tapped in different ways. A measure of care is not necessarily the same as a measure of constructivism; a justice measure is not necessarily a measure of realism. Because the questionnaire used in the quantitative section of this study asked explicitly about care and justice values rather than constructivism and realism, some important gender differences and differences between students with different attitudes toward psychology may have been missed.

Summary, Implications and Future Directions

Results of this study indicate that the natural sciences and psychology are symbolized differently. In contrast to the natural sciences, which are symbolically masculine (Kimball, in press; Worthley, 1992), the results of this study suggest that psychology is symbolized as both masculine and feminine. Worthley found that students whose own values are incongruent with those they perceived to be held by science dropped out of science programs. In the natural sciences, there is no room for students whose own voice is different from the dominant voice in the discipline. In contrast, psychology, which does not have such a dominant voice, may make room for

a variety of voices.

The symbolic gender flexibility of psychology has important implications for what has been called psychology's "identity crisis". Some have argued that because psychology is comprised of both scientific and humanistic components, it lacks a set of coherent values (Kimble, 1984). There are varying opinions about the inevitability of psychology's identity crisis. Staats (1981) has argued that the different belief systems that operate within psychology can come to a consensus. Conversely, Koch (1981) believes, and pessimistically so, that psychology's various components cannot come to a consensus. The data from this study, however, point to the possibility that psychology is just fine the way that it is. The variety of underlying belief systems in psychology may not be a problem that we need to overcome; rather, this diversity may be one of psychology's strongest assets (Dobson, 1995).

The results of this study also have implications for our understanding of women's underrepresentation in science. Psychology's flexible gender symbolization may, in part, be the reason that psychology is one science in which women are overrepresented. It can be argued that women go into psychology, not because of the symbolic flexibility of the field, but because it is less scientific than the natural sciences. It is, of course, impossible to determine by objective criteria the extent to which psychology is a science. But, perhaps, the more interesting issue is whether individuals subjectively view psychology as a science. These results show that many women do view psychology as a science and yet, they are choosing to stay in the field. Thus, it seems that science itself does not deter women. It may be instead, that women

are more likely to reject disciplines in which science and the scientific method are viewed as the only legitimate way of obtaining understanding.

It remains for future researchers to further examine care and justice values as well as epistemological commitments in psychology. It is important to conduct more extensive cross-sectional studies including, as participants, professional practitioners of psychology such as academic and clinical psychologists in order to examine their values and their epistemological views. Further, epistemological views should be examined more explicitly using semi-structured interviews and quantitative measures of epistemological values such as Unger's Attitudes About Reality Scale (Unger, Draper & Pendergrass, 1986). A longitudinal study of psychology students' and practitioners' values and epistemological views would be useful in order to determine the ways in which values change over time. Finally, it would be useful to examine the values and epistemological views of students and professionals in social sciences other than psychology. This research would give us a better understanding of the diverse needs and values of students and practitioners of psychology. Through such understanding, I believe that psychology, as a discipline, could become more aware of and more accepting of the diversity within psychology. It would also give us further insight into the similarities between psychology and other disciplines as well as the unique contributions that psychology can make to understanding human nature.

References

- Bakan, D. (1967). On method: Toward a reconstruction of psychological investigation. San Francisco: Jossey-Bass.
- Baumrind, D. (1986). Sex differences in moral reasoning: Response to Walker's (1984) conclusion that there are none. Child Development, *57*, 511-521.
- Becker, B.J. & Hedges, L.N. (1984). Meta-analysis of cognitive gender differences: A comment on an analysis by Rosenthal and Rubin. Journal of Educational Psychology, *76*, 583-587.
- Belenky, M.F., Clinchy, B.M., Goldberger, N. & Tarule, J.M. (1986). Women's ways of knowing: The development of self, body and mind. New York: Basic Books.
- Belsky, J., Lang, M.E., & Rovine, M. (1985). Stability and change in marriage across the transition to parenthood. Journal of Marriage and the Family, *47*, 855-865.
- Belsky, J., Spanier, G.B., & Rovine, M. (1983). Stability and change in marriage across the transition to parenthood. Journal of Marriage and the Family, *45*, 553-556.
- Bentley, D. & Watts, M. (1987). Courting the positive virtues: A case for feminist science. In A. Kelly (Ed.), Science for Girls? (pp. 89-99). Manchester: Manchester University Press.
- Bock, D.R. & Kolakowski, D. (1973). Further evidence of a sex-linked major-gene influence on human spatial visualizing ability. American Journal of Human Genetics, *25*, 1-14.

Broverman, D.M., Klaiber, E.L., Kobayashi, Y., & Vogel, W. (1968). Roles of activation and inhibition in sex differences in cognitive abilities. Psychological Review, 75, 23-50.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). New York: Academic Press.

Cowan, C.P., Cowan, P.A., Henning, G., Coysh, W.S., Curtis-Boles, H. & Boles, A.J. (1985). Transition to parenthood: His, hers, and theirs. Journal of Family Issues, 6(4), 451-481.

Cowan, C.P. & Cowan, P.A. (1988). Who does what when partners become parents?: Implications for men, women, and marriage. Marriage and Family Review, 12 (3/4), 105-131.

Cronbach, L.J. (1990). Essentials of psychological testing (5th ed.). New York: Harper and Row.

Danziger, K. (1990). Constructing the participant: Historical origins of psychological research. Cambridge: Cambridge University Press.

Deese, J. (1972). Psychology as science and art. New York: Harcourt Brace Jovanovich.

Dobson, K. (1995). Psychology in Canada: The future is not the past. Canadian Psychology, 36(1), 1-11.

Fausto-Sterling, A. (1992). Myths of gender: Biological theories about women and men (Rev. ed.). New York: Basic Books.

Ford, M.R. & Lowery, C.R. (1986). Gender differences in moral reasoning: A comparison of the use of justice and care orientations. Journal of Personality and Social Psychology, 50, 777-783.

Friedman, M. (1993). What are friends for? Feminist perspectives on personal relationships (Ch. 5, Gendered Morality, pp. 117-141). Ithaca, NY: Cornell University Press.

Gilligan, C. (1982). In a different voice: Psychological theory and women's development. Cambridge, MA: Harvard University Press.

Gilligan, C. & Wiggins, G. (1988). The origins of morality in early childhood relationships. In C. Gilligan, J.V. Ward, & J.M. Taylor (Eds.), Mapping the Moral Domain (pp. 111-137). Cambridge, M.A.: Harvard University Press.

Haan, N., Langer, J., & Kohlberg, L. (1976). Family moral patterns. Child Development, 47, 1204-1206.

Haig, A. (1990). Division of labour and marital adjustment across the transition to parenthood among feminist and traditional couples. Unpublished Master's Thesis. Simon Fraser University, Burnaby, British Columbia.

Hudson, L. (1972). The cult of fact. London, Cape.

Industry, Science and Technology Canada (1991). Women in science and engineering, vol. I: Universities. Ottawa, Ontario.

- Keller, E.F. (1985). Reflections on gender and science. New Haven, CT: Yale University Press.
- Keller, E.F. (1992). Secrets of life, secrets of death: Essays on language, gender and science. New York: Routledge.
- Kelly, A. (1987). Why don't girls do science? In A. Kelly (Ed.), Science for Girls? (pp. 12-17). Manchester: Manchester University Press.
- Kimball, M. (1989). A new perspective on women's math achievement. Psychological Bulletin, 105, 198-214.
- Kimball, M. (in press). Practicing feminist double visions: Gender similarities and differences. Binghamton, NY: Haworth Press.
- Kimble, G. (1984). Psychology's two cultures. American Psychologist, 39, 833-839.
- Koch, S. (1981). The nature and limits of psychological knowledge. American Psychologist, 36, 257-269.
- Kohlberg, L. (1981). The philosophy of moral development: Moral stages and the idea of justice: Essays on moral development, 1. San Francisco: Harper and Row.
- Leinhart, G., Seewald, A.M. & Engel, M. (1979). Learning what's taught: Sex differences in instruction. Journal of Educational Psychology, 71, 432-439.
- Levy, J. (1972). Lateral specialization of the human brain: Behavioral manifestations and possible evolutionary basis. In J.A. Kiger (Ed.), The Biology of behavior (pp. 159-180). Corvallis: Oregon State University Press.

Levy, R. (1993). Believability and doubtfulness: A paradigmatic view of qualitative methods. Canadian Journal on Aging, 12, 233-243.

Liben, L.S. & Golbeck, S.L. (1984). Performance on Piagetian horizontality and verticality tasks: Sex-related differences in knowledge of relevant physical phenomena. Developmental Psychology, 20, 595-606.

Linn, M.C. & Petersen, A.C. (1986). A meta-analysis of gender differences in spatial ability: Implications for mathematics and science achievement. In J.S. Hyde & M.C. Linn (Eds.). The Psychology of Gender: Advances Through Meta-Analysis (pp. 67-101). Baltimore, MD: Johns Hopkins University Press.

Lyons, N.P. (1983). Two perspectives: On self, relationships, and morality. Harvard Educational Review, 53, 125-145.

McGlone, J. (1981). Sexual variation in behavior during spatial and verbal tasks. Canadian Journal of Psychology, 35, 227-282.

McIlwee, J.S. & Robinson, J.G. (1992). Women in engineering: Gender, power, and workplace culture. Albany, NY: State University of New York Press.

McLaren, A. & Gaskell, J. (In press). School science and gender: Now you see it; Now you don't. In J. Gaskell & J. Willinsky (Eds.). Gender In/forms the curriculum: From enrichment to transformation. New York: Teachers College Press.

Ormerod, M.B. (1981). Factors differentially affecting the science participant preferences, choices, and attitudes of girls and boys. In A. Kelly (Ed.), The Missing Half: Girls and Science Education (pp.100-112). Manchester: Manchester University Press.

Parsons, J.E., Adler, T.F., & Kaczala, C.M. (1982). Socialization of achievement attitudes and beliefs: Parental influences. Child Development, 53, 310-321.

Rosser, S.V. (1990). Female friendly science: Applying women's studies methods and theories to attract students. New York: Pergamon press.

Smail, B. (1987). Organizing the curriculum to fit girls' interests. In A. Kelly (Ed.) Science for Girls? (pp. 80-88). Manchester: Manchester University Press.

Spear, M. (1987). Teachers' views about the importance of science for boys and girls. In A. Kelly (Ed.), Science for Girls? (pp. 52-57). Manchester: Manchester University Press.

Staats, A. (1981). Paradigmatic behaviorism, unified theory, unified theory construction methods, and the zeitgeist of separatism. American Psychologist, 36, 239-256.

Stage, E.K., Kreinberg, N., Parsons, J.E., & Becker, J.R. (1987). Increasing the participation and achievement of girls and women in mathematics, science and engineering. In A. Kelly (Ed.), Science for Girls? (pp. 119-133). Manchester: Manchester University Press.

Statistics Canada (1994). Universities: Enrollment and degrees. (Catalogue Number 81-204). Ottawa, Ontario: Industry, Science & Technology.

Traweek, S. (1988). Beamtimes and lifetimes: The world of high energy physicists. Cambridge, MA: Harvard University Press.

Unger, R., Draper, R., & Pendergrass, M. (1986). Personal epistemology and personal experience. Journal of Social Issues, 42(2), 67-79.

Walker, L (1984). Sex differences in the development of moral reasoning: A critical review. Child Development, 55, 667-691.

Walker, L., de Vries, B., & Trevethan, S. (1987). Moral stages and moral orientation in real-life and hypothetical dilemmas. Child Development, 58, 842-858.

Wark, G. (1992). The effects of sex, sex-role, and type of moral dilemma on moral maturity and moral orientation. Unpublished master's thesis. Simon Fraser University, Burnaby, B.C.

Worthley, J. (1992). Is science persistence a matter of values? Psychology of Women Quarterly, 16, 57-68.

Appendix A

Science Issues Survey (Canadian Version and Original)

INSTRUCTIONS

This questionnaire is aimed at understanding how people think about science and scientists. All of us have ideas about science; we are interested in how you think about science, rather than in any "right" answers to the questions.

On the pages which follow, there is a series of stories about problems faced by scientists. For this part of the questionnaire it is important that you take the role of a scientist and answer the questions as you believe a scientist would. Please begin with a careful reading of the story, and follow these steps:

- 1) Answer Yes ____ or No ____ to the question after the story (Q:)
- 2) Rate each item beneath the question according to how important that item would be TO A SCIENTIST in deciding "yes" or "no"

A biologist at McGill has applied to the National Science and Engineering Research Council (NSERC) for grant money to support three years of recombinant DNA research involving the chemical synthesis of pieces of DNA. This controversial research is monitored by the Medical Research Council, whose guidelines set standards for procedures, materials and safety in DNA research. One obvious danger with this research is the possibility that pathogens could be released into the environment, with unpredictable results for human and other populations. On the other hand, results from the proposed research could lead to a cure for genetic diseases like diabetes, or the reversal of genetic defects like dwarfism.

Q: Do you think that most scientists would vote to fund this research?
 Yes _____ No _____

How important would the following factors be to a scientist making this decision:

	Very Unimportant		Very Important				
	1	2	3	4	5	6	7
Whether the laboratory is located in a residential neighbourhood	1	2	3	4	5	6	7
Whether it is the right of qualified scientists to pursue basic research without outside interference	1	2	3	4	5	6	7
Whether it is only fair to support this research, since other scientists in places like the University of Toronto have received NSERC grants for equally controversial research	1	2	3	4	5	6	7
Whether the odds of a mishap harming people and the environment will be calculated and made public by the university	1	2	3	4	5	6	7
Whether government agencies like NSERC have the right to use their funds to regulate research conducted in university laboratories	1	2	3	4	5	6	7
Whether the introduction of this research will produce tensions between the university residents and residents of its surrounding neighbourhoods	1	2	3	4	5	6	7

The loss of the space shuttle *Challenger* revives debate over NASA policy on the use of humans in deep space exploration. Few people doubt that human exploration of space will continue, but information from the investigation of the shuttle disaster has moved the President's commission to ask for a 5-year suspension of flights carrying humans while NASA and the public evaluate shuttle program goals and NASA's launch procedures. Those who want a suspension claim that vulnerabilities in the technology and economic pressures on launch schedules expose crews to unacceptable risks. Those who disagree want the program to continue with minimal interruptions; they argue that shuttle flights are essential to national security, that astronauts are indispensable on missions involving communications hardware, and that overall, the program has a good safety record.

Q: Do you think that most scientists would vote for a 5-year suspension on humans in space?
 Yes _____ No _____

How important would the following factors be to a scientist making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether the panel's investigation reveals that NASA's procedures during the <i>Challenger</i> launch followed space agency regulations		1	2	3	4	5	6	7	
Whether the panel's investigation shows that NASA shared with the <i>Challenger</i> crew information related to the safety of the January 28th, 1986 launch		1	2	3	4	5	6	7	
Whether it can be shown that NASA provides long-term support and benefits to families of astronauts killed on duty		1	2	3	4	5	6	7	
Whether NASA and the Air Force have the right to control the shuttle program as long as flight crews are restricted to military personnel		1	2	3	4	5	6	7	
Whether the risks which non-civilian space crews take in the present can be justified by future financial and technological gains anticipated by shuttle planners		1	2	3	4	5	6	7	
Whether resuming shuttle flights too soon after the <i>Challenger</i> disaster would weaken public trust in NASA scientists		1	2	3	4	5	6	7	

A physician is treating a patient with incurable cancer who has no more than six months to live. The patient, who is alert and responsive, but already in constant pain and unable to breathe without automated equipment, has asked to be removed from the respirator. The patient's family refuses to allow the respirator to be removed, claiming that the patient is not competent to make such a request. The hospital's case review committee will meet to consider whether the physician can honour the patient's request.

Q: Do you think that most scientists would vote to follow the patient's wishes?
 Yes _____ No _____

How important would the following factors be to a scientist making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether the doctor considers the patient a partner in the treatment		1	2	3	4	5	6	7	
Whether the doctor is obligated by rules of practice to use all available measures to sustain life		1	2	3	4	5	6	7	
Whether the rights of the family or the rights of the patient take precedence in making the decision		1	2	3	4	5	6	7	
Whether the act of helping to end another's life is balanced by the alleviation of pain and suffering		1	2	3	4	5	6	7	
Whether the hospital has the right to continue life-support measures when a patient no longer wants to live		1	2	3	4	5	6	7	
Whether cooperation with the patient's request will alienate the patient's family		1	2	3	4	5	6	7	

Canada's population is aging at a rate which will make 18% of the population over 65 by the year 2020. As society ages, health care analysts envision a confrontation between the claims of the young, the middle-aged, the "young-old" and the "old-old" on limited medical resources. This confrontation is already shaping up in debates within the Canadian Medical Association over extended medical benefits for those over 65. On one side are practitioners who want to limit the medical benefits covered by the government; they cite "diminishing returns" and escalations in chronic illnesses associated with many medical interventions involving the elderly. On the other side are practitioners who assume that science will continue to improve the health and vitality of the elderly; they see extended medical benefits as a way to ensure the aged an equitable share of health services. Now the CMA task force on aging is considering steps to sharply limit extended health benefits to the aged, including raising the age eligibility standards, reducing benefits for the care of the terminally ill, and shifting from an age-based to a need-based program.

Q: Do you think that most scientists would support these limitations on extended medical benefits for those over 65?

Yes _____ No _____

How important would the following factors be to a scientist making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important					
Whether limiting extended medical benefits to the terminally ill elderly will result in neglect and abandonment of the aged in the last years of life		1		2		3		4		5		6		7
Whether the rights of the young, who are embarking on life, take precedence over the rights of the very old, whose lives are nearly over		1		2		3		4		5		6		7
Whether guaranteed standards in health care contribute to the psychological well-being of the elderly		1		2		3		4		5		6		7
Whether it is the duty of the young and able in society to provide care for the disabled elderly		1		2		3		4		5		6		7
Whether the decisions we make in middle age about the care of our parents' generation will be used as a model by our own children in caring for us		1		2		3		4		5		6		7
Whether cutbacks in health services to the elderly will create problems for middle aged adults who are caught between caring for their children and their aging parents		1		2		3		4		5		6		7

Research on AIDS (Acquired Immune Deficiency Syndrome) is being conducted worldwide, often through collaboration among researchers. However, the visibility of the research and the pressure for a breakthrough create a climate of competition, motivating some researchers to keep a result secret until it's in print and they are credited with the discovery. Recently, researchers at the National Cancer Institute (NCI) in the United States discovered that a drug now used against protozoan blood parasites suppresses the AIDS virus. It is not a cure, but the drug produces remissions and may provide information about the failure of AIDS patients' antibodies in combating opportunistic diseases. This discovery, however, divides scientists at NCI. Some are eager to call a press conference to announce their findings; others who want to shield their research are bitterly opposed to such a move.

Q: Do you think that most scientists would be in favour of holding a press conference to announce this discovery?
 Yes _____ No _____

How important would the following factors be to a scientist making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether it is a violation of scientific principles to release this information to the press before it appears in a science journal		1	2	3	4	5	6	7	
Whether the release of this information will raise false hopes among AIDS victims		1	2	3	4	5	6	7	
Whether the unwritten rules in science justify secrecy, because scientists who are first to make a discovery are most rewarded in science		1	2	3	4	5	6	7	
Whether releasing this information will promote exploitation of AIDS victims through "underground" dissemination of the drug		1	2	3	4	5	6	7	
Whether the rights of the scientists who want to protect their research take precedence over the rights of the scientists who want to share the discovery		1	2	3	4	5	6	7	
Whether announcing this finding will promote or hinder future collaborations involving NCI scientists and other AIDS researchers		1	2	3	4	5	6	7	

The proposed Strategic Defense Initiative ("Star Wars") calls for the development of sophisticated remote sensing devices along the new types of "kill mechanisms" including lasers and "smart rocks" designed to track and destroy incoming weapons. Contracts for "Star Wars" research are awarded to many university researchers, each one working on a bit of the technology crucial to the development of SDI. Recently, the American Association for the Advancement of Science met to consider whether "Star Wars" research violates the 1972 antiballistic missile treaty in which the U.S. and the USSR agreed "not to develop, test or deploy ABM systems." The issue facing AAAS is: Does the laboratory research on SDI violate the intentions of the ABM treaty, even though SDI now exists only on the drawing boards? Following a debate, hundreds of scientists will vote an official AAAS recommendation on its members' participation in "Star Wars" research.

Q: Do you think that most scientists would recommend that researchers refrain from participation in "Star Wars" research?
 Yes _____ No _____

How important would the following factors be to a scientist making this decision:

	Very Unimportant	1	2	3	4	5	6	7 Very Important
Whether academic research on SDI violates specific provisions of the ABM treaty		1	2	3	4	5	6	7
Whether academic scientists have a responsibility to examine the social outcomes of their work		1	2	3	4	5	6	7
Whether embarking on "Star Wars" research harms the chances for trust between the two nations		1	2	3	4	5	6	7
Whether AAAS is infringing on members' rights to professional independence by taking an official position on "Star Wars" research		1	2	3	4	5	6	7
Whether it would be a violation of scientific principles for AAAS to take an official position in a matter of foreign policy		1	2	3	4	5	6	7
Whether pursuit of "Star Wars" research harms our prospects for mutual arms' reductions in the future		1	2	3	4	5	6	7

INSTRUCTIONS

This questionnaire is aimed at understanding how people think about science and scientists. All of us have ideas about science; we are interested in how you think about science, rather than in any "right" answers to the questions.

On the pages which follow, there is a series of stories about problems faced by scientists. For this part of the questionnaire, it is important that you answer the questions **from your own point of view**. Please begin with a careful reading of the story, then follow these steps:

- 1) Answer Yes ___ or No ___ to the question after the story (Q:)
- 2) Rate each item beneath the question according to how important that item would be to you in deciding "yes" or "no".

A biologist at McGill has applied to the National Science and Engineering Research Council (NSERC) for grant money to support three years of recombinant DNA research involving the chemical synthesis of pieces of DNA. This controversial research is monitored by the Medical Research Council, whose guidelines set standards for procedures, materials and safety in DNA research. One obvious danger with this research is the possibility that pathogens could be released into the environment, with unpredictable results for human and other populations. On the other hand, results from the proposed research could lead to a cure for genetic diseases like diabetes, or the reversal of genetic defects like dwarfism.

Q: Would you vote to fund this research?
 Yes _____ No _____

How important would the following factors be for you in making this decision:

	Very Unimportant							Very Important						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Whether the laboratory is located in a residential neighbourhood	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Whether it is the right of qualified scientists to pursue basic research without outside interference	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Whether it is only fair to support this research, since other scientists in places like the University of Toronto have received NSERC grants for equally controversial research	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Whether the odds of a mishap harming people and the environment will be calculated and made public by the university	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Whether government agencies like NSERC have the right to use their funds to regulate research conducted in university laboratories	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Whether the introduction of this research will produce tensions between the university residents and residents of its surrounding neighbourhoods	1	2	3	4	5	6	7	1	2	3	4	5	6	7

The loss of the space shuttle *Challenger* revives debated over NASA policy on the use of humans in deep space exploration. Few people doubt that human exploration of space will continue, but information from the investigation of the shuttle disaster has moved the President's commission to ask for a 5-year suspension of flights carrying humans while NASA and the public evaluate shuttle program goals and NASA's launch procedures. Those who want a suspension claim that vulnerabilities in the technology and economic pressures on launch schedules expose crews to unacceptable risks. Those who disagree want the program to continue with minimal interruptions; they argue that shuttle flights are essential to national security, that astronauts are indispensable on missions involving communications hardware, and that overall, the program has a good safety record.

Q: Would you vote for a 5-year suspension on humans in space?
 Yes _____ No _____

How important would the following factors be for you in making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether the panel's investigation reveals that NASA's procedures during the <i>Challenger</i> launch followed space agency regulations		1	2	3	4	5	6	7	
Whether the panel's investigation shows that NASA shared with the <i>Challenger</i> crew information related to the safety of the January 28th, 1986 launch		1	2	3	4	5	6	7	
Whether it can be shown that NASA provides long-term support and benefits to families of astronauts killed on duty		1	2	3	4	5	6	7	
Whether NASA and the Air Force have the right to control the shuttle program as long as flight crews are restricted to military personnel		1	2	3	4	5	6	7	
Whether the risks which non-civilian space crews take in the present can be justified by future financial and technological gains anticipated by shuttle planners		1	2	3	4	5	6	7	
Whether resuming shuttle flights too soon after the <i>Challenger</i> disaster would weaken public trust in NASA scientists		1	2	3	4	5	6	7	

A physician is treating a patient with incurable cancer who has no more than six months to live. The patient, who is alert and responsive, but already in constant pain and unable to breathe without automated equipment, has asked to be removed from the respirator. The patient's family refuses to allow the respirator to be removed, claiming that the patient is not competent to make such a request. The hospital's case review committee will meet to consider whether the physician can honour the patient's request.

Q: Would you vote to follow the patient's wishes?
 Yes _____ No _____

How important would the following factors be for you in making this decision:

	Very Unimportant	2	3	4	5	6	7 Very Important
Whether the doctor considers the patient a partner in the treatment	1	2	3	4	5	6	7
Whether the doctor is obligated by rules of practice to use all available measures to sustain life	1	2	3	4	5	6	7
Whether the rights of the family or the rights of the patient take precedence in making the decision	1	2	3	4	5	6	7
Whether the act of helping to end another's life is balanced by the alleviation of pain and suffering	1	2	3	4	5	6	7
Whether the hospital has the right to continue life-support measures when a patient no longer wants to live	1	2	3	4	5	6	7
Whether cooperation with the patient's request will alienate the patient's family	1	2	3	4	5	6	7

Canada's population is aging at a rate which will make 18% of the population over 65 by the year 2020. As society ages, health care analysts envision a confrontation between the claims of the young, the middle-aged, the "young-old" and the "old-old" on limited medical resources. This confrontation is already shaping up in debates within the Canadian Medical Association over extended medical benefits for those over 65. On one side are practitioners who want to limit the medical benefits covered by the government; they cite "diminishing returns" and escalations in chronic illnesses associated with many medical interventions involving the elderly. On the other side are practitioners who assume that science will continue to improve the health and vitality of the elderly; they see extended medical benefits as a way to ensure the aged an equitable share of health services. Now the CMA task force on aging is considering steps to sharply limit extended health benefits to the aged, including raising the age eligibility standards, reducing benefits for the care of the terminally ill, and shifting from an age-based to a need-based program.

Q: Would you support these limitations on extended medical benefits for those over 65?

Yes No

How important would the following factors be for you in making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether limiting extended medical benefits to the terminally ill elderly will result in neglect and abandonment of the aged in the last years of life		1	2	3	4	5	6	7	
Whether the rights of the young, who are embarking on life, take precedence over the rights of the very old, whose lives are nearly over		1	2	3	4	5	6	7	
Whether guaranteed standards in health care contribute to the psychological well-being of the elderly		1	2	3	4	5	6	7	
Whether it is the duty of the young and able in society to provide care for the disabled elderly		1	2	3	4	5	6	7	
Whether the decisions we make in middle age about the care of our parents' generation will be used as a model by our own children in caring for us		1	2	3	4	5	6	7	
Whether cutbacks in health services to the elderly will create problems for middle aged adults who are caught between caring for their children and their aging parents		1	2	3	4	5	6	7	

Research on AIDS (Acquired Immune Deficiency Syndrome) is being conducted worldwide, often through collaboration among researchers. However, the visibility of the research and the pressure for a breakthrough create a climate of competition, motivating some researchers to keep a result secret until it's in print and they are credited with the discovery. Recently, researchers at the National Cancer Institute (NCI) in the United States discovered that a drug now used against protozoan blood parasites suppresses the AIDS virus. It is not a cure, but the drug produces remissions and may provide information about the failure of AIDS patients' antibodies in combatting opportunistic diseases. This discovery, however, divides scientists at NCI. Some are eager to call a press conference to announce their findings; others who want to shield their research are bitterly opposed to such a move.

Q: Would you be in favour of holding a press conference to announce this discovery?
 Yes _____ No _____

How important would the following factors be for you in making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether it is a violation of scientific principles to release this information to the press before it appears in a science journal		1	2	3	4	5	6	7	
Whether the release of this information will raise false hopes among AIDS victims		1	2	3	4	5	6	7	
Whether the unwritten rules in science justify secrecy, because scientists who are first to make a discovery are most rewarded in science		1	2	3	4	5	6	7	
Whether releasing this information will promote exploitation of AIDS victims through "underground" dissemination of the drug		1	2	3	4	5	6	7	
Whether the rights of the scientists who want to protect their research take precedence over the rights of the scientists who want to share the discovery		1	2	3	4	5	6	7	
Whether announcing this finding will promote or hinder future collaborations involving NCI scientists and other AIDS researchers		1	2	3	4	5	6	7	

The proposed Strategic Defense Initiative ("Star Wars") calls for the development of sophisticated remote sensing devices along the new types of "kill mechanisms" including lasers and "smart rocks" designed to track and destroy incoming weapons. Contracts for "Star Wars" research are awarded to many university researchers, each one working on a bit of the technology crucial to the development of SDI. Recently the American Association for the Advancement of Science met to consider whether "Star Wars" research violates the 1972 antiballistic missile treaty in which the U.S. and the USSR agreed "not to develop, test or deploy ABM systems." The issue facing AAAS is: Does the laboratory research on SDI violated the intentions of the ABM treaty, even though SDI now exists only on the drawing boards? Following a debate, hundreds of scientists will vote an official AAAS recommendation on its members' participation in "Star Wars" research.

Q: Would you recommend that researchers refrain from participation in "Star Wars" research?

Yes _____ No _____

How important would the following factors be for you in making this decision:

	Very Unimportant	1	2	3	4	5	6	7	Very Important
Whether academic research on SDI violates specific provisions of the ABM treaty		1	2	3	4	5	6	7	
Whether academic scientists have a responsibility to examine the social outcomes of their work		1	2	3	4	5	6	7	
Whether embarking on "Star Wars" research harms the chances for ... between the two nations		1	2	3	4	5	6	7	
Whether AAAS is infringing on members' rights to professional independence by taking an official position on "Star Wars" research		1	2	3	4	5	6	7	
Whether it would be a violation of scientific principles for AAAS to take an official position in a matter of foreign policy		1	2	3	4	5	6	7	
Whether pursuit of "Star Wars" research harms our prospects for mutual arms' reductions in the future		1	2	3	4	5	6	7	

A biologist at Stanford has applied to the National Science Foundation (NSF) for grant money to support three years of recombinant DNA research involving the chemical synthesis of pieces of DNA. This controversial research is monitored by the National Institute of Health, whose guidelines set standards for procedures, materials and safety in DNA research. One obvious danger with this research is the possibility that pathogens could be released into the environment, with unpredictable results for human and other populations. On the other hand, results from the proposed research could lead to a cure for genetic diseases like diabetes, or the reversal of genetic defects like dwarfism.

Q: Would you vote to fund this research?
 Yes _____ No _____

	Very Unimportant		Very Important				
	1	2	3	4	5	6	7
Whether the laboratory is located in a residential neighbourhood	1	2	3	4	5	6	7
Whether it is the right of qualified scientists to pursue basic research without outside interference	1	2	3	4	5	6	7
Whether it is only fair to support this research, since other scientists in places like the MIT have received NSF grants for equally controversial research	1	2	3	4	5	6	7
Whether the odds of a mishap harming people and the environment will be calculated and made public by the university	1	2	3	4	5	6	7
Whether government agencies like NSF have the right to use their funds to regulate research conducted in university laboratories	1	2	3	4	5	6	7
Whether the introduction of this research will produce tensions between the university residents and residents of its surrounding neighbourhoods	1	2	3	4	5	6	7

Appendix B
Undergraduate Student Package

Undergraduate Psychology Students Survey

Thank you very much for taking part in this study. In the attached survey you will be asked questions about your views of psychology and your views of science. It should take approximately 1 hour to complete this questionnaire, however you should take as much time as you need; you will not be timed. If there are any items that you do not wish to answer, please leave them blank. You can discontinue the questionnaire at any point. If any of the items are unclear, please ask for clarification.

Please hand in your completed survey to Heather Walters.

- 1) Sex ____ (F/M)
- 2) Age _____ years
- 3) What is your ethnicity? _____
- 4) What do you estimate your social class to be?
____ Lower
____ Lower-Middle
____ Middle
____ Upper-Middle
____ Upper
- 5) What is the highest level of education obtained by your mother?
____ Grade 1 - grade 6
____ Grade 7 - grade 9
____ Grade 10 - grade 12
____ Some post-secondary education
____ University degree (e.g., BA, BSc, BEd)
____ Post-graduate degree (e.g., MA, Ph.D., MD, MSW etc.)
- 6) What is the highest level of education obtained by your father?
____ Grade 1 - grade 6
____ Grade 7 - grade 9
____ Grade 10 - grade 12
____ Some post-secondary education
____ University degree (e.g., BA, BSc, BEd)
____ Post-graduate degree (e.g., MA, Ph.D., MD, MSW etc.)
- 7) Which degree are you working toward?
____ Major in Psychology
____ Honours in Psychology
- 8) How many psychology credits have you completed (including transfer credits)? _____
- 9) How many total credits have you completed (including transfer credits)? _____
- 10) Do you plan to go to graduate school in psychology?
____ Yes
____ No
- 11) If yes, do you see yourself going into a
____ Clinical/Counselling program
____ Experimental Program
____ Not decided

12) If you plan to go to graduate school in psychology, what role(s) do you eventually see yourself fulfilling? (please check all that apply)

- Research
 Teaching
 Applied Work (e.g., consultation, program evaluation, therapy)
 Other (please specify) _____

12b) Of the options that you checked above, please rank them in order of importance to you.

- 1) _____ (most important)
2) _____
3) _____
4) _____ (least important)

SIS Goes Here

Psychology is both a science and a helping profession. However, people differ in the extent to which they feel psychology is primarily a science or primarily a helping profession. On the following scale, please indicate your own view by putting an X at the point that most accurately reflects your view of psychology.

I _____ I
Psychology is Psychology is
primarily a primarily a
science helping profession

What do you think this study was about?

If you have any questions, comments or concerns about this study, please feel free to write them here.

Thank you very much for participating in this study. Over the next couple of weeks the primary investigator will be contacting psychology students to take part in interviews to find out more about students' opinions about this study, science and psychology. The interview will last approximately 1/2 hour.

If you wish to be interviewed, please fill out the following information, tear off this page and hand it in separately from the questionnaire you have just filled out. Please **do not** fill out this information if you are not interested in participating in the interview.

Name _____

Phone Number _____

Best time(s) to contact you _____

If you would like to receive a summary of the findings of this study, please write your name and address here and separate this page from the rest of your questionnaire. If you fill out this page, please hand it in separately from the rest of your questionnaire.

Name _____

Address _____

Once again, thank you for taking part in this study.

Appendix C

Simon Fraser University Graduate Students Package

Graduate Psychology Students Survey

In the attached questionnaire you will be asked questions about your views of psychology and your views of science. The questionnaire will take approximately 1 hour to complete. If there are any items that you do not wish to answer, please leave them blank.

When you have completed the questionnaire, please put it in the envelope provided, seal the envelope and leave it in Heather Walters' mailbox.

If you are aware of the hypotheses of this study, please fill in only the first page of this questionnaire and leave it in Heather Walters' mailbox.

If you do not wish to participate in this study, please put this blank questionnaire in Heather Walters' mailbox.

- 1) Sex ____ (F/M)
- 2) Age _____ years
- 3) What is your ethnicity? _____
- 4) What do you estimate your social class to be?
- _____ Lower
- _____ Lower-Middle
- _____ Middle
- _____ Upper-Middle
- _____ Upper
- 5) What is the highest level of education obtained by your mother?
- _____ Grade 1 - grade 6
- _____ Grade 7 - grade 9
- _____ Grade 10 - grade 12
- _____ Some post-secondary education
- _____ University degree (e.g., BA, BSc, BEd)
- _____ Post-graduate degree (e.g., MA, PhD, MD, MSW etc.)
- 6) What is the highest level of education obtained by your father?
- _____ Grade 1 - grade 6
- _____ Grade 7 - grade 9
- _____ Grade 10 - grade 12
- _____ Some post-secondary education
- _____ University degree (e.g., BA, BSc, BEd)
- _____ Post-graduate degree (e.g., MA, PhD, MD, MSW etc.)
- 7) Which degree are you working toward?
- _____ MA Experimental
- _____ MA Clinical
- _____ PhD Experimental
- _____ PhD Clinical
- 8) In the future, what role(s) do you see yourself performing in psychology? (please check all that apply)
- _____ Research
- _____ Teaching
- _____ Applied Work (e.g., consultation, program evaluation, therapy)
- _____ Please specify _____
- _____ Other (please specify) _____

8b) Of the options that you checked above, please rank them in order of importance to you.

1) _____ (most important)

2) _____

3) _____

4) _____ (least important)

Reminder: Please stop here if you have heard about the hypotheses of this study

SIS Goes here

Psychology is both a science and a helping profession. However, people differ in the extent to which they feel psychology is primarily a science or primarily a helping profession. On the following scale, please indicate your own view by putting an X at the point that most accurately reflects your view of psychology.

I _____ I
Psychology is Psychology is
primarily a primarily a
science helping profession

What do you think this study was about?

If you have any questions, comments or concerns about this study, please feel free to write them here.

Thank you very much for your participation in this study. Over the next couple of weeks Heather Walters will be contacting psychology students to participate in interviews to find out more about students' feelings and opinions about this study, science and psychology.

The interview will last approximately 1/2 hour.

If you wish to be interviewed, please fill out the following information, tear off this page and hand it in separately from the questionnaire you have just filled out. Please **do not** fill out this information if you are not interested in participating in the interview.

Name _____

Phone Number _____

Best time(s) to contact you _____

If you would like to receive a summary of the findings of this study, please write your name and address here and separate this page from the rest of your questionnaire. If you fill out this page, please send it in or hand it in separately from the rest of your questionnaire.

Name _____

Address _____

Once again, thank you for taking part in this study.

Appendix D

University of British Columbia Graduate Students Package

SIMON FRASER UNIVERSITY

DEPARTMENT OF PSYCHOLOGY



BURNABY, BRITISH COLUMBIA V5A 1S6

Telephone: (604) 291-3354

Fax: (604) 291-3427

100

To: Psychology Graduate Students

From: Heather Walters
Simon Fraser University

Views of Psychology and Science Questionnaire

Through the Psychology department at Simon Fraser University, I am conducting research to find out about students' views of science and psychology. As graduate students in Psychology, your opinions are very valuable to me. I would be very grateful if you would take the time to share your views by completing the enclosed questionnaire. The questionnaire will take approximately 45 minutes to complete.

Your participation is completely voluntary and if there are any items that you do not wish to answer, you may leave them blank. If the questionnaire is completed, it will be assumed that you have given your consent to participate in the study.

Because you are not required to provide your name or any other identifying information on the questionnaire, the anonymity of your responses is assured. If you agree to participate in a personal interview (more information provided at the end of the questionnaire), you will be asked to provide your name and address, however, this information will be kept separate from the questionnaires in a locked filing cabinet.

When you have completed the questionnaire, please put it in the large envelope provided, seal the envelope and put it in the campus mail box in the Psychology main office (no postage required) addressed to Heather Walters, Department of Psychology, Simon Fraser University, Burnaby, B.C. If you have any questions or comments about this study, please feel free to contact either Heather Walters (526-0261) or Dr. Meredith Kimball (291-4130) to discuss your concerns.

Thank you in advance for your assistance.

- 1) Sex ____ (F/M)
- 2) Age _____ years
- 3) What is your ethnicity? _____
- 4) What do you estimate your social class to be?
 - _____ Lower
 - _____ Lower-Middle
 - _____ Middle
 - _____ Upper-Middle
 - _____ Upper
- 5) What is the highest level of education obtained by your mother?
 - _____ Grade 1 - grade 6
 - _____ Grade 7 - grade 9
 - _____ Grade 10 - grade 12
 - _____ Some post-secondary education
 - _____ University degree (e.g., BA, BSc, BEd)
 - _____ Post-graduate degree (e.g., MA, Ph.D., MD, MSW etc.)
- 6) What is the highest level of education obtained by your father?
 - _____ Grade 1 - grade 6
 - _____ Grade 7 - grade 9
 - _____ Grade 10 - grade 12
 - _____ Some post-secondary education
 - _____ University degree (e.g., BA, BSc, BEd)
 - _____ Post-graduate degree (e.g., MA, Ph.D., MD, MSW etc.)
- 7) Which degree are you working toward?
 - _____ MA
 - _____ PhD
- 7 b) Which program are you in?
 - _____ Clinical
 - _____ Social/Personality
 - _____ Biopsychology
 - _____ Developmental
 - _____ Neuroscience
 - _____ Psychometrics
 - _____ Forensic
 - _____ Perception/Cognition/Environmental

8) In the future, what role(s) do you see yourself performing in psychology? (please check all that apply)

- Research
 Teaching
 Applied Work (e.g., consultation, program evaluation, therapy)
 Other (please specify) _____

8b) Of the options that you checked above, please rank them in order of importance to you.

- 1) _____ (most important)
2) _____
3) _____
4) _____ (least important)

SIS Goes Here

Psychology is both a science and a helping profession. However, people differ in the extent to which they feel psychology is primarily a science or primarily a helping profession. On the following scale, please indicate your own view by putting an X at the point that most accurately reflects your view of psychology.

I _____ I
Psychology is Psychology is
primarily a primarily a
science helping profession

What do you think this study was about?

If you have any questions, comments or concerns about this study, please feel free to write them here.

Thank you very much for your participation in this study. Over the next couple of weeks the primary investigator will be contacting psychology students to take part in interviews to find out more about students' feelings and opinions about this study, science and psychology. The interview will last approximately 1/2 hour.

If you wish to be interviewed, please fill out the following information, tear off this page and send it via campus mail in the small envelope provided. Please be sure to send this sheet in separately from your questionnaire. If you choose to volunteer for the interview part of the study, your name and participant number will be kept in a locked filing cabinet. Your name will not be associated with your questionnaire responses.

Please **do not** fill out this information if you are not interested in participating in the interview.

Name _____

Phone Number _____

Best time(s) to contact you _____

If you would like to receive a summary of the findings of this study, please print your name and address on this page and separate this page from the rest of your questionnaire.

If you fill out this page, please send it **separately** from the rest of your questionnaire via campus mail in the small envelope provided. This will ensure the anonymity of your responses.

Name _____

Address _____

Once again, thank you for taking part in this study.

Appendix E

Interviews

SIMON FRASER UNIVERSITY

DEPARTMENT OF PSYCHOLOGY



BURNABY, BRITISH COLUMBIA V5A 1S6
Telephone: (604) 291-3354
Fax: (604) 291-3427

108

Consent Form

Views of Psychology and Science Interview

I understand that I have been asked by Heather Walters of the Psychology Department of Simon Fraser University to participate in an interview as part of her Master's thesis research. I understand that this interview will be taped and that the information obtained in the interview will be available only to researchers involved in this study. Tapes will be transcribed and erased and the transcriptions will have all identifying information deleted. I also understand that after the research project is complete, all research material will be kept in a locked filing cabinet.

I understand that I may refuse to answer any questions and that I may withdraw from the interview at any time. I also understand that I may register any complaint I might have about the study with the researcher named above at 291-3354 or with Dr. Meredith Kimball (291-4130), Department of Psychology.

I agree to participate in a personal interview conducted by Heather Walters regarding my views of psychology and science.

Name: _____

Address: _____

Signature: _____

Date: _____

Once signed, a copy of this consent form and a subject feedback form will be provided to you.

Interview

What does "psychology" mean to you?

In what ways do you feel psychology is a science? helping profession?

When and how did you become interested in psychology?

What area of psychology are you most interested in?

How did you become interested in this area?

What area of psychology are you least interested in? Why?

In what ways do you think your view of psychology has changed since you first began in psychology?

What do you think is the most important contribution that psychology can make to the understanding of people?

What do you plan to do after you have completed your current degree?

Appendix F
Phone Interviews

Front End of Telephone Interview

This is Heather Walters from the Psychology department at Simon Fraser University. I am calling to follow up on the questionnaire that you completed in February about your views of psychology and science. At the time that you completed the questionnaire, you indicated that you would be interested in participating in an interview. I will not be able to interview you in person but, if you are willing, I would like to spend about 5 minutes asking you some questions over the phone. Is this time okay for you or would there be a better time when I can call you back?

As I indicated in the questionnaire, I'll be asking you about your experiences in psychology and in science. I will not be asking any questions that deal with very personal or sensitive matters, however you can refuse to answer any of the questions. Your name will not appear on the notes that I make from our telephone conversation and only myself and my advisor will have access to the information that you provide.

Would you be willing to participate in the interview?

Before we proceed, do you have any questions?

Phone interview

What does "psychology" mean to you?

In what ways do you feel that psychology is a science? helping profession?

What do you think is the most important contribution that psychology can make to the understanding of people?

What do plan to do after you have completed your current degree?

Appendix G

Table of Means, Standard Deviations and Number of Participants

Appendix G
Means, standard deviations, and number of participants

	Self/Care ^a	Self/Justice ^a	Science/Care ^a	Science/Justice ^a
Undergraduates (n=104)	5.32 (.64)	4.20 (.85)	4.47 (.95)	4.82 (.72)
Male (n=22)	5.07 (.73)	4.16 (.77)	4.49 (.98)	4.57 (.57)
Female (n=82)	5.39 (.60)	4.21 (.88)	4.47 (.95)	4.89 (.74)
Psychology=Science (n=43)	5.25 (.66)	4.11 (.90)	4.67 (.97)	4.94 (.70)
Psychology=Helping (n=59)	5.36 (.63)	4.25 (.81)	4.34 (.93)	4.76 (.72)
No Intention to go to graduate school (n=30)	5.24 (.55)	4.20 (.81)	4.33 (.81)	4.60 (.68)
Intend to go to experimental (n=18)	5.33 (.73)	4.12 (.88)	4.52 (1.11)	4.93 (.77)
Intend to go to clinical (n=56)	5.37 (.54)	4.44 (.67)	4.39 (.49)	4.86 (.52)
Graduates (n=36)	4.79 (.82)	3.99 (.73)	4.37 (.99)	4.74 (.60)
Male (n=16)	4.62 (.99)	3.83 (.82)	4.43 (1.08)	4.63 (.51)
Female (n=20)	4.93 (.63)	4.13 (.65)	4.32 (.93)	4.82 (.67)
Psychology=Science (n=26)	4.82 (.75)	4.03 (.72)	4.52 (.81)	4.72 (.63)
Psychology=Helping (n=8)	4.87 (.82)	3.73 (.78)	4.17 (1.39)	4.82 (.58)
Experimental (n=22)	4.69 (.92)	3.92 (.78)	4.49 (1.07)	4.74 (.62)
Clinical (n=14)	4.95 (.63)	4.11 (.66)	4.16 (.85)	4.73 (.61)

^aPossible range of 1-7; 1=very unimportant and 7=very important. Standard deviations are given in parentheses.

Appendix H

MANOVA Results of Analysis Using View of Psychology
MANOVA Results of Analysis Using Program

Effects of Variables on Self/Care, Self/Justice, Science/Care, Science/Justice Scores (analysis using View of Psychology)

Effect	F	p	Effect Size
Gender	3.42	0.07	0.030
Level of Education (LevEd)	2.82	0.09	0.220
View of Psychology (ViewPsy)	1.35	0.25	0.010
Gender X LevEd	0.37	0.55	0.002
Gender X ViewPsy	0.16	0.09	0.021
LevEd X ViewPsy	0.16	0.69	0.001
Gender X LevEd X ViewPsy	1.43	0.23	0.011
Point of View	0.50	0.48	0.004
Gender X Point of View	0.18	0.67	0.001
LevEd X Point of View	2.69	0.10	0.021
ViewPsy X Point of View	2.25	0.14	0.017
Gender X LevEd X Point of View	0.01	0.99	0.001
Gender X ViewPsy X Point of View	1.67	0.19	0.013
LevEd X ViewPsy X Point of View	0.91	0.34	0.007
Gender X LevEd X ViewPsy X Point of View	3.62	0.06	0.028
Orientation (Orient)	20.46	0.01	0.139
Gender X Orient	0.05	0.83	0.001
LevEd X Orient	0.95	0.33	0.007
ViewPsy X Orient	0.01	0.97	0.000
Gender X LevEd X Orient	0.01	0.97	0.000
Gender X ViewPsy X Orient	0.07	0.79	0.000
LevEd X ViewPsy X Orient	0.29	0.59	0.002
Gender X LevEd X ViewPsy X Orient	3.20	0.08	0.024
Point of View X Orient	106.90	0.0001	0.457
Gender X Point of View X Orient	0.01	0.99	0.000
LevEd X Point of View X Orient	0.60	0.44	0.005
ViewPsy X Point of View X Orient	3.63	0.06	0.027
Gender X LevEd X Point of View X Orient	5.15	0.02	0.039
Gender X ViewPsy X Point of View X Orient	3.49	0.06	0.026
LevEd X ViewPsy X Point of View X Orient	4.19	0.04	0.032
Gender X LevEd X ViewPsy X Point of View X Orient	6.46	0.01	0.048

Effects of Variables on Self/Care, Self/Justice, Science/Care, Science/Justice Scores (Analysis using Program)

Effect	F	p	Effect Size
Gender	0.75	0.389	0.007
Level of Education (LevEd)	2.69	0.104	0.026
Program	0.47	0.494	0.005
Gender X LevEd	0.10	0.751	0.001
Gender X Program	0.29	0.590	0.003
LevEd X Program	0.15	0.703	0.001
Gender X LevEd X Program	0.18	0.675	0.002
Point of View	0.33	0.567	0.003
Gender X Point of View	1.54	0.218	0.015
LevEd X Point of View	2.91	0.091	0.028
Program X Point of View	0.11	0.741	0.001
Gender X LevEd X Point of View	0.04	0.847	0.000
Gender X Program X Point of View	0.11	0.741	0.001
LevEd X Program X Point of View	1.94	0.167	0.019
Gender X LevEd X Program X Point of View	1.39	0.242	0.014
Orientation (Orient)	10.26	0.002	0.094
Gender X Orient	0.56	0.456	0.005
LevEd X Orient	0.01	0.921	0.000
Program X Orient	0.55	0.459	0.005
Gender X LevEd X Orient	0.40	0.526	0.004
Gender X Program X Orient	0.63	0.430	0.006
LevEd X Program X Orient	0.31	0.580	0.003
Gender X LevEd X Program X Orient	1.24	0.269	0.012
Point of View X Orient	78.18	0.000	0.441
Gender X Point of View X Orient	0.63	0.429	0.006
LevEd X Point of View X Orient	0.17	0.680	0.002
Program X Point of View X Orient	0.41	0.522	0.004
Gender X LevEd X Point of View X Orient	0.49	0.487	0.005
Gender X Program X Point of View X Orient	0.07	0.796	0.000
LevEd X Program X Point of View X Orient	0.70	0.405	0.007
Gender X LevEd X Program X Point of View X Orient	1.21	0.273	0.012