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McGinnis, Susanne P., Ph.D.

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DESCRIPTIVE AND EVALUATIVE COMPONENTS OF STEREOTYPES OF COMPUTER PROGRAMMERS AND THEIR DETERMINANTS

by

Susanne P. McGinnis

A dissertation submitted to the Graduate Faculty in Psychology in partial fufillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1989

This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

DESCRIPTIVE AND EVALUATIVE COMPONENTS OF STEREOTYPES OF COMPUTER PROGRAMMERS AND THEIR DETERMINANTS

by

Susanne P. McGinnis

Advisor: Professor Charles P. Smith

This study sought to determine: (a) whether there is a stereotype of computer programmers held by non-programmers; (b) if there is a stereotype, whether it differs by sex of target and sex of observer; and (c) whether the valence of the stereotype is related to reported frequency of contact, job status differential, cooperation, and competition. University students (81 males and 83 females) in business-related classes compared either male or female programmers respectively to males or females in general with respect to 42 traits extracted from the popular literature. A stereotype emerged consisting of those traits that significantly distinguished the target from the comparison group. From these traits, four broad factors emerged: competence-industriousness, emotional maturity, social deviance, and psychological abnormality. Both the descriptive and evaluative components of the stereotype differed selectively by

sex of target and sex of observer. A stereotype of psychological abnormality was held only by male observers of male programmers. Female observers of male programmers generated fewer traits indicative of a social deviance factor than other target-observer groups. Descriptively, there was more agreement among males and females in their stereotype of female programmers than of male programmers. The valence of the stereotype was more positive for cross-sex sex observers than for same-sex observers. As perceived job status of target exceeded that of observer, the valence of the stereotype became more positive. Contact and competition, however, each interacted with status differential to modify its relationship to valence. The findings are consistent with an equal-status contact hypothesis (Allport, 1954), namely, as perceived job status of target exceeded that of observer, high levels of contact were associated with a more negative stereotype. Level of competition interacted with status differential such that, as status of target exceeded that of observer, higher levels of competition were associated with a more negative stereotype. The results are discussed in terms of their potential to advance understanding of the definition and measurement of a stereotype and in terms of theories of sex-role stereotyping. The

practical implications of the research for human resource management in organizational settings are also discussed.

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Table of Contents

List of Tables

Chapter I

Introduction

A stereotype may be defined as: "A structured set of beliefs about the personal attributes of a group of people" (Ashmore & DelBoca, 1979, p. 222). The first purpose of this research was to determine whether there is evidence for a stereotype of computer programmers by those who are not in the occupation. In addition, the research was concerned with documenting differences in the descriptive and evaluative components of the stereotype by sex of target and/or observer, and describing the relationship between the evaluative component and social structure variables that have been shown to be modifiers of stereotype valence.

Overview

The first chapter discusses the rationale for the selection of computer programmers as the subject of this study. In the second chapter, hypotheses are formulated in the context of the relevant research on (a) the definition and measurement of a stereotype, (b) popular stereotypes of computer programmers, (c) sex role stereotypes, and (d) social structure variables, that is, frequency of contact, cooperation, competition, and status differences between target and

observer. The methodology and results are described in Chapters III and IV. The last chapter presents a discussion of the theoretical, methodological, and practical implications of the results.

Computer Programming as an Occupation

In the last few decades, the proliferation of the computer has spawned a relatively new but rapidly growing occupation--that of computer programming. As of 1987, there were 479,000 computer programmers in the United States (U.S. Bureau of the Census, 1987). The current demand for computer programmers exceeds their availability ("The capture, care and cost," 1980; Freedman, 1981) and this need is expected to surge ("Career prospects," 1984; Fowler, 1986; Dertouzos, 1984). In response to this need, the number of computer programmers is expected to increase by 70% by the year 2000 (U.S. Bureau of the Census, 1987). Furthermore, there is a prediction that computers will be the leading business in the 1990's (McClellan, 1984).

Anecdotal Evidence of the Stereotyping of Computer Programmers

Computer programmers appear to be the object of stereotyping by those who have worked in the computer field but are not themselves programmers. For example,

one president of a computer services consulting firm wrote:

> The personality traits of the average programmer almost universally reflect certain negative characteristics. The average programmer is excessively independent--sometimes to the point of mild paranoia. He is often egocentric, slightly neurotic, and he borders upon a limited schizophrenia (Brandon, 1968, p. 332).

More recently, one computer consultant-manager-teacher stated:

> DP [data processing] people . . . are quite different from other professionals . . . . DP people are loners . . . who would rather work with machines than with other people. DP people are creative and intelligent, but are often prima donnas . . . . DP people have huge egos that sometimes get in the way of getting the job done (Slaughter, 1982, p. 15).

Other observers who have published their opinions about computer personnel have either themselves expressed simiar views or have commented on the tendency to stereotype programmers (Bolter, 1984; Norman, 1984; Rosenberg, 1986; Sandberg-Diment, 1986; Turkle, 1984; Weizenbaum, 1976).

Implications of a Stereotype of Computer Programmers

It is generally acknowledged that computer programmers must be highly skilled (Burton, 1982; U. S. Department of Labor, 1977; Freedman, 1983; Hamblen, 1973; McClellan, 1984; Rosenberg, 1986; Sippl, 1966). Therefore, it is not surprising that the popular

stereotype includes such positive terms as intelligent and creative.

The inclusion of blatantly pejorative terms, however, such as egocentric and neurotic, may have unfortunate implications. For example, potentially suitable candidates for the occupation may decide against programming as a career because of the fear of being negatively stereotyped.

The relationship between programmers and their non-programmer co-workers may also be adversely affected by unfavorable perceptions. Contrary to popular belief, the nature of the programmer's job involves a significant degree of interaction with others ("The capture, care and cost," 1980; Bolter, 1984; Shneiderman, 1980; Weinberg, 1971). During many phases of a project, programmers must interact with users, computer operators, and managers. If these non-programmers tinge their purported admiration of the programmers's skills with a certain disdain, productivity may suffer.

It is also possible that negative stereotypes contribute to the oft-cited conflict between programmers and non-programming personnel within the same organization (Beeler, 1982; Lasden, 1981; Slaughter, 1982). On the other hand, those who blame

programmers for the conflict might, according to balance theory, seek a justification for their position by imputing negative characteristics to them. As Darley and Fazio (1980) have pointed out, a self-fulfilling prophecy may be created whereby group members who are the object of stereotyping internalize these attitudes and behave accordingly in subsequent interactions with the perceivers. A vicious cycle may therefore be sustained.

Purposes of the Present Research

Consequently, it seemed worthwhile to ask the following questions about the apparent stereotype of computer programmers.

1. Is it pervasive among the general population, or is it confined to the personal opinions of a handful of "experts"?

2. Insofar as perceptions of others are primarily evaluative in nature (Osgood, Suci and Tannenbaum, 1957), can the valence of the stereotype (i.e., its positive and negative aspects) be ascertained?

3. Are there factors in the relationship between programmers and non-programmers that might account for whether the stereotype is predominantly favorable or unfavorable?

4. Does the same stereotype apply to both male and female programmers? Although the occupation was once almost exclusively male, the percentage of females has increased to 34% of those in the field (U.S. Bureau of the Census, 1986). Is the stereotype of female programmers qualitatively and evaluatively different from that of male programmers?

5. Does the stereotype of male and/or female programmers differ according to the sex of the perceiver?

There has been virtually no systematic research to answer these questions; most of the evidence is anecdotal. One recent study by Matheson and Strickland (1986) asked subjects to compare computer scientists (a broader category than computer programmers) with university students on a number of traits and values. By using pre-established measurement devices, however, they precluded the inclusion of many of those traits specifically mentioned in the anecdotal literature (e.g., misfit, logical, cold, competent, creative, egotistical.) Although the researchers did find that computer scientists were seen as more technically oriented, less socially oriented, and less concerned with humane values than university students, the generalizability of the results may be compromised by

the choice of a such a limited comparison group. In addition, there was no attempt by Matheson and Strickland to answer any of the other questions mentioned above.

The purposes of the present research were, therefore, as follows:

1. To ascertain the pervasiveness of the popular stereotypes of computer programmers among a sample of non-programmers.

2. To quantify the valence of the stereotype.

3. To determine whether the sex of the target group and/or the sex of the observer has a bearing on the nature of the stereotype.

4. To determine whether the favorability or unfavorability of the stereotype is related to aspects of the social structure (i.e., frequency and type of interpersonal contact, status differential, a cooperative or competitive environment) that have been shown to be relevant to the stereotyping of other social categories.

In the next chapter, specific hypotheses are presented in the context of the empirical research on the stereotypes of computer programmers and other target groups, and the theoretical and methodological issues surrounding the stereotyping phenomenon. In

addition, there is a discussion of research in each of the following areas: (a) attitudes toward computers, (b) sex-role stereotyping as it pertains to possible differences in the perceptions of male and female programmers, and (c) the effect of social structure variables on the valence of a stereotype.

Chapter II

Stereotypes: A Review of the Relevant Research and the Formulation of Hypotheses

Background

Ever since 1922, when Walter Lippmann described stereotypes as "pictures in our heads," (Lippmann, 1922), social psychologists have been preoccupied with the study of stereotypes and the variables that affect their nature. Early investigations of stereotyping focused on the study of prejudice against ethnic and racial groups, especially Blacks. The emphasis was on determining which factors might be responsible for promoting favorable attitudes between groups whose interpersonal relations were characterized by conflict and unfavorable perceptions in the form of negatively biased stereotypes (Allport, 1954; Deutsch & Collins, 1951; Wilner, Walkley & Cook, 1952).

The scope of these investigations has since been broadened to include the study of attitudes toward other significant social groups: males and females (Bem, 1974; Broverman, Vogel, Broverman, Clarkson & Rosenkrantz, 1972; Spence & Helmreich, 1978), homosexuals (Kite & Deaux, 1987), the physically handicapped (Katz, 1979), the poor and the mentally ill

(Kerbo, 1976; Miller, 1982), and occupational groups such as the police (Lefkowitz, 1975, 1977; Niederhoffer, 1967; Rotter & Stein, 1971).

Most recently, cognitive psychologists have proposed that stereotypic attitudes may result from the assignment of individuals to social categories that have been made salient, as, for example, through experimental manipulation (Ashmore & DelBoca, 1979, 1981; Fiske & Taylor, 1984; Hamilton, 1976, 1981; Tajfel, 1982). According to Hamilton, "Stereotyping thus begins with the differential perception of social groups. If a perceiver differentially evaluates two groups--either two groups which he is not a part of or his own versus some other group--then the particular content of those evaluations provides the basis for stereotypic conceptions" (1976, p. 83).

The Functional Value of Stereotypes

Stereotypes provide the framework for much social interaction. As Campbell (1967) has pointed out, perceivers pay selective attention to surrounding stimuli and organize stimulus objects (including people) into groups for the purpose of "simplifying a complex world" (p. 86). The mental classification of another human being is a way of making a probabalistic judgment that the other has certain characteristics and

can be expected to behave toward the observer in a predictable manner (Ashmore & DelBoca, 1979). The ability to draw immediate, seemingly rational, perhaps overcautious inferences on the basis of social categorization alone may have evolved as a survival mechanism.

Some authorities have argued that stereotypes have predictive power insofar as beliefs about traits may be extended in cognition to beliefs about the nature of the behavioral interaction between target and observer. In a study by Andersen and Klatzky (1987), subjects made many rich associative links when asked to assign traits to selected social or occupational categories. These links extend to features of the target other than psychological attributes, for example, physical characteristics and overt behavior. The authors pointed out that, while non-redundancy of traits among different social categories purportedly increases the power to predict behaviorial interaction with the stereotyped group, "social stereotypes may be highly overlapping and yet predictively distinct" (p. 236).

The Definition of a Stereotype

Many critics have noted that research has been conducted on stereotypes without a clear definition of the term (Ashmore & DelBoca, 1981; Brigham, 1971, 1973;

Jackman & Senter, 1980; Jones, 1982; Hamilton, 1981; Mackie, 1973; McCauley, Stitt, & Segal, 1980; Miller 1981, 1982; Stephan & Rosenfield, 1982). Several questions, therefore, may be asked about the definition of a stereotype.

Are stereotypes inherently unfavorable? Since much stereotype research has had its origins in studies of prejudice, the notion of negativity became intertwined with the definition of a stereotype. Prejudice by definition is an adverse perception of a social group or individual as a member of a social category. Mackie (1973) has noted that Katz and Braly (1935) set the stage by defining prejudice as "a set of stereotypes" (Mackie, 1973, p. 436).

Peabody (1970) has argued that the "prevailing emphasis on evaluation was due to a failure to separate systematically the evaluative and descriptive aspects that are confounded in most traits used to judge personality" (p. 639). Fishbein and Azjen (1972) reserved separate terms, attitudes and beliefs, respectively, to describe these components of social perception. The evaluative component of a stereotype refers specifically to its valence; each trait may be said to occupy a position on a continuum (from favorable to unfavorable, positive to negative,

desirable to undesirable). The descriptive component refers to the semantic property of the trait names irrespective of their valence. Some researchers have successfully demonstrated that descriptive and evaluative dimensions of traits in person perception are orthogonal (Edwards, 1969; Felipe, 1979; Rosenberg & Olsham, 1970), but this distinction has rarely been preserved in the study of specific target groups.

The cognitive processes underlying the formulation of stereotypes have recently been shown to be no different from those governing other information processing mechanisms (Ashmore & DelBoca, 1981; Jones, 1981; Hamilton, 1981). This reconceptualization all but strips away completely any notion of negativity inherent in earlier definitions of stereotypes. Most contemporary researchers, therefore, have tended to agree that it is more parsimonious to avoid an assumption of unfavorability when defining or conducting research on stereotypes (Mackie, 1973; McCauley et al., 1980; Rhinelander, 1977-1978; Stephan & Rosenfield, 1982). The relative positivity or negativity of perceptions of a social category should be an empirical question to be investigated and not an a priori assumption. The present study, therefore, has concerned itself with perceptions of computer

programmers without presupposing they are necessarily pejorative in nature. Lefkowitz (1975) has pointed out that research on the police, for example, has suffered from an assumption that comparisons between the personality of police and the rest of the population are implicitly pejorative.

Are stereotypes inherently false? In his classic treatise, The Nature of Prejudice, Gordon Allport (1954) stated, "Some stereotypes are totally unsupported by facts; others develop from sharpening and overgeneralization of facts" (p. 186). Since then, researchers have differed in the extent to which they believe stereotypes are valid, that is, have a kernel of truth; some hold that the degree of congruence between the content of the stereotype and actual traits is a function of other variables such as exposure to the target group (e.g., Campbell, 1967). In a review of the literature, Mackie (1973) observed that degree of accuracy is a relatively unexplored variable; she concluded: "Validity is a variable and research is required to establish its correlates. Retention of statements pertaining to accuracy in definitions of stereotypes is, therefore, inappropriate" (p. 435). It is not within the scope of the present study to ascertain whether the stereotype of computer

programmers has any validity; this is an important question to be addressed by future research.

How much consensus should there be about the traits? The adjective checklist method, originally used by Katz and Braly (1935) has pervaded the research on stereotypes and has been criticized on several grounds--one of which is that traits selected by only a small percentage of observers have sometimes been included in the stereotype of a particular social group (Mackie, 1973). Although it is generally agreed that consensus or agreement by a substantial percentage of observers should be a criterion for the inclusion of a trait in the stereotype (Ashmore & DelBoca, 1979, 1981; Brigham, 1973; Mackie, 1973; McCauley & Stitt, 1978; McCauley et al., 1980; Miller, 1982; Wuthnow, 1982), the lower limit has not been determined.

The distinction has been made between a social (or cultural) stereotype, which emphasizes the degree of consensus (Ashmore & DelBoca, 1979; Karlins, Coffman and Walters, 1969), and a personal stereotype, that is, a single individual's set of trait ascriptions to the target group. In the present study, both aspects are of importance: intersubject agreement concerning the traits that distinguish the target group from the general population, and individual differences in

stereotyping insofar as they relate to other variables in the observer-target interaction.

Summary. A definition of a stereotype has evolved that eliminates any inherent notions of negativity and falsity. Mackie (1973) has proposed the following: "A stereotype refers to those folk beliefs about the attributes characterizing a social category on which there is substantial agreement" (p. 435). While recognizing that many researchers have incorporated a reference to consensus, Ashmore and Delboca (1979) have offered the most neutral and parsimonious definition: "A structured set of beliefs about the personal attributes of a group of people." (p. 222).

The Measurement of a Stereotype

In her extensive review of the research on stereotypes, Mackie (1973) reported that the adjective checklist was the most frequently employed measure. Observers have traditionally been asked to indicate those traits that they feel describe the target group. The limitations of this approach include (a) the inability of the observer to indicate the degree to which a particular trait is characteristic of the target group, (b) the difficulty of establishing a lower limit of consensual endorsement in order to determine the "cultural" stereotype, and (c) the lack

of a comparison population against which the relative presence or absence of a trait may be predicated.

The diagnostic ratio. Recently, a method has been introduced that is supposed to rectify these shortcomings. The diagnostic ratio, based upon Bayes' rule, is a measure of the probabilistic prediction that a trait is more, or less, characteristic of a group than of a comparison population (McCauley & Stitt, 1978; McCauley et al., 1980). The probability of a characteristic belonging to group A relative to the probability of the trait existing in general may be formulated as follows:

p (characteristic among the target group)

divided by

p (characteristic among the comparison group)

where p equals the probability estimate.

Each subject is asked to indicate the percentage of both the target group and the comparison group who possess the trait. Every trait whose mean diagnostic ratio is significantly different from 1.0 in either direction is considered a "differentiating" trait since it successfully distinguishes the target group from another group or the population at large. The stereotype is said to consist of all such traits. For example, if on the average a group of observers feel

that both 30% of acrobats and 30% of the population in general are generous, the mean diagnostic ratio is 1.0. Hence, there is no basis for thinking that the trait generous is part of a stereotype of acrobats. However, if on the average 60% of acrobats and 30% of the general population are seen as athletic, the mean diagnostic ratio is 2.0. If the difference is statistically different from 1.0, the trait athletic may be said to differentiate acrobats from the population in general, and therefore may legitimately be called stereotypic.

Ashmore and DelBoca (1981) have pointed out that "differentiating traits, even if they tend to be ascribed with a relatively low degree of frequency, should be regarded as elements of a stereotype" (p. 20). An example should illustrate: on the average, observers may feel that the percentage of the general population who have the trait dirty is 5%, but that 10% of the target group has this trait. In this case the mean diagnostic ratio equals 2.0. Even though a relatively small percentage of the target group is seen as having this trait, if the difference is statistically different from 1.0, dirty can be viewed as a stereotypic trait.

McCauley et al. (1980) have reported that

observers have no trouble in estimating probabilities as percentages. Recently, researchers in the area of sex role stereotypes have demonstrated that observers can successfully generate a probabalistic estimate when asked to contrast a subcategorical target population (e.g., employed males or employed females) with the superordinate category of males or females in general (Deaux & Lewis, 1984; Eagly & Steffen, 1984; Eagly & Wood, 1982; Locksley, Borgida, Brekke, & Hepburn, 1980).

Traditional measures of stereotyping assumed that observers make categorical, unqualified trait ascriptions (e.g., all Blacks are "athletic"). However, when observers are asked to assign a trait to a percentage of the target population, very few assign the trait to 100% of the target group (Brigham, 1973; Broverman et al., 1972; Jackman & Senter, 1980; McCauley & Stitt, 1978).

There are alternative methods of determining the degree to which a trait applies to a particular social group. For example, observers may be asked to use a continuous rating scale to indicate "how much" of each trait applies to a "typical" member of the target group. Although this method also permits observers greater differentiation in their responses, it suffers

from the assumption that observers assign the same amount of the trait to all members of the target group.

A study of sex-role stereotypes that compared the two methods (percentage ratings versus continuous trait rating scale) demonstrated that they generate similar results (Eagly & Steffen, 1988). Because the percentage method has been successfully used in recent research on stereotypes of specific target groups and because percentages are integral components of the diagnostic ratio as conceived by its designers, it is the method of choice in the present research.

The diagnostic ratio represents a substantial improvement over the trait check list method in the following respects:

1. Degree of stereotyping may be determined by examining the amplitude of the diagnostic ratio and the strength of the significance of the difference from 1.0 for each trait. That is, is the target population perceived as only slightly distinct or extremely distinct from the general population with respect to a trait?

2. An intrasubject stereotyping score may be obtained by calculating the diagnostic ratio for each trait for each subject.

3. Although the diagnostic ratio does not directly

address the issue of the lower limit of consensus with respect to the direction of the trait, it has a built-in control: large variances in responses would preclude the ratio from attaining significance.

4. Comparisions between the target and other groups are possible with respect to the same traits.

5. The evaluative dimension of the stereotype may be computed by multiplying the diagnostic ratio by the desirability rating of the trait.

Nevertheless, the diagnostic ratio is a relatively new method that has not yet been adequately "debugged"; in the present study, there were some unanticipated difficulties with its calculation as initially proposed by its developers. These are discussed in the Method Section of Chapter III.

Because of these problems with the diagnostic ratio, another index was also used, namely a statistical test of significance of the <u>difference</u> between the means of the percentages. The difference method preserves all of the advantages of the diagnostic ratio.

Previous research has not established a lower limit on the number of traits that may be said to constitute a stereotype. In the present study, it was anticipated that a stereotype of computer programmers

would consist of an indeterminate number of traits that distinguish them from the general population. Before a hypothesis concerning specific traits is presented, it is necessary to explore the nature and possible origins of the popular stereotypes of computer programmers.

Popular Stereotypes of Computer Programmers and Speculations about Their Origins

What are the components of the popular stereotype of computer programmers, and where do they come from? Consideration of published descriptions of programmers reveals that the traits ascribed to them fall into three main categories: competence, psychological abnormality, and social deviance. This material will be reviewed below.

There are at least two possible origins of these stereotypic traits. One is that the traits ascribed to members of an occupation come from the requirements of the job being performed. For example, Lefkowitz (1975) has observed that perceptions of the police personality (positive and negative) are almost certainly derived from beliefs about the nature of the job. The second possibility is that attitudes toward programmers reflect attitudes toward computers. For this reason, a brief review of attitudes toward computers will also be

presented.

Competence. The typical computer programmer has often been described as competent, intelligent, logical, perfectionistic, diligent, or creative (Bolter, 1984; McClellan, 1984; Rosenberg, 1986; Turkle, 1984). These traits have generally been associated with successful fulfillment of job requirements (Dickman, 1971; Occupational outlook handbook, 1982-1983); Slaughter, 1982; Tharrington, 1982; Weinberg, 1971). To the extent that observers have even a superficial comprehension of the job requirements, it is reasonable to assume that there is a high probability that they will ascribe a relatively favorable cluster of competence-related traits to programmers.

Although the accuracy of the stereotype is not a concern of the present study, it may be of interest to consider whether programmers do indeed have a competence-related cluster of traits that distinguish them from the general population. Although there do not appear to be any formal studies that document IQ among computer professionals, Weinberg (1971) has speculated that "the average programmer's IQ is well above the average" (p. 161). Furthermore, programmers have been shown to score high on achievement-related needs (Cross, 1970, 1971; Fitz-enz, 1978; Guarino,

1969; Willoughby, 1970).

Psychological abnormality. As noted earlier, Brandon (1968) described computer programmers as "slightly neurotic" and bordering upon a "limited schizophrenia." In an article in The New York Times, Reinhold (1984) quoted one (unidentified) computer authority as saying: "Some [programmers] are close to sociopathic personalities" (p. A17). Others have observed that members of the occupation are often perceived as eccentric or psychologically impaired, and as having an all-consuming obsession with the computer (McClellan, 1984; Rose, 1982; Rosenberg, 1986; Turkle, 1984; Weizenbaum, 1976). No systematic empirical evidence is cited to support any of the observations.

With respect to the issue of the validity of this aspect of the stereotype, thus far there has been no empirical evidence to substantiate a stereotype of mental disturbance among computer programmers. Although he did not obtain direct measures of psychological abnormality, Willoughby (1972) found a pattern of interests among data processing professionals that had been shown by previous research to be either unrelated or inversely related to the MMPI Paranoid, Schizoid, and Psychological Deviation scales.

What is the source of the stereotype of

psychological dysfunction among computer programmers? In her speculations about computers and computer programmers at M.I.T., Turkle (1984) stated that the image of programmers may be constructed around a "stereotype" of the computer that has been viewed in terms of "ugliness" and "perversion."

Social deviance. Shneiderman (1980) stated that the image of the programmer as an introverted "loner" intensely at work and impervious to others is "becoming only a wild caricature of reality" (p. 24). Unfortunately, this contention appears to be premature. Slaughter (1982) labelled them as "loners." In his article in The New York Times, Reinhold (1984) quoted one computer "authority," (the same person who saw computer programmers as mentally disturbed): "Computerists and programmers tend not to relate well to other people" (p. A17). Norman (1984) described a sporadic nightmare in which he is held hostage by his programmer-captors who chant in incomprehensible languages; he asks why they are unable to write programs accessible to "normal" folks. The terms "hacker," "computer addict," and "computer jock" have entered the vocabulary to describe the computer programmer who is perceived to be a socially backward recluse who would rather converse with computers than

with other human beings (Bolter, 1984; Fitz-enz, 1978; Ingber, 1981; Norman, 1984; Peter, Adams, Kanefsky, Crispin, Kudlac, & Johnson, 1980; Rosenberg, 1986; Turkle, 1984; Weizenbaum, 1976).

There is little evidence, however, to support a stereotype of social deviance. Although some researchers have found that computer programmers have a lower need for social interaction than others, whether work-related (Cross, 1970) or non-work-related (Cannon & Perry, 1966; Couger & Zawacki, 1980), the results do not support the conclusion that programmers are social isolates. The means for programmers are generally at the mid-point of the scales.

Is a stereotype of social deviance among computer programmers potentially accurate? Interestingly, computer programmers have been shown to place a great deal of importance on interpersonal relationships both on and off the job (Deutsch, Shea, & Evans, Inc., 1979; Fitz-enz, 1978; Willoughby, 1972). Moreover, although programmers do spend much time working alone when writing and debugging programs, they are most often part of a team that consists of both programmers and non-programmers (Bolter, 1984). Although Matheson and Strickland (1986) found that computer <u>scientists</u> are perceived as "introverted and not oriented toward

social activities," (p. 23), computer science students rated themselves as more people oriented than they rated the target group. The stereotype of computer programmers that includes a social deviance factor may reflect an exaggeration on the part of observers of their perception of a moderate tendency for computer programmers to differ from the general population on social need strength.

Miscellaneous traits. Because of the demand for their talents, programmers command high salaries. They have been accused of self-centeredness and disloyalty, and of "blackmailing" their employers by threatening to abandon projects for higher salaries elsewhere (Brandon, 1968). High turnover among computer programmers has been documented (Bartol & Martin, 1983; Deutsch, Shea & Evans, Inc., 1979). Therefore, it would not be surprising if the stereotype of computer programmers includes traits such as materialistic, egocentric, and immodest.

Summary. Although computer programmers have been described in the popular literature in relatively favorable terms with respect to intelligence and competence, they are viewed negatively in terms of psychological and social adjustment. Although the validity of the stereotype is not of primary interest

in the present study, there appears to be some evidence to support a stereotype of technical proficiency. The evidence does not support a stereotype of psychological maladjustment and social deviance.

Attitudes Toward Computers

Many have observed that it may be assumptions about computers themselves that are responsible for the frequent depictions of the programmer as an asocial wizard attached to his or her computer, somehow assimilating through osmosis the attributes of an intelligent and efficient, yet cold and impersonal machine (Bolter, 1984; London, 1976; Rosenberg, 1986). Let us examine the research in this area.

Chapanis (1982, 1984) described a factor-analytic study of attitudes toward computers that demonstrated that two independent factors account for much of the variance: the first, a favorable set of words that include the terms "efficient, precise, reliable, dependable, effective, systematic, fast, organized and cooperative"; the second, a negatively charged cluster encompassing the terms "dehumanizing, depersonalizing, impersonal, cold, unforgiving" (p. 108). In a similar vein, Turkle (1984) has noted that the computer is perceived not only as powerful and exciting, but also as threatening. Rosenberg (1986) has also pointed out

that people respond to computers with a mixture of infatuation and fear; computers are seen simultaneously as "amazing" and "dehumanizing." Furthermore, he presented evidence to show that these attitudes have not changed over the last two decades.

Heider (1958) proposed that there may be an associative link between objects that appear together; his balance theory would support the notion of congruence between attitudes toward computers and attitudes toward those who choose to work with them. To the extent that the computer is seen as having superhuman powers, the programmer by logical extension may be viewed as intellectually gifted. To the extent that the computer is perceived to be dehumanizing, programmers may be viewed as somehow inhuman or socially insensitive.

Orcutt and Anderson (1977) showed that subjects who played a game with a computer subsequently transferred a "dehumanized" approach to a human opponent. On the other hand, Scheibe and Erwin (1979) found that subjects had a tendency to address the computer in personal terms. If the boundaries between the machine and the person are perceived to be so fluid, it is possible that people may deliberately or unconsciously extrapolate from computer to computer

programmer.

The previous discussions of the processes that determine stereotyping and the published anecdotes specific to computer programmers led to the expectation that the present study would find evidence of stereotyping of computer programmers by non-programmers. Observers have been shown to have formulated stereotypes of other occupations (Brooks & Friedrich, 1970; Rotter, 1982; Rotter & Stein, 1971; Ryckman, Johnson, Jackson, Unsworth & Morganti, 1980; Skevington, 1981). It is likely that opinions have also been formed about the attributes of computer programmers.

From a purely cognitive point of view, the mere categorization mechanism by which an individual is classified as a computer programmer may be sufficient to arouse a stereotypic response. Fiske and Taylor (1984) have suggested that observers use a schema to make inferences about a categorical person. By schema these authors mean a pre-established script or scenario that contains a network of interrelationships among traits, events, and physical objects. It is likely that the label "computer programmer" evokes a schema in cognition such as a visual scene of a person sitting at a terminal writing a program, or an image that

emphasizes physical appearance, or some other mental representation depending on the individual experiences of the observer. Fiske and Taylor (1984) have stated, "Once a person is categorized . . . the stereotypic content of the schema is likely to apply" (p. 160). Furthermore, observers may make "rash predictions" about the target and have exaggerated positive and negative responses to the target when even scant information about the target is involved, since the schema in effect takes over from the stimulus person.

Do Stereotypes of Male and Female Programmers Differ?

One of the purposes of the present research was to determine whether male and female programmers are perceived as having different characteristics from each other. The female programmer has been almost totally ignored; in general, researchers have studied only male programmers or have eliminated females from the analyses even when they did collect data on them (Barnes & Gotterer, 1971; Cannon, 1965; Cannon & Perry, 1966; Cross, 1970, 1971; Perry & Cannon, 1967; Willoughby, 1972). Matheson and Strickland failed to distinguish male and female targets in their study of the stereotype of computer scientists.

Perhaps this neglect of the female programmer as an object of systematic study exists partly because

computer programming has traditionally been a male-dominated occupation. When the field was in its infancy, the ratio of males to females was 10:1 (Dickman, 1972). During the 1970's, the percentage of females rose to no more than 15-20% (Dicesare, 1975; Deutsch, Shea, & Evans, Inc., 1979). Turkle (1984) has observed that the computer world is male and that there are few female "hackers." Scheibe and Erwin (1979) found that subjects who played games with computers gave spontaneous verbal reactions containing only male terms of address. Most of those who have stereotyped programmers in the popular literature have used or implied the male personal pronoun.

We may no longer ignore female computer programmers or attitudes toward them. Recent estimates show that the percentage of females in the occupation has increased to 34% (U.S. Bureau of the Census, 1987). Several researchers have pointed out that programming is an occupation in which women have performed as successfully as males, and that has readily accepted females into its ranks (Dickman, 1971; Wallace, 1965). (See Rosenberg, 1986 for an alternate viewpoint.) In addition, many companies such as IBM encouraged women to enter the field when it was young ("The capture, care and cost," 1980). Several researchers have called

for more research on females in the computer field (Lockheed, 1985; Wilder, Mackie & Cooper, 1985).

What little documentation exists on perceptions of the female programmer is anecdotal in nature. Weinberg (1971) observed that females on the programming team are more often assigned the role of "[group] maintenance specialist" or "team-mother" rather than "task specialist." He also described an informal study by one of his female students on the attitudes toward women programmers by the men in her project team. Men tended to "belittle" the work done by females, and tended to interpret on-the-job behavior of males and females differently: females in dialogue with other females were engaging in "gossip"; among males, it was perceived as "business," despite the content of the conversation (p. 111). Since the possibility exists that the stereotype of male and female programmers may differ from one another, a decision was made to separate male and female targets in the present study.

Based upon the previous discussion a first hypothesis was therefore formulated:

Hypothesis 1a: The stereotype of computer programmers consists of a number of traits which distinguish male computer programmers from males in general, and female computer programmers from females in general.

More specifically, it was anticipated that the traits comprising the stereotype would reflect (a) the attitudes expressed by observers toward computers (Chapanis, 1982, 1984), (b) the traits attributed to computer programmers as expressed in the anecdotal literature, and (c) to some extent the traits and values ascribed to the computer scientist (Matheson & Strickland, 1986). It was expected that observers would assign significantly higher percentages to male and female programmers than to males and females in general on a subset of the following traits:

intelligent	independent
creative	perfectionistic
diligent	logical
proud	aggressive
dominating	shrewd
level-headed	cold
unconventional	misfit
eccentric	neurotic
anti-social	quiet
shy	dull
lonely	egotistical
pompous	opinionated
selfish	materialistic

It was expected that observers would assign significantly lower percentages to male and female

programmers than to males and females in general on a subset of the following traits:

incompetent	short-tempered
temperamental	touchy
emotional	realistic
normal	likeable
popular	witty
interesting	cultured
modest	childish

Assuming that a stereotype is demonstrated, one may ask whether the pattern and number of traits that differentiates male programmers from males in general is the same as that which distinguishes female programmers from females in general? How pejorative are the perceptions of female programmers relative to male programmers? Before specific hypotheses are presented, it is important to review the research on sex role stereotypes.

Sex Role Stereotypes

The bulk of this research has revealed that males are generally described as having "agentic" traits, that is, assertive, independent, dominant, active, logical, ambitious, and competitive, while females have usually been viewed as having "communal" traits, that is, emotionally expressive, dependent, concerned with others (Broverman et al., 1972; Spence & Helmreich, 1978).

Many researchers, however, have presented evidence in support of a theory that social role information

about a target is a strong modifier of traditional sex role stereotyping (Deaux & Lewis, 1984; Eagly & Steffen, 1984; Eagly & Wood, 1982; Kalin & Hodgins, 1984; Locksley et al., 1980). Stereotypes of social (and other) categories may be viewed as prototypes in a hierarchy of nested categories (Brewer, Dull & Lui, 1981). Gender is considered a superordinate category and employed male or employed female a subcategory, for example. In the absence of specific information about a stimulus person at the subcategory level, gender alone would be used to make inferences about traits. The more meaningful and reliable perceptions, however, are at the subcategory level whose boundaries are "less fuzzy" and the prototypic instances (actual or imaginary) of members of that category more readily represented in cognition.

Although Deaux, Winton, Crowley and Lewis (1985) recently found questionable support for the hierarchical model, they did find that the ratings of females with specific role information diverged more from the superordinate gender category than did the male subtype. In general, the traits associated with employed females have been seen as consistent with the traditional sex-role stereotype of males, especially with respect to competence and leadership (Durkin,

1985; Etaugh & Petroski, 1985; Geis, Brown, Jennings & Corrado-Taylor, 1984; Shinar, 1978). This phenomenon has also been observed in research on medical students (Juran, 1979), scientists (Spence & Helmreich, 1978), managers (Deaux, 1979; Schein, 1973), and on engineering college majors (Rotter, 1982).

Therefore, assuming that the stereotype of computer programmers is consistent with this pattern of results, the following hypothesis was formulated:

Hypothesis 1b: Female programmers differ from females in general on a greater number of traits than male programmers differ from males in general.

In addition to a prediction of sex differences in the number of differentiating traits, a prediction may also be made with respect to the evaluative dimension of the stereotype. Despite the finding that specific case information modifies traditional sex roles, many researchers have observed that males are still perceived to have significantly more ability than females, especially on tasks that are sex-typed as masculine (Deaux & Emswiller, 1974; Deaux & Farris, 1977). As Smith (1976) and Stein and Bailey (1973) have noted, there appears to be a cultural stereotype of lesser female competence in achievement situations. Not only are females viewed as less competent than

males, they are also viewed less favorably with respect to other traits. Males in general have been seen as possessing more socially desirable characteristics than females (Broverman et al., 1972). More recently, Shapiro and Shapiro (1985) found that the traditional female did not differ from the traditional male on the number of positive and negative traits subjects used to describe them. Nevertheless, they did find descriptive distinctions between the traditional male and female targets.

There appear to be strong taboos against violating sex role boundaries by engaging in activities or occupations that are heavily populated by the opposite sex (Epstein, 1970; Schein, 1973; Stein & Bailey, 1973; Tresemer & Pleck, 1976). The negative consequences for women entering predominantly male occupations have been documented: being labeled by society and/or male colleagues as deviant, and reacted to with hostility, discomfort, ambivalence, or even indifference, as if to deny their presence (Gutek & Cohen, 1987; Kanter, 1977; Tresemer & Pleck, 1976). Some research has shown that females in typically male scenarios are perceived as less likeable (Rotter, 1982), more formidable (Tresemer & Pleck, 1976), less dependable and less able to cope with crises (O'Leary, 1974), less attractive (Rotter,

1982), and less well-adjusted interpersonally (Shinar, 1978) than females in general. Females may internalize these attitudes and otherwise avoid these occupations for fear of social sanctions (Deaux, 1979; O'Leary, 1974; Schein, 1973). The impact on males is equally unfortunate: as more women do enter a predominantly male occupation, the males in that occupation are likely to be viewed as less masculine (Tresemer & Pleck, 1976).

Epstein (1970) and Schein (1973) noted that an occupation is sex-typed when a high proportion of those in it are of one sex and there is an expectation of the appropriateness of sustaining the status quo. Although Epstein (1970) observed that computer programming is an occupation that is not sex-typed, Gutek and Cohen (1987) in their research have classified an occupation as male-dominated if it is at least 65% male. If the occupation is sex-typed as male, is the female programmer viewed more negatively than the male programmer, and as substantially deviant from the female population in general? While the bulk of the evidence points to the probability that she will be viewed as highly competent, and as possessing "agentic" traits, she may also be seen as less likely to possess those positively valued traits seen as typical of

females in general. Therefore, an hypothesis implicating the evaluative component of the stereotype was formulated as follows:

Hypothesis 2: Male programmers are seen as having a more positively valued stereotype on average than female programmers.

Differences by Sex of Observer

Are there differences in stereotyping with respect to sex of observer vis a vis target group? As previously mentioned, the only study to date that assessed stereotypes of computer personnel did not collect data by sex of observer (Matheson & Strickland, 1986).

Ashmore and DelBoca (1979) found that sex of target was a more "powerful construct" for males than for females. On the other hand, Collis (1985) has shown that female high school students are more apt than males to have stereotypes of computer users.

With respect to the valence of the stereotype, some research has shown that males have more negative stereotypes than females. Morris and Williamson (1982) reported that males had more negative attitudes toward the poor than did females. The men in a Welsh community who expressed negative views of Italians outnumbered females by a ratio of four to one

(Chadwick-Jones, 1962). Males have been shown to rate employed female targets less positively than female subjects (Etaugh & Petroski, 1985). Males have also been shown to give less favorable ratings than female observers to both male and female stimulus persons whether in a sex-typed or sex-atypical occupation (Etaugh & Stein, 1984).

On the other hand, females have been shown to generate more negative reactions than males to female targets. Denmark (1980) found that females rated an outspoken women professor more negatively than did males. A study by Durkin (1985) showed that females gave less favorable ratings than males to female weather forecasters; they also viewed female targets less favorably than male targets. Although male subjects were not employed as a comparison group, female prejudice against aspiring women (Pheterson, Goldberg, & Kiesler, 1971) and professionally competent women (Goldberg, 1968) has been demonstrated. Pheterson et al. (1971) and Ward (1981) have suggested that this phenomenon occurs selectively, that is, when female expertise is seen as threatening. Males may be just as prejudiced against competent females under conditions of threat. For example, Hagen and Kahn (1975) demonstrated that males liked competitive

females more when observing than when interacting with them.

Because of the inconsistency of results in this area, no specific hypothesis was formulated with respect to sex of observer vis a vis target sex. Since it is likely, however, that a stereotype of male and/or female computer programmers differs as a function of sex of observer, the results of the present study have been analyzed according to this variable.

Social Structure Variables

One of the major contributions of research in the area of stereotyping has been the exploration of those variables that affect the nature of the stereotype. The present study has attempted to ascertain the relationship between the evaluative dimension of the stereotype of computer programmers and those aspects of the social structure that have been proposed as predictors of stereotypic attitudes toward other social groups. As some have observed, stereotypes have decidedly social functions and must be studied in the social context in which they are observed (Samuels, 1973; Tajfel, 1982). As a brief review of the stereotype literature will demonstrate, the type and degree of interpersonal contact, the cooperative or competitive nature of the interaction, the perceived or

actual status differential between observers and target groups, have at various times been shown, individually and in interaction, to affect the nature of the stereotypes of many social groups.

The effect of degree and type of interpersonal contact. What is the effect of interpersonal contact on the formulation and persistence of stereotypes? How does this variable affect the evaluative component of the stereotype? Is this relationship strictly linear?

Questions concerning the contact variable have emerged in the context of the study of racial prejudice primarily in an effort (a) to determine the effects of desegregation among Blacks and Whites, and (b) to decrease hostility and increase favorable attitudes between ethnic groups. Early researchers postulated that hostility could be reduced if the unfavorable stereotypes on which it was founded could be altered, purportedly through rectifying the incorrect perceptions arising from lack of acquaintance with members of the disfavored group (Allport, 1954; Norvell & Worchel, 1981; Rose, 1981). The evidence is not consistent, however.

Katz and Braly (1935) found that degree of contact did not have any measurable effect on the content of the stereotype of Blacks. It may be that a sufficient

range of contact, at that time of pre-integration, was not present among their subjects to permit an assessment of the effect of differences in degree of contact between Blacks and Whites.

Allport (1954) reviewed the research available at the time, which showed that different types of contact had different effects on degree of prejudice between Blacks and Whites. Acquaintance lessened prejudice; casual and occupational contact increased prejudice; and residential contact increased hostility but decreased perceptions of unfavorable traits.

In a review of 18 studies of the effects of school desegregation, Stephan (1978) reported that the resulting contact increased prejudice about as often as it decreased it.

What may be said about the effect of contact with respect to the stereotypes of other ethnic groups? Amir, Sharon, Bizman, Rivner & Ben-Ari (1978) found that contact between Jews and non-Jews was associated more with positive feelings than with negative ones. Work contact increased "economic" anti-Semitism among Blacks and reduced it among Whites.

Chadwick-Jones (1962) studied attitudes by Welsh workers toward the Italian minority in the community and found in general that the greater the contact the

more favorable the perceptions. The type of contact had a considerable influence on the nature of the attitude. Those with relatively little contact had indifferent, vague, ambiguous attitudes; those with intermittent or casual contact expressed the most negative feelings; those who had more face-to-face contact both as co-workers and aquaintances had favorable attitudes.

What may be said about the relationship between contact and the stereotyping of occupational groups? Brooks and Friedrich (1970) have reported that those who had direct personal contact with the police (and no history of arrest) had a more positive image of them. Stening, Everett & Longton (1981) found that high contact between expatriate and local managers yielded positive stereotypes of each other on a performance dimension but negative stereotypes on a managerial style dimension.

Therefore, although both the descriptive and the evaluative components of perceptions have some relationship to degree/type of contact, it is not consistent. As many researchers point out, generalizations, even valid ones, will most likely be made by those even with minimal contact with a target group. The stereotype may be based on "intrapsychic"

factors (Campbell, 1967), or on common folklore and mass media (Mackie, 1973; Rose, 1981).

Is there any evidence that contact modifies the stereotype of computer programmers? There appears to be scant research specifically dealing with this occupational group. One study (Lucas, 1974) dealt with attitudes toward computer operators by personnel occupying varying hierarchical rungs within the same organization. The study found that the more contact, the less favorable the attitudes. However, type of contact appeared to relate differentially to attitude. "Voluntary" or "social" contact seemed to be associated with more favorable attitudes, while "forced" contact appeared to generate the opposite effect. If this finding generalizes to computer programmers (or even to other occupational groups), it has serious ramifications insofar as much of the contact between various work groups within the organizational setting can be viewed as involuntary.

In summary, the research to date has failed to demonstrate an unequivocal link between the contact variable and the stereotyping of a target group (Cagle, 1973; Fishbein & Ajzen, 1972; Rose, 1981). Therefore, no simple linear relationship between contact and stereotyping was hypothesized.

The effect of status. Some research has shown that it is lower socio-economic class rather than race that accounts for unfavorable stereotypes of Blacks (Bayton, McAlister, & Hamer, 1956; Feldman, 1972; Kinloch, 1977; Smedley & Bayton, 1978). Other studies have demonstrated the significance of a class factor on attitudes toward Blacks (Rosenfield, Sheehan, Marcus & Stephan, 1981; St. John & Lewis, 1975), toward police (Lefkowitz, 1977; Niederhoffer, 1967), toward Jews (Wuthnow, 1982), toward the poor (Jackman and Senter, 1980; Morris and Williamson, 1982).

Studies whose focus is occupational status in applied settings are relevant to the present research. Occupational categories generally reflect differences in levels of skill, compensation and power; these differences imply a prestige hierarchy or status ranking (Treiman, 1977). MacKenzie (1948) found that white men who had known "unskilled" Negroes as co-workers had less favorable attitudes than those who had contact with Negroes of equal or higher occupational status. Goudy (1971) has pointed out that a general pattern emerges in support of a "self-interest thesis." This theory postulates that beliefs that can be used to justify the existing (socio-economic) distribution are likely to be held most by those at high socio-economic

levels, for example, blaming the target group (poor, Blacks, etc.) for their plight and attributing undesirable personality characteristics to them (Williamson, 1974).

Skevington (1981) found that both lower and higher status nurses assigned a large number of positive characteristics to the higher status group. Part of the interpretation may rest in the desire of the low status nurses to gain entry into the higher status group. When this desire is not present, however, the principle of relative deprivation might operate such that the low status group might assign negative characteristics to the higher status group out of resentment. Tripathi and Srivastava (1981) found that subjects who scored higher on objective measures of relative deprivation assigned more negative characteristics to the outgroup than those who scored lower.

There do not appear to be any studies that directly assess perceptions of the relative status of computer programmers by those either within or outside the occupation. Considering the importance of hierarchical structure within organizations (Treiman, 1977), and the observation that "occupation stands out as the major status determinant in industrialized

societies" (Hall, 1975, p. 242), it is possible that the stereotype of the programmer might differ as a function of the occupational status of the observer relative to that of the computer programmer.

Many have pointed out that computer programmers represent an "elite" group whose specialized technical knowledge gives them a gain in power and authority over others (Gottleib & Borodin, 1973; Hall, 1975; Seaman, 1980; Treiman, 1977). Computer professionals are generally given exceptional treatment as a group in terms of educational opportunity, high salaries, promotions and other incentives (Cannon, 1965; Couger & Zawacki, 1980; Kleinfeld, 1977; Seaman, 1980; Slaughter, 1982; Tharrington, 1982). Do those who perceive their own occupations to be less prestigious than computer programming have favorable views of programmers perhaps out of admiration or recognition of the specialized talents of those who enter the field? Or do they have negative views generated possibly out of resentment over the perhaps artificially high material rewards associated with the occupation, as the theory of relative deprivation might predict? Because of the inconsistency of the results linking status and stereotyping, no simple linear relationship is predicted.

Zimmerman (1985) has suggested that the lack of demonstrated relationship between status inconsistency and dependent variables under study may be due to the effect of other variables. He has stated, "We need to know more about the interaction context of individuals in status inconsistent positions. Patterns of interaction in occupations and private circles should be studied" (p. 210). Let us, therefore, examine the issue of whether the contact and status variables might interact in some way to more precisely predict the nature of a stereotype.

The effect of the interaction between interpersonal contact and status. In attempting to tease apart his mixed findings, Allport theorized that prejudice toward Blacks was reduced only when contact was between Blacks and Whites who were equal in status. Based upon his review of studies in integrated communities, he observed:

> The trend of evidence clearly indicates that white people who live side by side with Negroes of the same general economic class in public housing projects are on the whole more friendly, less fearful, and less stereotyped in their views than white people who live in segregated arrangements (p. 260).

Has the equal status-contact hypothesis been subsequently confirmed by empirical evidence? Most researchers point to two classic studies (Deutsch &

Collins, 1951; Wilner et al., 1952) on integrated public housing. The validity of the findings, however, has been questioned (Cagle, 1973). Almost all (Blacks and Whites) belonged to the lower class; it was not status differential that was being manipulated but rather degree of contact within an equal status context.

Other researchers have claimed to find support for the equal-status contact hypothesis. Stephan and Rosenfield (1982), in their review of the research on racial and ethnic stereotypes, stated that contact involving people of equal status has been shown to destroy negative stereotypes. When status is unequal, pre-existing stereotypes may be confirmed. No evidence was cited to support this conclusion, however. In his discussion of anti-Semitism, Wuthnow (1982) has observed, "When contact occurs between equals as among friends, it usually reduces prejudice; but when it occurs between persons of unequal status, as between employers and employees or between persons of discrepant socio-economic standing, it is likely to increase levels of prejudice especially on the part of the subordinates" (p. 176). Here, too, no evidence is cited to support this contention.

Therefore, there appears to be a noticeable dearth

of direct tests of the equal-status contact hypothesis. Many authors seem to have assumed its validity without confirming it through controlled studies where both variables are manipulated or observed in interaction. One of the purposes of the present study was to rectify this shortcoming. Therefore, two additional hypotheses were formulated:

Hypothesis 3a: Frequency of work-related contact interacts with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Hypothesis 3b: Frequency of non-work-related contact interacts with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Specifically, for both types of contact situations, it is predicted that, as contact frequency increases, there is a greater increase in favorability ratings among equal status observers than among unequal status observers, regardless of the direction of the status differential.

The equal status-contact hypothesis was formulated in the context of racial prejudice. Therefore, the observers (whites) were generally higher, or equal, in status to the target group (Blacks). As many

researchers have pointed out, much less is known about attitudes of those whose status is lower than that of the target group (Morris & Williamson, 1982; Stephan & Rosenfield, 1982).

As previously noted, this gap is partially filled by the results of studies of relative deprivation that demonstrate that negative attitudes result when members of lower status groups perceive the status differential between themselves and those higher in status to be illegitimate and threatening (Tripathi & Srivastava, 1981). It is logical to expect that a high degree of contact between these groups would increase the unfavorability of the attitudes.

It is important to note that neither the equal status-contact hypothesis nor relative deprivation theory predicts differences in attitudes toward the target group at all levels of contact and status differential. Because the subject population in the present research has been drawn from the university student population, not all of whom might be employed, it is anticipated that a large majority of observers will perceive the status of their jobs to be lower than, or equal to that of the target group of computer programmers. Therefore, the predictions made in hypotheses 3a and 3b are consistent with both equal

status-contact and relative deprivation theories, which predict more favorable attitudes among those in high contact, equal status interactions.

The measurement of status. Before an exploration of the potential for other variables to affect stereotyping, a brief discussion of the appropriateness of the status measure is warranted.

The present study is concerned with the effect of occupational status differential for the following reasons. Most researchers agree that the status dimension selected for study should be salient and relevant to the contact situation if it is to be shown to affect social perception (Kramer, 1959; Norvell & Worchel, 1981; Zimmerman, 1985). Although status may be defined in terms of a wide variety of dimensions such as education, ability, age, sex, and income, Hall (1975) has observed that it is "occupations [that] are used in common social interaction as a major means of locating the individual within the social system" (p. 240). (See also Blackwell, Bates and Garbin, 1980; Treiman, 1977.) Abrahamson (1979) has noted that organizational stratification involves "functional importance, relative scarcity and differential reward" (p. 128), circumstances that apply to computer programmers. To the extent that the principle of

relative deprivation might be responsible in part for negative evaluations of programmers, relative occupational status should demonstrate this relationship most clearly.

The present study used a subjective measure of status differential. Several researchers have concluded that a subjective measure has more predictive power than an objective measure such as salary or position on a prestige scale (Blocker & Riedesel, 1978; Zimmerman, 1985). Hodge (1981) asserted that occupational status is defined most precisely in terms of subjective measures and in relative terms, that is, the perceived difference in ranking between two members of different occupations. Research has shown that subjects can successfully differentiate among occupational specialities on a status dimension (Ryckman et al., 1980).

The effect of competition and cooperation. Competition between groups has been linked to conflict and hostility, which in turn have been shown to be related to negative stereotyping (Levine and Campbell, 1972). Realistic group conflict theory holds that group conflicts are rational in the sense that incompatible goals and competition for scarce resources pose a threat to the groups involved. Negative

stereotypes then arise to justify the hostility toward competitors (Nye, 1973; Samuels, 1973; Triandis, 1977).

Research has also demonstrated a direct link between stereotyping and competition (Blake & Mouton, 1961; Sherif & Sherif, 1969). Furthermore, the relationship between conflict, contact, status differential and negative attitudes has been observed (Rosenfield et al., 1981), as well as the relationship between contact, competition and prejudice (Deutsch & Collins, 1951; Nye, 1973).

Deutsch (1973) has astutely pointed out that there are two classes of determinants that guide social interaction in general: structural (aspects of the social environment such as communication networks, status systems, goal interdependence) and attitudinal (perceptual, evaluative and affective orientations of the interacting individuals to one another). Using Heider's (1958) theory of cognitive balance as a model, Deutsch claimed that social structure and attitudes tend toward equilibrium: competition is in balance with negative attitudes and cooperative structure is in balance with positive attitudes.

More positive attitudes, therefore, should result when the interaction between groups is characterized by cooperative effort. Sherif (1958) showed that negative

attitudes became more favorable when groups in competition had to shift to a more cooperative strategy in order to achieve goals that each group could not acquire alone (i.e., superordinate goals).

What relevance do these observations have to the study of these variables in the context of stereotypes of computer programmers? To a great extent, programmers and non-programmers within the same organization share common goals and depend on each other for successful project completion. But this picture is oversimplified. Deutsch (1973) reserved the terms promotive interdependence to describe a situation in which the attainment goals of the linked participants are congruent, and contrient interdependence when they are incongruent. To the extent that the goals of programmers and non-programmers are incongruent, (e.g., recognition for individual achievement) or there is competition for rewards (e.g., promotions, salary increases), conflict and negative stereotyping may result.

Furthermore, frequent contact between programmers and non-programmers in hostile, competitive encounters should intensify the negativity of the stereotypes. In their study of groups in organizations who communicated frequently via computer, Kiesler, Siegel, and McGuire

(1984) found that negative attributions were prevalent among groups in conflict.

Status differential may also interact with frequency of contact, and competition or cooperation, in determining the valence of the stereotype. Those higher than programmers in the organizational hierarchy and who feel threatened by them may scapegoat them when things go wrong, thereby justifying a negative stereotype. Those lower in status who are in competition with programmers and who have a high degree of contact should be likely to have more negative stereotypes than those who have less contact and/or less competition with them.

Recall that Hypotheses 3a and 3b postulated an interaction between status differential and contact frequency in predicting the position of programmers on the evaluative continuum. In view of the probable effect of the variables of cooperation and competition, as evidenced in the previous discussion, those hypotheses have been be extended to include the triple interaction of status differential, contact frequency and a measure of either cooperation or competition, as follows:

Hypothesis 4: Level of cooperation interacts with frequency of contact (work-related and/or non-work-related) and with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Hypothesis 5: Level of competition interacts with frequency of contact (work-related and/or non-work-related) and with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Although it is difficult to predict the precise form of such a complicated interaction, it is anticipated that observers who report the most frequent contact (both work- and non-work-related), the least status differential, the least competitiveness and the most cooperation with respect to computer programmers would have the most favorable stereotypes.

Summary of Hypotheses

Hypothesis 1a: The stereotype of computer programmers consists of a number of traits which distinguish male computer programmers from males in general, and female computer programmers from females in general.

Hypothesis 1b: Female programmers differ from females in general on a greater number of traits than

male programmers differ from males in general.

Hypothesis 2: Male programmers are seen as having a more positively valued stereotype on average than female programmers.

Hypothesis 3a: Frequency of work-related contact interacts with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Hypothesis 3b: Frequency of non-work-related contact interacts with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Specifically, for both types of contact situations, it is predicted that, as contact frequency increases, there is a greater increase in favorability ratings among equal status observers than among unequal status observers.

Hypothesis 4: Level of cooperation interacts with frequency of contact (work-related and/or non-work-related) and with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

Hypothesis 5: Level of competition interacts with frequency of contact (work-related and/or non-work-related) and with status of observer relative to that

of computer programmers in predicting the evaluative dimension of the stereotype.

Although it is difficult to predict the precise form of such a complicated interaction, it is anticipated that observers who report the most frequent contact (both work- and non-work-related), the least status differential, the least competitiveness and the most cooperation with respect to computer programmers would have the most favorable stereotypes.

Chapter III

Method

Overview

During class sessions, undergraduate students completed a questionnaire in which they were asked to give trait ratings to one of two target groups: male or female computer programmers. Subjects received one of two versions each listing the traits in a different random order. In addition, subjects were asked to provide information on frequency of computer use, attitudes toward computers, and various aspects of their relationships with the target group. Demographic data were also requested of the subjects.

Subjects

Subjects were 176 undergraduate and general education students in statistics, economics, and business management classes at two New York City greater metropolitan area colleges. The original intention was to conduct the study within one or two business organizations, thereby using only employed subjects. A major effort to enlist the cooperation of an organization in this study proved fruitless. It became necessary, therefore, to request the assistance of undergraduate students. Business-related classes were selected in order to maximize subjects' familiarity with the target group. In fact, a large

majority of subjects (71%) were employed either full-time or part-time in a wide range of occupations in a variety of organizational settings.

All questionnaires were reviewed for completeness, frivolous responses, understanding of instructions, and appropriateness of subject's occupation. Twelve subjects were eliminated: seven for omitting responses to more than two traits; four for failing to indicate their sex; and one whose occupation was reported as "programmer."

The final number of participants consisted of 81 males and 83 females. The breakdown of subjects by sex of respondent, sex of target and version of questionnaire is shown in Table 1.

Profile of the subject population. The mean age was 24.9 years for male subjects and 25.8 for female subjects. The difference was not significant ($t(162) = 0.87$, $p<.39$). Mean salary (employed subjects only) was $22,520 for males and $18,273 for females, a difference which was marginally significant ($t(110) = 1.86$, $p<.07$). Thirty-one percent of the males and 18% of the females indicated that they owned a personal computer, a difference which did not quite reach significance (chi-square (1, $N=164$) = 2.98, $p<.08$).

Subjects were asked how frequently they used a

Table 1

Number of Subjects by Sex of Subject and Version of Questionnaire

Target	Sex of Subject: Male	Female
Male Programmers		
Version 1	23	20
Version 2	19	22
Female Programmers		
Version 1	19	20
Version 2	20	21

computer for various activities. The results are shown in Table 2. The majority of subjects checked frequently or sometimes for word processing, games, statistical analysis, data organization, and communications. Fewer subjects used the computer for graphics. A multivariate test of significance revealed no sex differences with respect to frequency of use for any of these activities with the exception of data organization for which a marginally significant difference was observed (chi-square (2, N=154) = 5.5, p<.07), with males reporting greater frequency of use. Subjects were also asked to write in another activity if it applied. There were some isolated responses, but too few to make any generalizations concerning computer use for another distinctive activity.

In answer to a question, "How do you feel about the effect of computers on society?" subjects in general expressed a positive attitude. The mean response (2.5) was the same for both male and female subjects, a value between the extremely positive (1) and moderately positive (3) scale labels.

Materials

The questionnaire was designed to assess subjects' views of either male or female applications computer programmers (see Appendix A). Some computer

Table 2

Responses to Question 13 Concerning Various Computer Activities

	Male Subjects		Female Subjects	
	n	%	n	%
Word Processing				
Frequently	18	23.7	26	33.8
Sometimes	28	36.8	22	28.6
Never	30	39.5	29	37.7
Games				
Frequently	9	11.5	6	7.6
Sometimes	40	51.3	46	58.2
Never	29	37.2	27	34.2
Graphics				
Frequently	8	10.7	3	4.1
Sometimes	24	32.0	22	29.7
Never	43	57.3	49	66.2
Statistical Analysis				
Frequently	15	19.5	11	15.1
Sometimes	41	53.2	45	61.6
Never	21	27.3	17	23.3

Table 2 (continued)

Responses to Question 13 Concerning Various Computer Activities

	Male Subjects		Female Subjects	
	n	%	n	%
Data Organization				
Frequently	28	36.4	17	22.1
Sometimes	29	37.7	28	36.4
Never	20	26.0	32	41.6
Communications				
Frequently	15	20.0	17	22.7
Sometimes	25	33.3	24	32.0
Never	35	46.7	34	45.3

Note: Sex difference was marginally significant for Data Organization (chi-square (2, N = 154) = 5.5, p(.065).

programmers, called systems engineers, or systems programmers, are technical specialists who write instructions for the internal operating system of the computer. The vast majority of computer programmers, however, are applications programmers who write computer programs to meet the data processing needs of the organization employing them. It is this group with which subjects should have the most familiarity and which is intended as the target of the study.

In order to eliminate the possibility that subjects might confuse this group with systems programmers or those employed in other computer-related occupations, the questionnaire began with a brief description of applications computer programmers as those "generally responsible for designing, writing, testing, and documenting the set of instructions which the computer uses to manipulate data for specific applications such as money transfer in banking, payroll, or airline reservations. They work in government, academia, and business settings." Subjects were further instructed to "have this group of people in mind" while they completed the questionnaire.

Measures of stereotypic attitudes. The first question asked subjects to give their own personal opinion of the percentage of male (or female)

programmers, and males (or females) in general, who have each of a series of personality traits. One group of subjects was asked to compare male programmers with males in general; another group was asked to compare female programmers with females in general.

Subjects were also asked to report their level of confidence in their responses to the trait names by circling a percentage (0% to 100% at 10% intervals) of the responses for which they felt "reasonably certain." Mean responses to this question are shown in Table 3. There were no significant main effects for target group ($F(1, 159) = 0.00$, $p<.99$) or for sex of subject ($F(1, 159) = 1.24$, $p<.27$). The Target x Sex of subject interaction was not significant ($F(1, 159) = 1.66$, $p<.20$).

Trait selection criteria. In order to permit the assessment of both the descriptive and evaluative components of the stereotype of computer programmers, value-laden traits were selected from Anderson's (1968) compilation of 555 personality-trait words. Mean evaluative ratings were assigned by Anderson's subjects

Table 3

Mean Responses to Question 4: Percentage of Traits for Which Subjects Reported They Were "Reasonably Certain"

	Target					
	Male Programmers			Female Programmers		
Subjects	M	SD	n	M	SD	n
Males	55.0	23.0	42	59.7	22.6	38
Females	55.5	22.2	42	51.0	23.3	41

and have been shown to highly reliable.[1] Traits on Anderson's list range in valence from 000 (least favorable or desirable) to 600 (most favorable or desirable.) A score of 300 represents a neutral rating.

A subset of 40 traits (see Table 4) was selected for the present study on the following bases:

1. The mention of the trait name (or a word in Anderson's list that was equivalent in meaning) in the anecdotal and empirical literature on computer programmers.

2. In order to minimize the potential for demand effects, some (14) of the 40 traits were listed in a direction opposite to prediction. For example, instead of the traits competent, not likeable, unemotional, the traits incompetent, likeable, emotional were used. Because Anderson's list did not contain a trait name opposite in meaning in every instance, no systematic attempt was made to equate the number of traits in each direction.

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[1] Intersubject reliability coefficients for evaluative scores obtained from three additional subject populations (university students) were, respectively, .98, .98, and .99 (Anderson, 1968). Although the trait ratings were obtained by Anderson almost two decades ago, it was anticipated that the valence of the traits used in the present study would remain relatively stable. See Chapter V for a discussion of this issue.

Table 4

Trait Names and Their Evaluative Ratings

Trait Name	Evaluative Rating[a]	Transformed Rating[b]	Evaluative Category
intelligent	537	+237	+++
interesting	511	+211	+++
likeable	497	+197	++
level-headed	489	+189	++
witty	480	+180	++
logical	465	+165	++
creative	462	+162	++
independent	455	+155	++
cultured	450	+150	++
diligent	449	+149	++
realistic	447	+147	++
modest	428	+128	++
popular	426	+126	++
proud	368	+68	+
normal	362	+62	+
unconventional	346	+46	+
shrewd	328	+28	+
perfectionistic	322	+22	+
quiet	311	+11	+
aggressive	304	+4	+
shy	291	-9	-
emotional	283	-17	-
materialistic	260	-40	-
opinionated	257	-43	-
eccentric	257	-43	-
lonely	256	-44	-
temperamental	221	-79	-
pompous	177	-123	--
short-tempered	159	-141	--
dominating	153	-147	--
neurotic	152	-148	--
misfit	147	-153	--
anti-social	144	-156	--

Table 4 (continued)

Trait Names and Their Evaluative Ratings

Trait Name	Evaluative Rating [a]	Transformed Rating [b]	Evaluative Category
touchy	134	-166	--
dull	121	-179	--
egotistical	116	-184	--
cold	113	-187	--
incompetent	110	-190	--
childish	109	-191	--
selfish	82	-218	---

Note. The categorization of traits from +++ to --- is a useful way of representing the position of each trait within its appropriate interval on the Anderson 6-point scale: +++ = "most favorable or desirable"; --- = "least favorable or desirable."

[a] From Anderson (1968).

[b] Scores were transformed from Anderson's ratings so that a score of zero would be neutral.

3. High meaningfulness ratings, (i.e., the degree to which terms are understood by the general population), as obtained by Anderson.

4. A broad range on the evaluative dimension from extremely positive to extremely negative. (On Anderson's scale a score of 300 represents a neutral rating; traits whose mean evaluative scores are above 300 are relatively favorable or desirable and those whose scores are below 300 are relatively unfavorable or undesirable.) In the present study, the Anderson scale values were transformed so that scores of zero are neutral. That is, the scores ranged from -300 to +300, with the sign of the score (plus or minus) indicating favorability or unfavorability, and the absolute value indicating its intensity or degree. The traits were further categorized as "+++" or extremely positive (+201 through +300), "++" or moderately positive (+101 through +200), "+" or somewhat positive (+1 through +100), "-" or somewhat negative (-1 through - 100), "--" or moderately negative (-101 through -200), and "---" or extremely negative (-201 through -300). These categories correspond to the six intervals used by Anderson and are helpful in analyzing the results in terms of the evaluative aspect of the stereotype.

5. The results of a pretest which minimized the probability of a high rate of missing responses for the trait.

In addition, the traits masculine and feminine (not in Anderson's list) were included. Although these terms were not entered into those analyses dealing with the evaluative dimension of the stereotype, responses to these traits provided a measure of how sex-typed the occupation is.

Control for the effect of word order. In order to determine the possible effect of word order on responses to traits, they were listed in two different random orders in two versions of the questionnaire for each target group. Table 5 shows the order of the traits for each version. Approximately one-fourth of the subjects received version 1 with male targets, one-fourth received version 1 with female targets, one-fourth received version 2 with male targets, and the remaining one-fourth received version 2 with female targets.

Measures

The diagnostic ratio and difference measures. The question asking subjects to rate the primary target group vs. the population in general was designed with the intention of using the diagnostic ratio as the

Table 5

Sequence of Trait Names on Versions 1 and 2 of Questionnaire

Version 1		Version 2	
Trait Name	Evaluative Category	Trait Name	Evaluative Category
likeable	++	pompous	--
intelligent	+++	intelligent	+++
materialistic	-	perfectionistic	+
shrewd	+	selfish	---
independent	++	modest	++
creative	++	lonely	-
masculine		unconventional	+
short-tempered	--	emotional	-
unconventional	+	neurotic	--
anti-social	--	shrewd	+
quiet	+	incompetent	--
misfit	--	witty	++
shy	-	masculine	
feminine		dominating	--
dull	--	cold	--
popular	++	aggressive	+
temperamental	-	eccentric	-
level-headed	++	childish	--
cold	--	cultured	++
egotistical	--	diligent	++
pompous	--	interesting	+++
interesting	+++	realistic	++
eccentric	-	likeable	++
perfectionistic	+	materialistic	-
touchy	--	dull	--
opinionated	-	feminine	
selfish	---	egotistical	--
dominating	--	opinionated	-
proud	+	quiet	+
lonely	-	misfit	--
witty	++	level-headed	++
childish	--	proud	+
realistic	++	normal	+
cultured	++	logical	++
modest	++	temperamental	-
diligent	++	short-tempered	--
incompetent	--	popular	++
logical	++	touchy	--
aggressive	+	creative	++
neurotic	--	anti-social	--
emotional	-	independent	++
normal	+	shy	-

measure of stereotyping. (In the interest of avoiding cumbersome expressions in subsequent discussions, male and female programmers will sometimes be referred to as MP and FP, respectively; males and females in general will be designated as MG and FG.) In keeping with the method described by McCauley and Stitt (1978) and McCauley et al. (1980), for every trait response, for every subject, a diagnostic ratio (DR), was calculated as follows: percent MP/percent MG or percent FP/percent FG. The numerator is the percentage of the target group, male or female programmers, that the subject felt exhibited the trait. The denominator represents the percentage assigned by subjects to the comparison population, males or females in general.

Problems in the calculation of the diagnostic ratio. It became readily apparent that certain properties of the data in the present study were not taken into account by the developers of this relatively new measure. For example, it is impossible to calculate a DR for the rare, but valid instance, in which a subject responds with a zero in both the numerator and the denominator. Although one might argue that the result should be 1.0, thereby reflecting the subject's implication of no difference between programmers and the general population, the authors

neglected to include a discussion, mathematical or theoretical, of how to handle this case.

A further examination of the response patterns demonstrated that a small number of subjects gave the seemingly illogical response of non-zero to the primary target and zero to the comparison population. The reverse pattern, (e.g., MG = non-zero and MP = zero), is feasible, although it raises the issue of exaggerated values in the DR, a matter to be addressed below. The response pair MP = non-zero and MG = zero raises the question of whether there was a failure to understand the instructions, taken practically verbatim from the published literature. However, the data from subjects who gave this pair of responses were not rejected because they occurred relatively infrequently and the remaining responses did not appear to be frivolous. One possible explanation is that subjects viewed the respective populations as mutually exclusive sets, instead of seeing programmers as a subset of the general population. That is, it may have been the intention of the subject to predicate the presence of the trait among male or female programmers while indicating its absence in the remainder of the general male or female population. Since computer programmers represent such a small percentage of the general

population, this response pattern is not much different from one that imputes a logically correct and very small value greater than zero to males or females in general in the general population.

Since none of these unusual response patterns was described in the published literature, I discussed them on the telephone with Clark McCauley, the researcher primarily responsible for the development of the diagnostic ratio (McCauley & Stitt, 1978; McCauley, Stitt, & Segal, 1980). As a results of this conversation, it was decided to interpret the MP(FP) = zero and MG(FG) = zero response pattern as yielding a DR of 1.0 because it implied no difference between the target and the comparison group.

McCauley could not recall any occurrence among his data of the MP(FP) = non-zero and MG(FG) = zero response pattern. The solution to this problem emerged inadvertantly from a revelation by McCauley of a recently discovered flaw in the use of a raw DR.

Researchers using traditional measures of stereotyping have generally asked subjects to assign (or decline to assign) a trait to a target population irrespective of a comparison population. Although the diagnostic ratio, (or any method dealing with relative values), now permits greater variation and more

complexity in a subject's response, a potential error in the use of the DR arises when the responses of subjects are not uniformly in the same direction. An example will illustrate. A subject who believes that 80% of MP and 40% of MG have the trait intelligent will have a DR of 2.0. Another subject might give the equally legitimate response of 40% to MP and 80% to MG, yielding a DR of .5. Although the magnitude of the difference is the same for both subjects, the DR calculated in strict accordance with the instructions given by McCauley and Stitt (1978) and McCauley et al. (1980) is four times larger for the first subject.

The solution proposed by McCauley was to take the base 10 logarithm of the raw DR. While the strength of a raw DR is measured in terms of its distance from 1.0, the strength of the log of the DR is measured by its distance from 0.0, since the log of a DR of 1.0 equals zero. With this procedure, a DR of 2.0 and a DR of 0.5 are equal but have opposite signs.

The use of the log function, although solving one problem, introduces another: how to handle mathematically a DR of 0.0. The log of zero is incalculable, since it represents infinity. This issue directly implicates the problem of exaggerated values in the DR when large differences between MP(FP) and

MG(FG) occur at the low end of the response range. For example, a subject who responds MP = 10%, MG = 1% for a particular trait will have a DR of 10.0 while a subject who responds MP = 90%, MG = 80% will receive a DR of slightly more than 1.0. Although one might argue that a subject who specifies the virtual absence of a trait among the target group while affirming its presence at a low rate among the comparison group should be assigned a larger DR than a subject whose response pair is midrange, it is likely that the large DR is more an artifact of the method than a true reflection of an extreme stereotypic response.

It was decided,therefore, to assign the raw percentages to small intervals from 1 to 21 inclusive prior to calculating the DR and its log.[2] Table 6 shows the percentage range for each of the 21 intervals. This approach provides a solution to the problems previously discussed as follows:

1. Extremely large diagnostic ratios generated from responses at the low end of the scale are now attenuated. In our previous example, MP = 10% (interval 3), MG = 1% (interval 1) now yields a DR of 3.0 versus the 10.0 obtained using the unclassified values. Most mid-scale values are not appreciably

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[2] At the suggestion of a statistician, Alan Gross.

Table 6

Assignment of Subject's Trait Percentages to Intervals Prior to Calculation of Diagnosic Ratio and Its Logarithm

Percentage Range	Interval Classification	Percentage Range	Interval Classification
0 - 2	1	53 - 57	12
3 - 7	2	58 - 72	13
8 - 12	3	63 - 67	14
13 - 17	4	68 - 72	15
18 - 22	5	73 - 77	16
23 - 27	6	78 - 82	17
28 - 32	7	83 - 87	18
33 - 37	8	88 - 92	19
38 - 42	9	93 - 97	20
43 - 47	10	98 - 100	21
48 - 52	11		

Note. The top and bottom intervals include three raw scores; the remainder include five.

altered; for example, a ratio of 70/50 is very close to the ratio of 15/11 obtained after interval classification.

2. A DR of 0.0 becomes impossible in favor of a generally small, mathematically workable value that still preserves the intention of the subject whose raw responses presumably indicate the relative absence of the trait among programmers and its presence to some degree among the general population.

3. A DR of infinity based upon the response pattern MP(FP) = non-zero, MP(FG) = zero becomes impossible in favor of a generally large mathematically workable value that still preserves the intention of the subject whose raw response pattern presumably indicates a much higher prevalence of the trait among programmers than among the general population, viewed as mutually exclusive sets.

4. The DR obtained from the interval assignments probably coincides more closely with an observer's psychological ability to distinguish differences between the target and comparison groups.

Classifying the raw responses by intervals may make it more difficult to attain significance, but a conservative approach is warranted until the constructs underlying the mathematical relationships expressed by

the diagnostic ratio are clarified.

The difference method as a supplementary measure of stereotyping. Given the problems encountered in the use of the DR, the significance of the difference was tested between the means (MP vs. MG) and (FP vs. FG) for all traits as well as between log(DR) and zero. Therefore, for each subject, two scores were calculated initially for each trait: (a) the log of the diagnostic ratio percent MP/percent MG (or percent FP/percent FG) after interval classification; and (b) a difference score MP - MG (or FP - FG). Two-tailed t-tests were performed on the difference between the mean of the log and 0.0, and on the difference scores. (A preliminary multivariate test of the significance of the difference scores for all traits was also carried out.) In keeping with a conservative approach to the data, only those traits reaching significance by both DR and difference score tests, or by one method supported by a trend ($.05<p<.10$) in the other method, were selected as constituting the stereotype.

Measures of reported frequency of contact. Subjects were asked to indicate the frequency of contact they have with male or female programmers both within and outside of the course of their work. For each type of contact situation, subjects were asked to

indicate the average number of male or female programmers with whom they interact. They were asked to give the number of business days per year on which they have work-related contact and the number of calendar days per year on which they have non-work-related contact. In addition, the number of hours per day for each type of contact was requested.

Measures of subjective job status. Subjects were asked to circle a number from 1 to 9 that expressed their opinion of how much "status or prestige" is associated with the job of the target in their business organization. Using the same scale in a subsequent question, subjects were asked to give their opinion about the "status or prestige" of their own job.

Measures of cooperation and competition. Subjects were asked to use a scale from 1 to 9 to indicate the number that best describes how much cooperation there is in their interaction with male or female programmers in the work environment. The same scale was used in a subsequent question which asked subjects to indicate the degree of their perceived competition with the target population for rewards such as "bonuses, promotions or recognition for your work." The lower the scale number the lower the levels of cooperation and competitiveness.

Other Subject Data. The following information was solicited: the subject's occupation and job title, and a brief description by the subject of the target group and how the subject felt about them.

Procedure

Approval for this study was obtained from the Human Subjects Committee of the City University of New York Graduate School. Participation by subjects was voluntary and procedures were designed in accordance with the ethical standards of the American Psychological Association.

The author introduced herself to the students in each class and told them the following:

> For my Ph.d dissertation, I am studying attitudes toward computer programmers by those who are not in the occupation. I would appreciate it if you would take a few moments to complete a questionnaire. It should take you no longer than 15 to 20 minutes. Please be assured that your participation is voluntary and your responses are completely anonymous. Are there any questions?

The author then distributed the questionnaires. In order to insure an appropriate distribution of the four versions, the questionnaires were handed out in the following order: version 1, male targets; version 1, female targets; version 2, male targets; version 2, female targets. The completed questionnaires were collected and the subjects were thanked for their participation. No subject refused to participate.

Chapter IV

Results

Questionnaire Version Comparisions

It was first necessary to ascertain whether order of presentation of traits had an effect on the results. Two ways of analyzing the data for order effects were employed. First, for each trait, mean responses on Version 1 for (a) male targets by male subjects, (b) male targets by female subjects, (c) female targets by male subjects, and (d) female targets by female subjects, were compared with their counterparts on Version 2. Recall that subjects were asked to give percentage ratings to male programmers and males in general, or female programmers and females in general, on 42 selected traits. Therefore, the number of comparisions made was 2 (ratings per trait) x 42 (traits) x 4 (sex of target/ sex of subject combinations). Of 336 t-tests (two-tailed), 20 or 5.9% were significant at $p<.05$. Second, a multivariate test of the difference scores for each trait yielded no significant differences between versions for male targets ($F(1, 38) = .99$, $p<.52$) and for female targets ($F(1, 35) = .83$, $p<.72$). (It was impossible to execute multivariate tests by sex of subject within sex of target group because the number of subjects was less

than the number of traits, resulting in an insufficient number of within-cells degrees of freedom.) Since neither method of analysis gave clear evidence of an order effect, the responses were collapsed across versions for subsequent analyses. Although the order of the questions that followed the traits did not vary by version, comparisons by version were made. Of 100 t-tests (two-tailed), only four or 4.0% were significant at $p<.05$.

Results Concerning Hypothesis 1a

Pattern of stereotypic traits. Hypothesis 1a states that the stereotype of computer programmers consists of a number of traits which distinguish male computer programmers from males in general, and female computer programmers from females in general.

This hypothesis is strongly supported by the results. A multivariate analysis of variance of the difference scores for all 42 traits was highly significant, both for male targets ($F(1, 39) = 4.67$, $p<.001$), and for female targets ($F(1, 36) = 3.46$, $p<.001$). Therefore one may reject the null hypothesis that subjects see no difference between the target and the population in general on the traits when the trait variables are treated as jointly dependent.

The results of the univariate tests for each

trait by sex of subject within target group are shown in Tables 7, 8, 9, and 10. Within each table, the traits are grouped according to whether they satisfied the criterion for agreement between the diagnostic ratio and the difference score methods with respect to significance levels. The first group, labelled Stereotypic Traits, contains those traits for which a statististically significant value in the DR or difference score was supported by at least a trend ($p<.10$) by the other method. The second group, labelled Non-Stereotypic Traits, contains all traits not meeting this criterion. According to the operational definition of stereotyping adopted in the present study, the traits in the first group constitute a stereotype of the target group. These traits may be termed distinctive, insofar as they distinguish the target group from the population in general.

A comparison of the results of the significance tests of the DR and the means of the difference scores showed a high degree of correspondence between the two methods. In nearly every instance, a significant difference by means of one method was supported by a significant difference or trend using the other method. When all 42 traits are taken into account, the percentage of traits for which there was a match

Table 7

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Male Programmers (MP) vs. Males in General (MG)

Male Subjects Only (n=42)

Trait Name	MP		MG		Log of Diagnostic Ratio (%MP/%MG)			Difference Score: %MP - %MG			Consensus (%)
	M	SD	M	SD	M	SD		M	SD		
Stereotypic Traits											
logical	80.8	19.3	53.0	19.9	0.192	0.22	***	27.8	22.1	***	88.1
perfectionistic	71.3	25.7	47.2	23.6	0.167	0.20	***	24.1	24.1	***	85.7
quiet	59.9	22.3	41.6	17.8	0.135	0.28	**	18.3	23.6	***	71.4
creative	68.9	28.8	50.7	19.6	0.107	0.30	*	18.2	29.7	***	73.8
interesting	37.2	22.4	55.0	18.4	-0.209	0.29	***	-17.8	24.3	***	71.4
intelligent	73.0	21.1	55.2	22.1	0.116	0.17	***	17.8	19.0	***	71.4
lonely	59.8	27.3	42.7	21.5	0.125	0.26	*	17.1	17.1	***	66.7
diligent	64.7	22.0	48.0	19.0	0.121	0.16	***	16.7	19.2	***	71.4
popular	40.1	24.3	54.5	16.0	-0.197	0.31	***	-14.4	24.8	**	64.3
anti-social	50.9	28.0	36.6	18.1	0.097	0.22	**	14.3	22.5	***	66.7
emotional	36.9	25.0	50.4	22.7	-0.172	0.29	***	-13.5	23.7	***	66.7
likeable	50.1	20.6	63.4	15.9	-0.123	0.16	***	-13.3	17.3	***	64.3
masculine	46.9	26.8	59.9	21.2	-0.133	0.18	***	-13.0	19.8	***	73.8
level-headed	61.1	23.0	50.1	19.5	0.082	0.25	*	11.0	23.4	**	54.8
aggressive	49.8	27.0	59.4	19.4	-0.124	0.29	**	-9.6	28.4	*	64.3
dominating	46.3	22.8	55.0	21.5	-0.084	0.25	*	-8.7	24.5	*	71.4
normal	55.7	26.1	62.2	20.7	-0.091	0.28	*	-6.5	20.9	*	45.2
dull	55.5	27.0	42.9	18.0	0.071	0.26	tr	12.6	24.4	**	64.3
shy	50.7	25.5	38.3	17.1	0.089	0.30	tr	12.4	23.8	**	69.0
neurotic	45.9	28.5	36.8	22.0	0.062	0.22	tr	9.1	20.2	**	57.1
short-tempered	43.3	28.4	50.0	20.5	-0.103	0.24	**	-6.7	24.9	tr	54.8
incompetent	23.4	22.2	30.0	15.6	-0.149	0.30	**	-6.6	21.9	tr	66.7

Table 7 (continued)

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Male Programmers (MP) vs. Males in General (MG)

Male Subjects Only (n=42)

Trait Name	MP M	MP SD	MG M	MG SD	Log of Diagnostic Ratio (%MP/%MG) M	Log of Diagnostic Ratio (%MP/%MG) SD	Difference Score: %MP - %MG M	Difference Score: %MP - %MG SD	Consensus (%)
Non-Stereotypic Traits									
misfit	43.3	28.6	32.3	20.2	0.077	0.31	11.0	26.6 **	
eccentric	49.9	26.8	41.6	20.2	0.041	0.30	8.3	24.2 *	
independent	69.9	0.2	62.1	19.7	0.044	0.17	7.8	20.6 *	
shrewd	58.5	27.3	51.6	20.5	0.029	0.18	6.9	20.2 *	
witty	47.2	26.6	50.5	18.1	-0.004	0.26 *	-3.3	23.3	
feminine	28.6	28.6	22.3	17.9	0.021	0.29	6.3	24.1 tr	
proud	66.5	23.9	61.3	21.4	0.026	0.15	5.2	21.6	
selfish	53.1	24.7	48.7	20.4	0.023	0.19	4.4	20.5	
cold	44.1	25.3	41.1	19.9	0.004	0.24	3.0	23.7	
childish	37.0	24.9	39.6	22.7	-0.050	0.25	-2.6	23.1	
materialistic	59.2	25.5	61.8	18.2	-0.044	0.26	-2.6	25.9	
temperamental	47.3	25.1	49.0	20.6	-0.024	0.33	-1.7	27.0	
pompous	43.2	26.9	44.9	20.0	-0.052	0.27	-1.7	25.5	
opinionated	56.9	24.0	58.5	21.5	-0.026	0.17	-1.6	22.0	
egotistical	54.5	27.0	55.6	21.6	-0.036	0.23	-1.1	24.3	
touchy	49.3	20.3	48.4	23.6	-0.015	0.27	0.9	23.6	
cultured	46.2	23.4	45.4	20.0	-0.012	0.21	0.8	20.3	
unconventional	44.3	25.8	44.6	17.9	-0.044	0.26	-0.3	24.7	
realistic	56.0	24.0	55.8	17.9	-0.026	0.22	0.2	24.3	
modest	45.1	21.3	45.3	17.0	-0.022	0.20	-0.2	15.4	

Note: Significance test for log of diagnostic ratio is difference from 0.0.

Stereotypic traits are defined as all traits whose log or difference scores are significant and supported by at least a trend ($p<.10$) using the alternate method.

*$p<.05$ **$p<.01$ ***$p<.001$ tr = $p<.10$

Table 8

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Male Programmers (MP) vs. Males in General (MG)

Female Subjects Only (n=42)

Trait Name	MP		MG		Log of Diagnostic Ratio (%MP/%MG)			Difference Score: %MP - %MG			Consensus (%)
	M	SD	M	SD	M	SD		M	SD		
Stereotypic Traits											
perfectionistic	69.1	27.3	45.2	21.3	0.177	0.25	***	23.9	25.7	***	76.2
dominating	44.6	25.7	67.1	21.2	-0.218	0.30	***	-22.5	26.5	***	61.9
logical	82.7	18.2	60.3	22.8	0.164	0.27	***	22.4	28.7	***	78.6
quiet	60.9	24.1	42.7	19.8	0.156	0.28	**	18.2	25.3	***	73.8
intelligent	78.6	15.6	60.7	16.9	0.113	0.14	***	17.9	19.5	***	71.4
temperamental	40.9	21.5	58.4	21.7	-0.179	0.31	***	-17.5	25.7	***	59.5
short-tempered	37.9	22.4	53.6	20.0	-0.168	0.26	***	-15.7	24.5	***	64.3
level-headed	66.7	24.1	51.8	20.2	0.102	0.17	***	14.9	21.9	***	71.4
childish	36.6	27.4	51.1	31.3	-0.150	0.31	**	-14.5	27.2	***	57.1
diligent	70.2	20.1	55.9	19.8	0.090	0.13	***	14.3	19.0	***	59.5
popular	38.2	25.5	51.7	19.0	-0.169	0.23	***	-13.5	20.6	***	71.4
egotistical	52.2	27.4	65.4	25.2	-0.123	0.23	**	-13.2	24.8	***	57.1
aggressive	49.3	26.0	62.2	24.9	-0.113	0.24	**	-12.9	26.4	**	61.9
selfish	43.7	24.3	55.9	24.4	-0.129	0.25	**	-12.2	22.8	***	40.5
realistic	67.9	20.9	55.9	20.3	0.090	0.20	*	12.0	27.2	**	57.1
pompous	42.0	25.8	54.0	24.0	-0.132	0.28	**	-12.0	27.7	**	54.8
emotional	34.9	21.0	46.7	21.6	-0.131	0.18	***	-11.8	15.0	***	66.7
materialistic	59.0	24.5	70.6	20.4	-0.094	0.20	**	-11.6	20.6	***	57.1
creative	68.7	22.6	57.3	19.1	0.072	0.20	*	11.4	22.3	**	61.9
interesting	48.2	23.9	59.0	17.4	-0.117	0.24	**	-10.8	24.0	**	54.8
incompetent	25.4	24.4	35.9	20.5	-0.197	0.27	***	-10.5	21.6	**	64.3
touchy	38.1	22.4	48.0	23.9	-0.109	0.23	**	-9.9	24.3	*	45.2
feminine	16.9	15.2	24.0	19.9	-0.139	0.28	**	-7.1	18.7	*	42.9
neurotic	35.9	27.7	42.4	24.4	-0.114	0.31	*	-6.5	24.2	tr	47.6

Table 8 (continued)

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Male Programmers (MP) vs. Males in General (MG)

Female Subjects Only (n=42)

Trait Name	MP M	MP SD	MG M	MG SD	Log of Diagnostic Ratio (%MP/%MG) M	Log of Diagnostic Ratio (%MP/%MG) SD	Difference Score: %MP - %MG M	Difference Score: %MP - %MG SD	Consensus (%)
Non-Stereotypic Traits									
shy	51.1	27.4	41.1	21.7	0.074	0.34	10.0	27.5 *	
witty	44.5	24.8	50.1	20.4	-0.069	0.25 tr	-5.6	21.4 tr	
eccentric	41.5	25.4	43.9	22.4	-0.066	0.25 tr	-2.4	18.0	
masculine	57.1	26.9	64.9	21.0	-0.068	0.30	-7.8	27.6 tr	
lonely	50.6	29.9	43.8	23.4	0.023	0.31	6.8	27.8	
modest	48.7	26.0	42.8	23.0	0.044	0.26	5.9	23.3	
dull	48.0	26.9	43.0	21.4	0.015	0.21	5.0	20.9	
opinionated	59.3	22.9	64.0	21.9	-0.035	0.21	-4.7	25.2	
unconventional	45.3	24.7	49.9	19.1	-0.002	0.33	-4.6	27.4	
independent	74.4	20.4	70.1	14.6	0.014	0.16	4.3	20.5	
anti-social	43.3	29.2	39.3	21.7	0.007	0.21	4.0	23.3	
likeable	57.0	22.6	60.6	20.8	-0.030	0.19	-3.6	21.8	
normal	66.5	22.8	69.7	18.9	-0.035	0.14	-3.2	15.5	
proud	67.4	22.4	69.3	22.4	-0.013	0.11	-1.9	15.2	
shrewd	54.2	23.3	55.9	21.5	-0.029	0.19	-1.7	23.5	
misfit	33.1	27.1	31.9	24.6	-0.023	0.35	1.2	25.0	
cultured	49.6	21.4	50.8	19.6	-0.019	0.19	-1.2	17.5	
cold	42.6	27.2	42.0	23.8	-0.027	0.27	0.6	20.2	

Note: Significance test for log of diagnostic ratio is difference from 0.0.

Stereotypic traits are defined as all traits whose log or difference scores are significant and supported by at least a trend ($p < .10$) using the alternate method.

$n=41$ for traits shrewd and witty; $n=40$ for trait misfit.

*$p < .05$ **$p < .01$ ***$p < .001$ tr = $p < .10$

Table 9

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Female Programmers (FP) vs. Females in General (FG)

Male Subjects Only (n=39)

Trait Name	FP		FG		Log of Diagnostic Ratio (%FP/%FG)			Difference Score: %FP - %FG			Consensus (%)
	M	SD	M	SD	M	SD		M	SD		
Stereotypic Traits											
logical	79.9	31.5	51.4	26.6	0.207	0.26	***	28.5	34.3	***	82.1
perfectionistic	72.3	21.5	46.8	24.9	0.210	0.24	***	25.5	27.0	***	66.7
emotional	48.2	30.3	68.5	23.9	-0.189	0.29	***	-20.3	30.6	***	59.0
childish	26.6	23.7	46.0	25.1	-0.277	0.38	***	-19.4	27.7	***	66.7
independent	68.7	25.7	49.6	25.6	0.149	0.23	***	19.1	26.4	***	61.5
diligent	67.6	22.3	50.7	9.9	0.127	0.23	**	16.9	25.7	***	61.5
incompetent	18.2	18.3	33.1	21.6	-0.253	0.28	***	-14.9	19.4	***	76.9
likeable	43.8	24.3	58.6	20.7	-0.150	0.23	***	-14.8	21.3	***	61.5
dull	54.0	29.0	40.3	22.9	0.101	0.27	*	13.7	30.9	**	51.3
anti-social	46.2	30.7	32.7	26.3	0.131	0.32	*	13.5	26.4	**	59.0
popular	41.5	26.1	54.9	22.3	-0.165	0.31	**	-13.4	25.3	**	61.5
intelligent	70.3	19.2	57.1	20.6	0.107	0.23	**	13.2	22.6	***	64.1
materialistic	59.7	26.4	72.7	19.4	-0.111	0.23	**	-13.0	26.9	**	48.7
touchy	44.4	26.4	57.2	23.5	-0.147	0.33	**	-12.8	29.6	**	46.2
level-headed	61.1	23.5	48.3	23.6	0.113	0.26	**	12.8	27.8	**	56.4
feminine	57.3	29.0	70.1	27.7	-0.097	0.27	*	-12.8	28.0	**	43.6
interesting	44.8	24.2	57.0	23.7	-0.124	0.28	**	-12.2	28.2	**	61.5
short-tempered	44.3	27.6	56.2	22.9	-0.139	0.35	*	-11.9	30.6	*	46.2
lonely	54.8	30.0	43.1	23.5	0.070	0.19	*	11.7	22.0	**	56.4
temperamental	52.4	31.3	61.5	25.5	-0.109	0.25	*	-9.1	25.2	*	43.6
realistic	57.9	24.7	49.5	21.4	0.058	0.21	tr	8.4	21.4	*	53.8
quiet	51.8	26.6	43.7	22.0	0.057	0.20	tr	8.1	23.7	*	41.0
selfish	43.2	29.7	49.5	29.2	-0.072	0.22	*	-6.3	22.5	tr	41.0

Table 9 (continued)

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Female Programmers (FP) vs. Females in General (FG)

Male Subjects Only (n=39)

Trait Name	FP		FG		Log of Diagnostic Ratio (%FP/%FG)		Difference Score: %FP - %FG		Consensus (%)
	M	SD	M	SD	M	SD	M	SD	
Non-Stereotypic Traits									
proud	68.4	24.8	61.1	23.3	0.038	0.17	7.3	20.0 *	
cold	51.3	27.8	43.2	24.7	0.063	0.28	8.1	28.9 tr	
cultured	56.1	24.0	49.1	21.4	0.045	0.22	7.0	21.7 tr	
unconventional	42.5	29.6	36.2	22.0	0.014	0.21	6.3	20.0 tr	
normal	66.5	23.7	71.3	21.0	-0.036	0.13 tr	-4.8	19.4	
aggressive	57.5	40.0	49.9	21.8	0.015	0.30	7.6	29.8	
creative	59.7	26.2	53.8	21.6	0.020	0.29	5.9	25.8	
opinionated	60.5	25.8	54.7	25.1	0.039	0.27	5.8	31.5	
pompous	40.5	23.7	45.4	21.9	-0.066	0.26	-4.9	26.2	
shy	48.3	29.4	44.1	25.2	0.010	0.27	4.2	26.4	
eccentric	39.4	26.3	35.6	23.6	0.014	0.30	3.8	22.0	
masculine	24.8	24.2	21.2	20.2	0.024	0.30	3.6	23.3	
neurotic	41.4	32.3	38.4	30.6	0.018	0.32	3.0	21.5	
misfit	31.6	29.6	28.7	25.2	-0.016	0.38	2.9	26.5	
witty	46.5	28.2	48.2	21.0	-0.059	0.31	-1.7	27.0	
dominating	44.8	29.3	46.5	24.8	-0.050	0.29	-1.7	24.6	
egotistical	54.3	26.2	53.6	21.3	-0.014	0.23	0.7	24.5	
shrewd	50.2	29.3	49.8	23.6	-0.034	0.31	0.4	30.0	
modest	50.5	24.1	50.4	23.9	0.002	0.21	0.1	20.3	

Note: Significance test for log of diagnostic ratio is difference from 0.0.

Stereotypic traits are defined as all traits whose log or difference scores are significant and supported by at least a trend ($p < .10$) using the alternate method.

$n=38$ for traits pompous and normal.

*$p < .05$ **$p < .01$ ***$p < .001$ tr = $p < .10$

Table 10

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Female Programmers (FP) vs. Females in General (FG)

Female Subjects Only (n=41)

Trait Name	FP		FG		Log of Diagnostic Ratio (%FP/%FG)			Difference Score: %FP - %FG			Consensus (%)
	M	SD	M	SD	M	SD		M	SD		
Stereotypic Traits											
level-headed	71.5	22.0	58.0	20.9	0.088	0.15	**	13.5	22.5	***	61.0
logical	85.2	15.0	65.0	20.2	0.126	0.15	***	20.2	20.0	***	80.5
anti-social	48.6	30.0	28.6	18.4	0.178	0.34	**	20.0	30.6	***	56.1
perfectionistic	76.4	22.0	58.1	21.7	0.116	0.18	***	18.3	22.2	***	75.6
emotional	40.8	26.8	59.0	23.9	-0.194	0.28	***	-18.2	24.5	***	68.3
dull	54.3	30.3	37.4	20.1	0.104	0.29	*	16.9	29.0	***	61.0
materialistic	52.4	22.3	68.0	19.2	-0.137	0.24	**	-15.6	24.0	***	63.4
feminine	62.3	25.9	76.6	17.8	-0.110	0.18	***	-14.3	22.0	***	58.5
popular	43.0	26.3	57.1	21.8	-0.160	0.25	***	-14.1	25.3	***	63.4
independent	73.9	21.5	60.3	23.5	0.099	0.22	**	13.6	27.4	**	61.0
witty	38.0	28.8	51.6	22.0	-0.286	0.37	**	-13.6	29.0	**	58.5
diligent	70.8	24.3	57.6	22.7	0.088	0.13	***	13.2	18.3	***	58.5
lonely	52.4	26.3	40.4	20.3	0.086	0.23	*	12.0	24.4	**	51.2
quiet	53.3	28.1	41.4	21.9	0.093	0.19	**	11.9	22.2	***	56.1
cold	47.0	29.0	35.2	23.6	0.101	0.26	*	11.8	26.4	**	51.2
temperamental	43.8	25.5	55.0	20.2	-0.134	0.23	***	-11.2	21.1	**	56.1
childish	18.8	20.5	30.0	20.0	-0.218	0.32	***	-11.2	17.4	***	61.0
interesting	51.9	27.8	63.0	20.4	-0.126	0.28	**	-11.1	26.7	*	53.7
incompetent	16.8	19.1	27.3	19.6	-0.233	0.26	***	-10.5	16.5	***	63.4
intelligent	78.9	18.7	69.2	19.8	0.060	0.18	*	9.7	23.2	*	65.9
likeable	52.5	24.2	62.1	19.8	-0.093	0.22	**	-9.6	25.0	***	61.0
realistic	70.1	23.0	60.7	19.6	0.051	0.18	tr	9.4	22.2	**	53.7
short-tempered	41.0	28.5	48.4	20.0	-0.146	0.32	**	-7.4	25.6	tr	53.7
touchy	45.8	27.2	52.8	22.7	-0.099	0.27	*	-7.0	24.9	tr	53.7

Table 10 (continued)

Mean Percentage Trait Ratings: Raw Scores and Stereotyping Measures

Female Programmers (FP) vs. Females in General (FG)

Female Subjects Only (n=41)

Trait Name	FP		FG		Log of Diagnostic Ratio (%FP/%FG)		Difference Score: %FP - %FG		Consensus (%)
	M	SD	M	SD	M	SD	M	SD	
Non-Stereotypic Traits									
shy	47.3	30.9	38.3	20.2	0.018	0.25	9.0	20.6 **	
dominating	43.7	27.1	48.4	19.6	-0.113	0.35 *	-4.7	28.0	
masculine	26.6	23.3	21.9	17.8	0.038	0.23	4.7	15.5 tr	
selfish	43.2	26.7	49.0	25.1	-0.072	0.28	-5.8	27.1	
eccentric	38.2	27.6	33.7	24.1	0.029	0.32	4.5	28.3	
modest	45.9	27.1	49.6	22.0	-0.072	0.28	-3.7	24.1	
aggressive	56.3	27.6	53.0	23.1	0.009	0.22	3.3	26.1	
cultured	50.6	28.0	53.8	21.9	-0.061	0.27	-3.2	25.1	
shrewd	51.0	29.3	48.1	25.8	0.007	0.20	2.9	20.8	
misfit	27.2	27.0	24.5	16.7	-0.038	0.31	2.7	23.3	
neurotic	34.2	26.2	36.8	25.0	-0.060	0.28	-2.6	22.4	
normal	67.5	25.3	69.8	21.2	-0.039	0.25	-2.3	22.7	
proud	68.3	24.8	66.6	20.2	-0.003	0.15	1.7	19.3	
egotistical	51.0	30.0	49.3	22.3	-0.030	0.33	1.7	28.9	
creative	66.2	26.7	64.7	19.5	-0.012	0.20	1.5	24.7	
opinionated	56.3	24.4	54.9	21.2	-0.002	0.22	1.4	24.3	
unconventional	43.2	25.2	42.7	18.6	-0.027	0.22	0.5	21.4	
pompous	34.4	24.4	34.8	22.0	-0.017	0.29	-0.4	24.3	

Note: Significance test for log of diagnostic ratio is difference from 0.0.

Stereotypic traits are defined as all traits whose log or difference scores are significant and supported by at least a trend ($p<.10$) using the alternate method.

*$p<.05$ **$p<.01$ ***$p<.001$ tr = $p<.10$

between the diagnostic ratio and the difference scores with respect to significance levels was: 98% for female subjects rating male targets and for male subjects rating female targets, 95% for female subjects rating female targets, and 88% for males subjects rating male targets.

The Consensus column of Tables 7 through 10 shows the percentage of subjects whose responses agreed with the direction of the difference score. For example, the first entry listed in Table 7 shows that 88.1% of males assigned a higher percentage to MP than to MG for the trait logical. These percentages are substantially higher than those obtained by Katz and Braly (1935) in their study of ethnic stereotypes. Using a pre-selected list of trait names, those researchers identified traits as stereotypic of a particular ethnic group when consensus percentages were as low as 11%. In fact they seldom found more than 40% agreement among their subjects for any particular trait. Although the studies are not strictly comparable because comparisons of the target group with the general population were not done by Katz and Braly, the measured construct is the same, that is, the percentage of subjects who affirm the presence of a particular trait among a target population.

To what extent are the same stereotypes held for male and female targets, and by male and female subjects? Table 11 compares the significant traits for male and female programmers by sex of respondent. The term *significant trait(s)* will be used to refer to only those traits that were significant by one measure of stereotyping supported by at least a trend by the other measure. (Traits reaching significance by one method only are shown in parentheses). In addition, each of the significant traits is classified according to its evaluative category (see Table 4) and whether the percentage assigned to the target is greater or less than that assigned to the general population. (For example, the trait *interesting*, which falls into the evaluative category "+++", is classified as "---", because the target group was assigned a significantly lower percentage than the comparison group.)

Table 11 shows that 11 traits were seen by both male and female subjects as stereotypic of both male and female programmers. Both groups of subjects saw both targets as more likely to be intelligent, logical, level-headed, diligent, perfectionistic, and quiet, and less likely to be emotional, popular, short-tempered interesting, and incompetent than their sex-specific counterparts in the general population. Of these 11

Table 11

Target vs. General Population: Comparision of Significant Traits by Sex of Subject

Male Programmers (MP) vs. Males in General (MG)		Female Programmers (FG) vs. Females in General (FG)	
Male Subjects	Female Subjects	Male Subjects	Female Subjects
+++ more intelligent	+++ more intelligent	+++ more intelligent	+++ more intelligent
++ more logical	++ more logical	++ more logical	++ more logical
++ less short-tempered	++ less short-tempered	++ less short-tempered	++ less short-tempered
++ more level-headed	++ more level-headed	++ more level-headed	++ more level-headed
++ more diligent	++ more diligent	++ more diligent	++ more diligent
++ less incompetent	++ less incompetent	++ less incompetent	++ less incompetent
+ more perfectionistic	+ more perfectionistic	+ more perfectionistic	+ more perfectionistic
+ more quiet	+ more quiet	+ more quiet	+ more quiet
+ less emotional	+ less emotional	+ less emotional	+ less emotional
— less popular	— less popular	— less popular	— less popular
—— less interesting	—— less interesting	—— less interesting	—— less interesting
++ less dominating	++ less dominating		
++ more creative	++ more creative		
- less aggressive	- less aggressive		
(++ more independent)		++ more independent	++ more independent
(+ more shrewd)			
- more lonely		- more lonely	- more lonely
- more dull		- more dull	- more dull
— more anti-social		— more anti-social	— more anti-social
— less likeable		— less likeable	— less likeable
	++ less touchy	++ less touchy	++ less touchy
	++ less childish	++ less childish	++ less childish
	++ more realistic	++ more realistic	++ more realistic
	+ less materialistic	+ less materialistic	+ less materialistic
	+ less temperamental	+ less temperamental	+ less temperamental

Table 11 (continued)

Target vs. General Population: Comparision of Significant Traits by Sex of Subject

Male Programmers (MP) vs. Males in General (MG)		Female Programmers (FG) vs. Females in General (FG)	
Male Subjects	Female Subjects	Male Subjects	Female Subjects
- less normal - more shy (— more misfit) (- more eccentric)	(- more shy)		(- more shy)
	+++ less selfish ++ less egotistical ++ less pompous	+++ less selfish	
		(+ more proud)	
			— less witty — more cold (++ less dominating)
— more neurotic	++ less neurotic		
less masculine	less feminine	less feminine	less feminine

Note. Traits in parentheses were found to be significant by one method (log of diagnostic ratio or mean difference test) unsupported by significance or a trend ($p < .10$) using the other method. All other traits listed were significant by both methods, or significant by one method supported by a trend using the other method.

The evaluative ratings of the traits range from very positive (+++) to very negative (—).

The term "more" indicates a higher percentage for MP or FP than for MG or FG.

The term "less" indicates a lower percentage for MP or FP than for MG or FG.

traits, nine have relatively positive valences, and two have relatively negative valences.

Next let us consider the additional traits that differentiated male programmers from males in general:

1. Both male and female subjects also saw MP, in comparison with MG, as more likely to be creative, and less likely to be dominating and aggressive.

2. Male subjects only saw MP, in comparison with MG, as more likely to be lonely, dull, anti-social, shy, and neurotic, and less likely to be normal and likeable. All of these traits have relatively negative valences. In addition, male subjects (but not female subjects) saw MP, in comparison with MG, as less likely to be masculine.

3. Female subjects only saw MP, in comparison with MG, as more likely to be realistic and less likely to be touchy, childish, materialistic, temperamental, selfish, egotistical, pompous, and neurotic. All of these traits have relatively positive valences. In addition, female subjects (but not male subjects) saw MP, in comparison with MG, as less likely to be feminine.

Note that the trait neurotic was the only significant trait rated in opposite directions by male and female subjects describing MP vs. MG. In addition, male subjects saw MP, in comparison with MG, as less

likely to be masculine, while female subjects saw MP, in comparison with MG, as less likely to be feminine. These interesting findings are discussed further in Chapter V.

Next, let us consider the additional traits that distinguish female programmers from females in general:

1. Both male and female subjects also saw FP, in comparison with FG, as more likely to be independent, realistic, lonely, dull, and anti-social, and less likely to be materialistic, likeable, temperamental, touchy, and childish. Six traits have relatively positive valences and the remaining four have relatively negative valences. In addition, both male and female subjects saw FP, in comparison with FG, as less likely to be feminine.

2. Male subjects only saw FP, in comparison with FG, as less likely to be selfish, a trait with a relatively positive valence.

3. Female subjects only saw FP, in comparison with FG, as less likely to be witty, and more likely to be cold, traits with relatively negative valences.

In summary, both male and female subjects saw 11 traits as differentiating all programmers from the population in general. Other differentiating traits, however, were assigned to the target selectively by sex

of subject. A noteworthy pattern is that in every instance in which male and female subjects differed in the differentiating traits assigned to the targets, the same-sex target was described negatively and the cross-sex target positively.

There was more agreement between male and female subjects in their responses to female programmers than there was between them when they describe male programmers. When the number of significant traits was classified according to whether there was agreement or disagreement by males and females with respect to each target, the results were as follows: for MP, there was agreement on 14 traits and disagreement on 17 traits; for FP there was agreement agreement on 22 traits and disagreement on 3 traits. A 2 x 2 chi-square (sex of target by agreement-disagreement category) was significant (chi-square (1, n=56) = 9.27, p<.01, Yates' correction applied).

Although a priori predictions were made with respect to the direction of every trait, two-tailed tests of significance were done in the event that some results might be opposite to prediction. For a majority of the traits (62.5%), significance was achieved in the predicted direction for at least one sex of target/sex of observer group. For 20% of the

significant traits, the direction was opposite to prediction for certain sex of target/sex of subject combinations. For example, contrary to prediction, the target group was seen as more likely to be realistic and less likely to be materialistic, egotistical, or pompous than the comparison group. Some traits (20%) did not differentiate either MP from MG, or FP from FG (e.g., unconventional, misfit, or modest). Percentages add up to slightly more than 100% because the trait neurotic was counted twice: its direction was consistent with prediction for male subjects rating MP (i.e., MP, in comparison with MG, were seen by male subjects as more likely to be neurotic), and contrary to prediction for female subjects rating MP (i.e., MP, in comparison with MG, were seen by female subjects as less likely to be neurotic).

Free-form comments by subjects. In general, the responses by subjects to the question that asked them to describe the target group in their own words were consistent with the results obtained from the assignment of percentage ratings. Many subjects repeated traits on the list and/or added related terms, for example, sensible, organized, detail-oriented, boring, ambitious, introverted, hard-working, self-controlled, "geeks," "techies," "a little genius."

A large number of responses included descriptions of the target that went beyond single trait terms. Some examples regarding male programmers:

> Loners but very nice people. They spend so much time with a computer that they lose touch!! (female subject, merchandising salesperson)

> They like working with computers because they are predictable and don't have feelings. (female subject, student)

> Introverted people who like dealing with machines more than dealing with people. They are better with figures, more level-headed and realistic than men in general. They also tend to have strange habits with dealing with every day problems and have tendencies towards phobias. Some fear crowds, etc. (male subject, district sales manager, food products)

Some examples with respect to female programmers:

> Not party types. Not much into high fashion or popular music. No make-up. Earth shoes. (female subject, systems consultant)

> Calculation off the belt and taped glasses. (male subject, stock broker, investment banking)

> They feel they are better and more knowledgeable than everyone else and because they are into computers, [they feel that] one should respect them very highly and give them royal treatment. (male subject, salesman, hotel business)

Evaluative dimension of the stereotype. Since the evaluative dimension of the stereotype is implicated in subsequent hypotheses, analyses involving the valence of the traits were done.

Table 12 shows the number of significant traits in each evaluative category broken down by sex of target

Table 12

Breakdown of Number of Significant Traits by Evaluative Category and Sex of Subject

	+++	++	+	Row Total		-	—	——	Row Total	
Male Programmers vs. Males in General										
Male Subjects	1	7	3	11	52.4%	4	5	1	10	47.6%
Female Subjects	2	13	5	20	87.0%	1	1	1	3	13.0%
Column Total	3	20	8	31	70.5%	5	6	2	13	29.5%
Female Programmers vs. Females in General										
Male Subjects	2	9	5	16	72.7%	1	4	1	6	27.3%
Female Subjects	1	9	5	15	65.2%	1	6	1	8	34.8%
Column Total	3	18	10	31	68.9%	2	10	2	14	31.1%

and sex of subject. With all positive (+++, ++, +) and all negative (---, --, -) categories collapsed, the pattern of responses for female subjects describing MP vs. MG differed significantly from those for male subjects describing MP vs. MG (chi-square (1, n = 44) = 4.76, $p<.05$; Yates' correction applied). Overall, female subjects generated a greater number of positively valenced differentiating traits for MP than did male subjects. There was no difference between male and female subjects in the number of distinctive positive and negative traits ascribed to FP (chi-square (1, n = 44) = 0.01, $p<.82$; Yates' correction applied).

An examination of Table 11 shows that many of the positively charged terms center around competence and industriousness, while the more negative traits have to do with perceived deficiencies in the social dimension. Although programmers were viewed as less likely to be socially competent and sensitive to others, they were viewed favorably with respect to what might be called "emotional maturity": in comparison with their counterparts in the general population, they were generally seen as less likely to be temperamental, short-tempered, touchy, or childish, and more likely to be level-headed. Although part of the popular stereotype of computer programmers included traits

denoting psychological abnormality, these traits were assigned only to male programmers, and only by male subjects.

The pattern of reponses toward programmers in the present study parallels that found by Chapanis (1982) whose study of attitudes toward computers revealed two factors, one positive and one negative. His subjects concurrently used both favorable terms such as efficient, precise, reliable, effective, and unfavorable words such as impersonal and cold.

A factor analysis was done in order to determine whether there is support for these observations. Using the MP - MG and FP - FG difference scores of the significant traits for each sex of subject group, four factor analyses (principal componenents analysis, varimax rotation) were done. (The appropriateness of doing this analysis is discussed below.) The results are presented in Appendix B and summarized in Tables 13 and 14. Several of the factors extracted do seem to have to do with intellectual competence, maturity, emotional insensitivity, and lack of social orientation.

The results were not always comparable across the sex-specific subject populations, and they reflect the differences by sex of subject with respect to the

Table 13

Factor Analysis of Difference Scores of Significant Traits

Male Programmers (MP) vs. Males in General (MG)

Male Subjects (n=42)		Female Subjects (n=42)	
Trait Ascription	Loading	Trait Ascription	Loading
Factor 1		**Factor 1**	
+ less emotional	0.84	+++ less selfish	0.81
++ more level-headed	-0.69	++ less touchy	0.80
++ more logical	-0.65	++ less pompous	0.70
--- less interesting	0.61	++ less dominating	0.65
- less normal	0.47	++ less egotistical	0.54
Factor 2		**Factor 2**	
- more shy	0.83	++ more level-headed	-0.77
+ more quiet	0.82	++ less short-tempered	0.72
less masculine	-0.65	+ less temperemental	0.64
++ less dominating	-0.60	++ less childish	0.54
		++ more logical	-0.54
Factor 3		**Factor 3**	
— less likeable	-0.73		
- more dull	0.73	- less aggressive	0.80
— more neurotic	0.53	— less popular	0.74
-- more anti-social	0.49	+ less materialistic	0.61
Factor 4		**Factor 4**	
++ more creative	0.82	++ more creative	0.79
+ more perfectionistic	0.77	+ more perfectionistic	0.68
++ more diligent	0.70		
- more lonely	0.46		

Table 13 (continued)

Factor Analysis of Difference Scores of Significant Traits

Male Programmers (MP) vs. Males in General (MG)

Male Subjects (n=42)		Female Subjects (n=42)	
Trait Ascription	Loading	Trait Ascription	Loading
Factor 5		**Factor 5**	
+++ more intelligent	-0.86	— less interesting	0.82
++ less short-tempered	0.85	+ less emotional	0.76
++ less incompetent	0.60		
Factor 6		**Factor 6**	
- less aggressive	0.87	++ less incompetent	0.74
-- less popular	0.59	++ less neurotic	0.70
		Factor 7	
		+ more quiet	0.76
		less feminine	0.65
		++ more realistic	0.53
		Factor 8	
		++ more diligent	0.83
		+++ more intelligent	0.67

Note. The term "more" indicates a higher percentage for MP than for MG.

The term "less" indicates a lower percentage for MP than for MG.

Table 14

Factor Analysis of Difference Scores of Significant Traits

Female Programmers (FP) vs. Females in General (FG)

Male Subjects (n=39)		Female Subjects (n=41)	
Trait Ascription	Loading	Trait Ascription	Loading
Factor 1		**Factor 1**	
++ less incompetent	-0.76	- more dull	0.83
++ more logical	0.75	- more lonely	0.78
++ more level-headed	0.74	— more anti-social	0.78
++ more independent	0.73	— more cold	0.74
		+ more quiet	0.69
		— less interesting	-0.66
		— less likeable	-0.64
Factor 2		— less popular	-0.64
		less feminine	-0.52
+ less temperamental	0.68		
++ less touchy	0.65		
+ less emotional	0.60		
+ less materialistic	0.55	**Factor 2**	
+++ less selfish	0.48		
		++ more realistic	0.81
		++ more level-headed	0.73
		++ less childish	-0.59
Factor 3			
— less interesting	0.81		
++ less short-tempered	0.80	**Factor 3**	
— less likeable	0.73		
		++ less touchy	0.80
		+ less temperamental	0.80
		+ less emotional	0.66
Factor 4			
— more anti-social	0.83		
- more lonely	0.68		
++ more realistic	0.63		
+ more quiet	0.61		
— less popular	-0.53		

Table 14 (continued)

Factor Analysis of Difference Scores of Significant Traits

Female Programmers (FP) vs. Females in General (FG)

Male Subjects (n=39)		Female Subjects (n=41)	
Trait Ascription	Loading	Trait Ascription	Loading
Factor 5		**Factor 4**	
- more dull	0.80	++ less incompetent	0.83
less feminine	-0.69	++ more diligent	-0.69
+ more perfectionistic	0.53		
		Factor 5	
Factor 6		— less witty	0.75
++ more diligent	0.80	+ less materialistic	0.73
+++ more intelligent	0.54	++ more independent	0.58
Factor 7		**Factor 6**	
++ less childish	0.84	+ more perfectionistic	0.79
		++ less short-tempered	-0.57
		Factor 7	
		+++ more intelligent	0.82
		++ more logical	0.78

Note. The term "more" indicates a higher percentage for FP than for FG.

The term "less" indicates a lower percentage for FP than for FG.

evaluative component of the stereotype as well as the descriptive component. For female subjects rating MP vs. MG, 87% of the significant differentiating traits were in the favorable direction. Indeed the first two factors extracted for this group consisted entirely of traits whose valence is positive. For male subjects rating MP, the number of significant positive and negative traits was almost equal and the factor clusters reflect this pattern.

With respect to female programmers, both male and female subjects assigned more positive than negative traits: the ratio for male subjects is 8:3 and for female subjects about 8:4. The representation of negative traits, however, is sufficiently large to preclude calling the stereotype uniformly positive. Indeed, the results of the factor analysis for female subjects rating FP shows that the first factor consisted almost entirely of negatively valenced traits, and a sizeable number at that. Although there were no significant differences between male and female subjects rating female programmers with respect to the numbers in each evaluative category, the factor analysis reveals that the cluster pattern differed qualitatively by sex of subject.

A caveat is warranted with respect to the validity

of applying a factorial approach to the data in the present study. For each set of data, the number of subjects did not greatly exceed the number of significant traits, a situation that is less than optimal. Furthermore, as Gulliksen (1978) has pointed out, it is essential that the smaller dimension (traits) be two to four times the number of factors and the larger dimension (subjects) be five to ten times the number of factors, with strong preference given to the upper values. The numbers in the present study just barely satisfy the minimum requirements. None of the hypotheses in the present study, however, is dependent on the results of a factor analysis of the data; extracted factors are of interest insofar as they help in interpreting the results obtained using other methods.

Thus far, the evaluative dimension of the stereotype has been treated as a categorical variable, that is, as the number of positive and negative significant traits. This dimension may also be explored as a continuous variable, that is, as a single score whose sign and magnitude would describe its valence and intensity.

Toward this end, an evaluative intensity score was first calculated for each subject by multiplying each

trait's evaluative rating (-300 to +300) by the size of the difference between MP and MG or FP and FG, and then summing across all 42 traits. Because of the documented problems with the diagnostic ratio, it was decided to use the difference score measure for this and all subsequent analyses that involve the trait ratings.

All further analyses involving the evaluative dimension of the stereotype employed all traits rather than only significant traits. As the standard deviations in Tables 7 through 10 indicate, there was considerable variability for significant traits. In addition, the consensus scores were far from unanimous; any individual subject's response for a particular trait may not necessarily reflect the majority, even for significant traits. For example, although 64.3% of male subjects said MP, in comparison with MG, were less likely to be likeable, 21.4% of subjects saw no difference between MP and MG on this trait, and 14.3 subjects viewed MP as more likely to be likeable. Many of the remaining hypotheses involve the intrasubject relationship between the evaluative dimension of the stereotype and other critical measures. Selecting only significant traits for those analyses might distort the picture for subjects who deviate from the majority on

one or more traits, especially significant ones.

Tables 15, 16, 17, and 18 show the evaluative intensity score as well as the number of traits in each valence category for each subject. Before the mean evaluative intensity scores are presented, a brief exploration of the information presented in these tables is warranted.

In the Introduction, mention was made of the finding that observers respond to computers with a mixture of positive and negative feelings (Chapanis, 1982, 1984; Rosenberg, 1986; Turkle, 1984). The results of the present study suggest that a similar evaluative pattern applies to observers of computer programmers. Although some subjects demonstrated a stereotype that tended to be either predominantly positive or predominantly negative, many subjects simultaneously assigned to the target a large number of both positive and negative traits. In addition, many of the comments given by subjects with this response pattern reflected a dual attitude:

> The majority of male programmers are lobe heads....They are more intensely consumed with their task and may forget to eat or sleep. They are not very concerned about social interaction or style or taste. Most often they are physically overweight or underweight and look untidy....They are usually very creative, persistent and knowledgeable. (male subject, sales manager, computer-aided drafting and design)

Table 15

Intrasubject Profile of Evaluative Dimension: Male Programmers (MP) vs. Males in General (MG)

Male Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (MP=MG)	Evaluative Intensity Score
28	30	9	1	98516
22	28	11	1	77880
37	31	7	2	68955
19	22	7	11	60695
21	24	15	1	48290
3	21	12	7	47630
34	19	12	9	42849
16	22	11	7	40855
32	26	14	0	40650
24	21	9	10	33935
12	19	11	10	32491
8	25	9	6	25723
38	22	8	10	20560
30	12	12	16	19310
29	22	14	4	15180
33	20	19	1	14437
20	17	15	8	11735
10	18	21	1	3272
7	18	15	7	1955
18	18	20	2	1042
4	8	9	23	5
2	16	18	6	-158
36	14	20	6	-1024
27	19	13	8	-1095
39	13	15	12	-1525
6	20	17	3	-2170
42	19	21	0	-3540
26	15	18	7	-5094
23	14	9	17	-5194

Table 15 (continued)

Intrasubject Profile of Evaluative Dimension: Male Programmers (MP) vs. Males in General (MG)

Male Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (MP=MG)	Evaluative Intensity Score
15	14	14	12	-5552
5	22	13	5	-10344
1	20	18	2	-13115
35	12	17	11	-14735
25	14	14	12	-18871
41	13	20	7	-19319
40	11	26	3	-25261
14	11	16	13	-27055
31	12	23	5	-28413
17	12	23	5	-40055
9	13	19	8	-42230
13	9	28	3	-131050
11	4	24	12	-134578

Note. Intensity score is calculated as follows: for each trait, its evaluative rating (-300 to +300) is multiplied by the subject's difference score (MP - MG) and the results are summed. The number of traits is 40 because Masculine and Feminine are omitted.

Table 16

Intrasubject Profile of Evaluative Dimension: Male Programmers (MP) vs. Males in General (MG)

Female Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (MP=MG)	Evaluative Intensity Score
18	31	4	5	165144
42	23	9	8	133474
5	23	4	13	116153
32	25	6	9	98850
41	33	7	0	92822
7	21	11	8	91692
15	26	10	4	77669
28	22	7	11	60950
1	21	8	11	54625
27	24	13	3	53914
16	19	9	12	51335
39	23	10	7	49730
14	24	3	13	47600
6	22	11	6	46525
36	22	7	11	43138
20	22	9	9	42775
17	16	12	12	39190
29	24	15	1	26366
25	18	13	9	23075
12	19	15	6	22462
11	20	11	9	21000
8	17	11	12	18440
40	14	11	15	17891
22	18	17	5	16165
2	18	15	7	14840
30	16	18	6	10317
31	20	15	5	9918
23	9	3	28	9325
4	13	12	15	5032

Table 16 (continued)

Intrasubject Profile of Evaluative Dimension: Male Programmers (MP) vs. Males in General (MG)

Female Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (MP=MG)	Evaluative Intensity Score
37	15	18	7	4509
35	10	6	24	3775
21	18	11	11	2570
13	0	0	40	0
26	18	21	1	-2236
3	1	3	34	-3220
19	13	20	7	-4910
10	17	18	5	-6385
24	17	19	4	-7620
33	3	7	30	-14630
38	18	21	1	-18015
34	16	21	3	-27865
9	12	20	7	-49692

Note. Intensity score is calculated as follows: for each trait, its evaluative rating (-300 to +300) is multiplied by the subject's difference score (MP - MG) and the results are summed. The number of traits is 40 because Masculine and Feminine are omitted.

Table 17

Intrasubject Profile of Evaluative Dimension: Female Programmers (FP) vs. Females in General (FG)

Male Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (FP=FG)	Evaluative Intensity Score
24	32	4	4	150423
21	25	7	7	115623
1	24	13	3	113075
28	26	12	2	74097
37	28	11	1	72430
39	23	14	3	63215
2	21	13	6	62577
11	27	11	2	60694
6	26	13	1	38240
19	20	12	8	29620
16	21	16	3	27575
20	16	12	12	27010
17	16	8	16	26333
4	12	5	23	24280
9	17	12	11	21105
29	15	15	10	19588
34	16	15	9	17625
5	20	14	6	12248
13	19	11	10	11717
32	3	1	35	9630
14	13	5	22	9066
12	18	16	6	8629
31	15	8	17	6850
18	21	16	3	2383
38	12	10	18	2104
27	0	0	40	0
3	0	0	40	0

Table 17 (continued)

Intrasubject Profile of Evaluative Dimension: Female Programmers (FP) vs. Females in General (FG)

Male Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (FP=FG)	Evaluative Intensity Score
8	14	19	7	-3365
15	13	19	8	-4000
7	14	19	7	-4615
23	15	19	6	-8725
10	12	10	18	-10550
36	17	20	3	-10864
26	18	17	5	-13290
33	14	24	2	-25810
25	13	19	8	-27325
35	19	18	3	-40885
22	17	20	3	-55090
30	8	32	0	-63900

Note. Intensity score is calculated as follows: for each trait, its evaluative rating (-300 to +300) is multiplied by the subject's difference score (FP - FG) and the results are summed. The number of traits is 40 because Masculine and Feminine are omitted.

Table 18

Intrasubject Profile of Evaluative Dimension: Female Programmers (FP) vs. Females in General (FG)

Female Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (FP=FG)	Evaluative Intensity Score
3	32	4	4	140457
9	26	11	3	87184
1	25	12	3	73452
5	25	11	4	62170
7	28	8	4	59321
15	25	6	9	58493
29	20	5	15	55595
2	22	14	4	46890
6	21	5	14	38805
31	2	0	38	36180
4	25	13	2	33595
34	22	14	4	29434
41	16	10	14	28890
17	18	12	10	28145
19	23	15	2	26030
36	19	17	4	21435
16	24	12	4	21194
27	25	12	3	19510
35	24	13	3	11816
32	10	7	23	9410
38	17	22	1	8479
13	5	5	30	4520
37	13	10	17	2250
22	14	11	15	1932
21	20	18	2	424
39	14	14	12	140
25	0	0	40	0

Table 18 (continued)

Intrasubject Profile of Evaluative Dimension: Female Programmers (FP) vs. Females in General (FG)

Female Subjects

Subject Number	Number of Traits: Positive	Negative	Neither (FP=FG)	Evaluative Intensity Score
28	9	11	20	-10030
20	5	13	22	-14830
33	18	17	5	-14980
26	16	18	6	-15960
10	12	13	15	-17395
23	19	16	5	-18540
24	14	20	6	-22290
12	18	19	3	-26000
8	17	18	5	-27575
14	11	18	11	-56240
30	15	18	7	-63670
11	15	19	6	-65480
40	12	24	4	-101365
18	7	29	4	-226355

Note. Intensity score is calculated as follows: for each trait, its evaluative rating (-300 to +300) is multiplied by the subject's difference score (FP - FG) and the results are summed. The number of traits is 40 because Masculine and Feminine are omitted.

> Female programmers are "intelligent, soft-spoken, aloof, speak strange languages and laugh at inside jokes only." (male subject, clerical worker)
>
> Nice, logical, neurotic people. (male subject rating female programmers, auditing director, manufacturing)

A small number of subjects saw no difference between the target and comparison groups on a sizeable number of traits. Their comments reflected their beliefs that computer programmers are a heterogeneous group or people who share many characteristics with the population in general.

The means for evaluative intensity scores are shown in Table 19. There was no significant main effect for target group ($F(1,160) = 0.68$, $p<.41$). There was, however, a significant Sex of target x Sex of subject interaction ($F(1, 160) = 7.04$, $p<.01$). Same-sex programmers were rated less positively than cross-sex programmers. In addition, there was a significant difference between male and female subjects who rated male programmers. The mean evaluative intensity score for male subjects (+4,200) was significantly less than that for female subjects (+31,807), $t(82) = 2.86$, $p<.01$. With respect to female programmers, the mean evaluative intensity score for male subjects (+18,708) did not differ significantly from that for female subjects (+5,488), $t(78) = 1.14$,

Table 19

Mean Evaluative Intensity Scores

	Target					
	Male Programmers			Female Programmers		
Subjects	M	SD	n	M	SD	n
Males	4200	44081	42	18708	44654	39
Females	31807	44372	42	5488	57600	41

Note. Evaluative intensity scores differed significantly for male and female subjects rating male programmers: $t(82) = 2.86$, $p < .01$.

$p<.26$.

Although no hypothesis was made with respect to attitudes toward the effect of computers on society, it is interesting to note that the correlations between this variable and the evaluative component of the stereotype was close to zero for all sex of subject/sex of target groups with one exception. For male subjects rating FP, the correlation was significant: ($r(38) = -0.44$, $p<.01$). The less favorable the attitude toward computers, the more negative the evaluative score.

Results Concerning Hypothesis 1b

Hypothesis 1b states: Female programmers differ from females in general on a greater number of traits than male programmers differ from males in general.

This hypothesis is not supported by the data. For all subjects combined, the number of significant traits differentiating MP from MG was about the same as the number for FP vs. FG. In addition, the number of traits was equally distributed among the subjects by sex for each target group. Male subjects assigned 21 significant differentiating traits to MP and 22 to FP; females subjects assigned 23 to MP and 23 to FP.

Because subjects were asked to respond only to the male or the female target, it is not surprising that only a small number of subjects made comparisons

between male and female programmers in their comments. Those who did generally felt there were no differences between male and female programmers. For example, one subject stated, "Sex has no bearing on the success, competence or worth of a position." (female, statistician, financial publication and services).

Results Concerning Hypothesis 2

Hypothesis 2 states: Male programmers are seen as having a more positively valenced sterotype on the average than female programmers.

This hypothesis is not supported by the data. Table 12 shows that the number of positive and negative differentiating traits ascribed to MP and FP were equally balanced after collapsing across subjects. As previously demonstrated, there was no main effect for target sex for evaluative intensity score.

Summary of Results for Hypotheses 1a, 1b, and 2

In summary, the results of the present study support the existence of a stereotype of computer programmers by those who are not in the occupation. This stereotype consisted of a number of favorable and unfavorable traits that cluster around Intelligence/Competence, Maturity, Emotional Control, and Social Deviance Factors. However, the results show that it is imperative to take into account both sex of

target and sex of subject when describing both the evaluative and descriptive components of the stereotype.

With respect to the descriptive component of the stereotype, our subjects, regardless of sex, predicated the presence of 11 traits that differentiate both male and female programmers from males and females in general. Several other traits, however, were assigned to the target group selectively according to sex of subject, and/or sex of target. Sex of subject played an especially important role in the description of male programmers; there was more agreement between male and female subjects in the traits they assigned to female programmers than to male programmers.

With respect to the evaluative component of the stereotype, nine positive and two negative traits were assigned to both targets by both male and female subjects. Overall intensity score was also in the favorable direction. Male and female programmers were not perceived to differ from each other with regard to the number of positive and negative traits assigned or to overall intensity score.

Sex of subject, however, accounted for differences in the valence of the stereotype of male programmers, with male subjects demonstrating a significantly less

favorable response than female subjects. In addition, the evaluative component was less favorable when sex of subject and target was the same than when they were different.

Results Concerning Hypotheses 3a, 3b, 4, and 5

According to these hypotheses, it was expected that the evaluative dimension of the stereotype would be predicted by the interactions between the following variables: (a) contact (both work-related and non-work-related), (b) status differential and (c) cooperation and competition between target group and subject. First, the responses by subjects to the relevant questions concerning the social structure variables are examined.

Contact. For both work-related and non-work-related contact situations, subjects were asked to give the number of male programmers or female programmers with whom they had "interaction." If the answer was non-zero, they were asked to indicate the number of days and the number of hours per day they had this interaction. The questions on work-related contact were completed only by those subjects who were employed on either a full-time or a part-time basis.

The results for the measures of contact are shown in Tables 20 and 21. Fewer subjects responded to the

Table 20

Mean Responses to Questions 6 & 7: Work-Related Contact

(Employed Subjects Only)

	Target					
	Male Programmers			Female Programmers		
Subjects	*M*	*SD*	*n*	*M*	*SD*	*n*
	Number of Programmers					
Males	4.1	5.4	29	3.3	10.1	30
Females	3.7	9.0	26	2.7	4.3	29
	Number of Days per Year					
Males	118.1	87.0	22	144.5	107.1	11
Females	127.3	90.7	13	86.0	86.6	18
	Number of Hours per Day					
Males	3.0	1.8	21	3.2	2.5	12
Females	2.1	1.3	13	1.8	1.4	19

Note. Mean responses to number of programmers include zero. *N*'s are smaller for questions concerning days and hours because responses are dependent on non-zero responses to question concerning number of programmers.

Table 21

Mean Responses to Questions 10 & 11: Non-Work-Related Contact

	Target					
	Male Programmers			Female Programmers		
Subjects	*M*	*SD*	*n*	*M*	*SD*	*n*
	Number of Programmers					
Males	2.9	4.5	42	1.4	3.5	35
Females	2.0	2.4	42	1.8	2.8	39
	Number of Days per Year					
Males	91.2	82.0	25	62.5	65.6	14
Females	69.0	104.7	23	49.9	68.4	18
	Number of Hours per Day					
Males	1.8	1.3	23	3.2	2.0	13
Females	3.4	3.7	22	2.6	1.4	18

Note. Mean responses to number of programmers include zero. *N*'s are smaller for questions concerning days and hours because responses are dependent on non-zero responses to question concerning number of programmers.

questions concerning work-related contact than those concerning non-work-related contact because 29% of the subjects were not employed. Nevertheless, for all sex of target/sex of observer groups, substantially more subjects gave non-zero responses to the question concerning work-related contact than to that concerning non-work-related contact. For both types of contact situations, there were no significant differences between male and female subjects in the number of programmers with whom they had contact either within target group or overall.

Although a pretest supported the feasibility of using questions about contact days per year and hours per day, in the present study some of the subjects neglected to answer one of the pairs of questions. Therefore, only the number of programmers was used as a measure of contact in all subsequent analyses.

Job status. Employed subjects were asked to give their opinions of "how much status or prestige" is associated with (a) the job of MP or FP at their business organization, and (b) their own jobs. The scale values range from 1 (very low status/prestige) to 9 (very high status/prestige). Because it was status differential that was of primary interest, a difference score was calculated as follows: status of job of

target (MP or FP) minus status of job of subject. Researchers have successfully used such a mathematical difference score as a measure of status differential between observers and targets (Rosenfield et al., 1981). Using the difference formula, the possible range of status differential scores is from +9 to -9: a plus score indicates a job status of target higher than that of subject; a minus score indicates a job status of target lower than that of subject. There were two ways to analyze the data; one was to preserve the sign of the difference, the other was to disregard the sign and use the absolute difference. Both methods of analysis were carried out. Because they did not yield different results, only the analyses that preserved the sign are reported. The fact that the analyses that employed absolute differences did not yield different results may be due to the fact that there were relatively few instances in which the job status of the observer was greater than that of the target. A large majority (74%) of subjects reported job status levels lower than or equal to that of the target group.

The means for all status measures are shown in Table 22. Note that all of the means for status of target indicate a moderate level of prestige and are

Table 22

Mean Responses to Questions 4 and 5: Perceived Status of Target's Job and Subject's Job (Employed Subjects Only)

	Target					
	Male Programmers			Female Programmers		
Subjects	M	SD	n	M	SD	n
	Status of Target's Job					
Males	6.0	1.8	29	5.3	1.5	32
Females	5.7	1.7	25	5.8	1.9	28
	Status of Subject's Job					
Males	5.3	1.6	29	5.3	2.3	32
Females	4.6	1.9	25	4.6	2.4	28
	Status Differential Scores					
Males	0.7	2.8	29	0.0	2.3	32
Females	1.1	2.5	25	1.2	2.4	28

Note: Status scale values ranged from 1 = very low status/prestige to 9 = very high status/prestige. Mean status of male and female subjects differed significantly, $t(112) = 2.01$, $p < .05$. Status differential scores were calculated as follows: target's job status minus subject's job status.

comparable to the results reported by Stevens and Featherman (1981), who obtained a mean of 63.57 on a 100-point scale for the job of computer programmer. The perceived status of one's own job differed significantly for male subjects (M = 5.3) and for female subjects (M = 4.6), $t(112) = 2.01$, $p<.05$. This result is not surprising insofar as higher status positions are traditionally occupied by more males than females.

With respect to status differential, all means were small but positive, indicating that the job of computer programmer is viewed by the subjects as having, on average, somewhat more status/prestige than their own. On this measure, there was a statistically significant difference between the means for males (0.0) and for females (1.2), $t(58) = 2.01$, $p<.05$ when they rated FP.

Cooperation and Competition. Employed subjects only were asked how much cooperation there is in their work-related interaction with MP or FP. The scale values ranged from 1 (extreme lack of cooperation) to 9 (extreme amount of cooperation) with the midpoint 5 labelled neutral. The next question asked these same subjects about how much competition they had with male or female programmers in their organization with

respect to "raises, bonuses, promotions or recognition for your work." The scale values ranged from 1 (extreme lack of competition to 9 (extreme amount of competition) with the midpoint 5 labelled neutral.

The results are shown in Table 23. Note that the mean level of cooperation is situated approximately midway between neutral and moderate. With respect to perceived competition, the means are situated close to the scale value 3 reflecting a moderate lack of competition for all subject groups. There were no significant differences between male and female subjects either within target group or overall with respect to cooperation and competition levels.

Correlations between critical variables. The critical variables are those implicated in hypotheses 3a, 3b, 4, 5, namely, cooperation, competition, work-related contact, non-work-related contact, job status of target, job status of observer, job status differential, and evaluative intensity score. Before direct tests of these hypotheses are described, it is helpful to examine the pattern of intercorrelations between these variables. The results for all sex of target/sex of observer combinations are shown in Tables 24, 25, 26 and 27.

Because the number of subjects in some cells is

Table 23

Mean Responses to Questions 8 & 9: Perceived Levels of Cooperation and Competition between Target and Subject (Employed Subjects Only)

	Target					
	Male Programmers (MP)			Female Programmers (FP)		
Subjects	M	SD	n	M	SD	n
	Cooperation					
Males	5.9	1.6	23	5.8	2.1	13
Females	5.9	2.2	13	6.3	1.8	18
	Competition					
Males	3.3	2.0	23	3.3	2.4	13
Females	3.2	2.4	13	4.3	2.5	18

Note. Higher scale values indicate greater levels of cooperation and competition. Responses to these questions are dependent on non-zero responses to Question 6 which asks for number of MP(FP) with whom subject has work-related contact.

Table 24

Intercorrelations Between Responses to Critical Questions

Target: Male Programmers (MP) (Male Subjects Only)

	2	3	4	5	6	7	8
1. Cooperation	.18	.41	-.14	.34	.04	.27	.06
(n)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
2. Competition	—	.29	-.12	.25	.35	.20	.11
(n)		(23)	(23)	(23)	(23)	(23)	(23)
3. Perceived Status of Job of MP		—	-.35	.84 ***	.24	.26	-.22
(n)			(29)	(29)	(29)	(29)	(29)
4. Perceived Status of Subject's Job			—	-.81 ***	.09	-.16	-.18
(n)				(29)	(29)	(29)	(29)
5. Status Differential (#3 minus #4)				—	.10	.26	-.04
(n)					(29)	(29)	(29)
6. Work-Contact: # of MP's					—	.59 ***	-.30
(n)						(29)	(29)
7. Non-Work-Contact: # of MP's						—	.05
(n)							(42)
8. Evaluative Intensity Score							—

*p(.05. ***p(.001.

Table 25

Intercorrelations Between Responses to Critical Questions

Target: Male Programmers (MP) (Female Subjects Only)

	2	3	4	5	6	7	8
1. Cooperation	.30	.00	.22	-.13	.22	-.32	-.30
(n)	(13)	(13)	(13)	(13)	(13)	(13)	(13)
2. Competition	—	.28	.50	-.09	-.12	-.01	-.61 *
(n)		(13)	(13)	(13)	(13)	(13)	(13)
3. Perceived Status of Job of MP		—	.06	.65 ***	-.48 ***	-.53 **	-.06
(n)			(25)	(25)	(25)	(25)	(25)
4. Perceived Status of Subject's Job			—	-.73 ***	.15	.07	-.10
(n)				(25)	(25)	(25)	(25)
5. Status Differential (#3 minus #4)				—	-.45 *	-.42 *	.04
(n)					(25)	(25)	(25)
6. Work-Contact: # of MP's					—	.41 *	.13
(n)						(26)	(26)
7. Non-Work-Contact: # of MP's						—	.11
(n)							(42)
8. Evaluative Intensity Score							

*p(.05. **p(.01. ***p(.001.

Table 26

Intercorrelations Between Responses to Critical Questions

Target: Female Programmers (FP) (Male Subjects Only)

	2	3	4	5	6	7	8
1. Cooperation	.25	-.00	.21	-.24	-.34	.33	.70 **
(n)	(13)	(13)	(13)	(13)	(13)	(13)	(13)
2. Competition	—	.32	.40	-.18	.05	.52	-.11
(n)		(13)	(13)	(13)	(13)	(13)	(13)
3. Perceived Status of Job of FP		—	.32	-.34	.06	.28	-.04
(n)			(32)	(32)	(30)	(29)	(32)
4. Perceived Status of Subject's Job			—	-.78 ***	.01	.05	-.10
(n)				(32)	(30)	(29)	(32)
5. Status Differential (#3 minus #4)				—	.03	.12	-.12
(n)					(30)	(29)	(32)
6. Work-Contact: # of FP's					—	.31	-.34
(n)						(28)	(30)
7. Non-Work-Contact: # of FP's						—	-.01
(n)							(35)
8. Evaluative Intensity Score							—

**p(.01. ***p(.001.

Table 27

Intercorrelations Between Responses to Critical Questions

Target: Female Programmers (FP) (Female Subjects Only)

	2	3	4	5	6	7	8
1. Cooperation	-.09	.27	.40	-.18	-.17	.33	.26
(n)	(18)	(18)	(18)	(18)	(18)	(18)	(18)
2. Competition	—	.28	-.17	.47 *	-.29	.05	.06
(n)		(18)	(18)	(18)	(18)	(18)	(18)
3. Perceived Status of Job of FP		—	.41 *	.40 *	-.39 *	-.39 *	-.22
(n)			(28)	(28)	(27)	(28)	(28)
4. Perceived Status of Subject's Job			—	-.67 ***	-.10	-.26	-.10
(n)				(28)	(27)	(28)	(28)
5. Status Differential (#3 minus #4)				—	-.22	-.05	-.00
(n)					(27)	(28)	(28)
6. Work-Contact: # of FP's					—	.28	-.09
(n)						(29)	(29)
7. Non-Work-Contact: # of FP's						—	.20
(n)							(39)
8. Evaluative Intensity Score							—

*p(.05. ***p(.001.

small, the correlations were recomputed for each target group, collapsing across sex of subject. The results are shown in Tables 28 and 29. Note that no new significant correlations emerged from these analyses, and that some of the relationships were actually obscured when the scores were collapsed across sex of subject.

With respect to Tables 24 throuth 27, significant relationships worthy of mention are as follows:

1. For female subjects rating MP, evaluative intensity score was negatively associated with competition ($r(13) = -0.61$, $p<.05$). As reported level of competition increased, the evaluative score became more negative. For male subjects rating FP the sign of the correlation was also negative but the relationship was not significant. For male subjects rating MP and for female subjects rating FP, the signs of the correlations were positive, but the relationships were not significant.

2. For female subjects rating MP, status differential scores were negatively related to both work-related ($r(25) = -0.45$, $p<.05$) and non-work-related contact ($r(25) = -0.42$, $p<.05$), that is, as perceived status of MP relative to female subjects increased, amount of contact decreased. For female

Table 28

Intercorrelations Between Responses to Critical Questions

Target: Male Programmers (MP) (All Subjects)

	2	3	4	5	6	7	8
1. Cooperation	.05	.22	.02	.11	.14	.12	-.07
(n)	(36)	(36)	(36)	(36)	(36)	(36)	(36)
2. Competition	—	.28	.13	.11	.07	.15	-.17
(n)		(36)	(36)	(36)	(36)	(36)	(36)
3. Perceived Status of Job of MP		—	-.12	.74 ***	-.18	.08	-.16
(n)			(54)	(54)	(54)	(54)	(54)
4. Perceived Status of Subject's Job			—	-.76 ***	.13	-.03	-.19
(n)				(54)	(54)	(54)	(54)
5. Status Differential (#3 minus #4)				—	-.20	.08	.03
(n)					(54)	(54)	(54)
6. Work-Contact: # of MP's					—	.41 **	-.03
(n)						(55)	(55)
7. Non-Work-Contact: # of MP's						—	.03
(n)							(84)
8. Evaluative Intensity Score							—

**p(.01. ***p(.001.

Table 29

Intercorrelations Between Responses to Critical Questions

Target: Female Programmers (FP) (All Subjects)

	2	3	4	5	6	7	8
1. Cooperation	.09	.16	.28	-.14	-.28	.32	.39 *
(n)	(31)	(31)	(31)	(31)	(31)	(31)	(31)
2. Competition	—	.32	.00	.25	-.00	.20	-.04
(n)		(31)	(31)	(31)	(31)	(31)	(31)
3. Perceived Status of Job of FP		—	.34	.39 **	-.00	-.18	-.16
(n)			(60)	(60)	(57)	(57)	(60)
4. Perceived Status of Subject's Job			—	-.74 ***	-.02	-.19	.01
(n)				(60)	(57)	(57)	(60)
5. Status Differential (#3 minus #4)				—	-.04	.06	-.13
(n)					(57)	(57)	(60)
6. Work-Contact: # of FP's					—	.19	-.21
(n)						(57)	(59)
7. Non-Work-Contact: # of FP's						—	.10
(n)							(74)
8. Evaluative Intensity Score							—

*p(.05. **p(.01. ***p(.001.

subjects rating FP the signs of the correlations were also negative, while for male subjects rating MP and for male subjects rating FP the signs were positive, but the relationships were not significant.

3. For male subjects rating FP, evaluative intensity scores were positively associated with cooperation ($r(13) = 0.70$, $p<.01$), that is, higher levels of cooperation were associated with positive evaluative scores. For male subjects rating MP and for female subjects rating FP, the signs of the correlations were also positive, while for female subjects rating MP the sign was negative, but the relationships were not significant.

4. For female subjects rating FP, competition was positively related to status differential scores ($r(18) = 0.47$, $p<.05$), (i.e., as status of FP relative to that of female subjects increased so did reported levels of competition). For male subjects rating MP, the sign of the correlations was also positive, while for female subjects rating MP and for male subjects rating FP, the signs were negative, but the relationship were not significant.

For no sex of target/sex of subject group was there a significant correlation between measures of (a) cooperation and competition, (b) cooperation and any of

the status measures (c) competition and either subject's or target's perceived job status, (d) cooperation and work-related or non-work-related contact, (e) evaluative intensity score and contact (work-related and non-work-related), and (f) evaluative intensity score and any of the status measures.

Direct tests of hypotheses 3a, 3b, 4, and 5. These hypotheses dealt with predicted interactions concerning contact, status differential (subjective), cooperation, and competition. Multiple regression analysis was used to test these hypotheses. The criterion measure was evaluative intensity score. For tests of hypotheses 3a and 3b, the predictor terms were status differential, contact (number of target) and an interaction term created by multiplying the status differential and contact scores. For a test of hypotheses 4 and 5, the predictor terms were cooperation, competition, status differential and contact. (The means for all predictor variables were presented in Tables 20 through 23.) For tests of all of these hypotheses, separate equations were computed for work-related and non-work-related contact. With respect to hypothesis 4, the cooperation measure was entered as a single term, and in interaction with status differential and the appropriate contact

measure. In similar fashion, the competition measure was entered for a test of hypothesis 5. In addition, the triple interaction term Cooperation (or Competition) x Status differential x Contact was entered. The hypotheses would be supported if the beta weights of the appropriate interaction terms were significant when a linear relationship between the dependent and the independent variables was found.

Given the strong possibility that the slopes would differ among the four sex of target/sex of subject groups, and the relatively small number of subjects in each, it was decided to approach the analyses in three phases:

1. The first series of analyses employed all subjects and made no distinction by sex of target or sex of subject.

2. In the second phase, all subjects were used, but group membership "dummy" variables were entered into the equation as follows: (a) GR1 = 1 if the measures are from a female subject rating MP; zero otherwise; (b) GR2 = 1 if the measures are from male subjects rating FP; zero otherwise; (c) GR3 = 1 if the measures are from female subjects rating FP; zero otherwise. Males rating MP are represented when GR1, GR2, and GR3 all equal zero. Each of these dummy

variables was entered as a single term and in combination with every other term in the regression equations to create a fully saturated model.

3. In the third phase, an attempt was made to compute the multiple regression equations separately for each sex of target/sex of subject group.

Although the results of all regression phases are summarized in the text, presentation in Tables is limited to selected significant results because of the large number of regression equations generated.

Results concerning hypothesis 3a. Hypothesis 3a states: Frequency of work-related contact interacts with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

The results provide qualified support for this hypothesis. Table 30 shows the outcome for the first multiple regression employing all subjects. R square (0.09) failed to attain significance ($F(3,63) = 1.99$, $p<.12$; however, the beta weight (-0.29) for the interaction term Status differential x Work contact was significant ($t(67) = -.2.06$, $p<.05$). In addition, the change in R square (0.06) generated by the addition of the interaction term was significant ($p<.05$).

When the fully saturated model with group

Table 30

Results of Multiple Regression Analysis: Evaluative Intensity Score as a Function of Work Contact (WC), Status Differential (SD), and WC x SD: Male and Female Programmers Combined, All Subjects

Multiple R	.29	Analysis of Variance	df	F	p
R Square	.09	Regression	3		
Standard Error	51106.8	Residual	63	1.99	.12

Variable	B	Beta	r	Partial r	t	p
Work Contact	-920.9	-.16	-.09	-.16	-1.29	.20
Status Differential	321.4	.02	-.12	.01	.11	.91
Work Contact x Status Differential	-587.8	-.29	-.25	-.25	-2.06	.05

membership terms was used, the R square (0.19) still did not attain significance ($F(15,93) = 1.43$, $p<.15$). (See Table 31.) Once again, however, the only term whose beta weight (-1.14) was significant was the interaction term Status differential x Work contact ($t(109) = -2.37$, $p<.05$). There was a near-significant beta weight (1.00) for the term GR1 (female subject rating MP) x Status differential x Work contact ($t(108) = 1.91$, $p<.06$). Note that the sign of this beta weight is positive while the sign of the term not containing the group membership term is negative.

The results of the multiple regression equations generated in the third phase, for each sex of target/sex of subject group are shown in Tables 32 and 33. For male subjects rating male programmers, the R square (0.34) was significant ($F(3,25) = 4.35$, $p<.05$), and the beta weight (-.95) for the interaction term Status differential x Work contact was significant ($t(29) = -3.14$, $p<.01$). (The sign of the beta weight for this interaction term is also negative for female subjects rating female programmers, while the signs of these weights are positive for same-sex observers. This pattern of results suggested that work contact might interact with status differential in opposite ways for same-sex observers, but the only interaction

Table 31

Results of Multiple Regression Analysis: Evaluative Intensity Score as a Function of Work Contact (WC), Status Differential (SD), and WC x SD Group Membership Variables Included

Male and Female Programmers Combined, All Subjects

Multiple R	.43	Analysis of Variance	df	F	p
R Square	.19	Regression	12		
Standard Error	51186.8	Residual	93	1.43	.15

Variable	B	Beta	r	Partial r	t	p
WC	2364.0	.35	-.13	.09	.89	.38
SD	7859.8	.38	-.05	.17	1.63	.11
Group 1 (GR1)	26600.2	.22	.23	.14	1.39	.17
Group 2 (GR2)	20199.4	.17	.02	.12	1.17	.24
Group 3 (GR3)	5285.0	.04	-.15	.03	.28	.78
WC x SD	-2904.2	-1.14	-.20	-.24	-2.37	.02
WC x GR1	-1344.0	-.12	.13	-.03	-.31	.76
WC x GR2	-4710.9	-.49	-.14	-.15	-1.42	.16
WC x GR3	-3900.1	-.19	-.13	-.12	-1.1	.26

Table 31 (continued)

Results of Multiple Regression Analysis: Evaluative Intensity Score as a Function of Work Contact (WC), Status Differential (SD), and WC x SD Group Membership Variables Included

Male and Female Programmers Combined, All Subjects

Variable	B	Beta	r	Partial r	t	p
SD x GR1	-5624.2	-.14	.10	-.08	-.78	.44
SD x GR2	-11376.7	-.27	-.06	-.17	-1.70	.09
SD x GR3	-8202.7	-.20	-.12	-.12	-1.20	.23
WC x SD x GR1	2924.6	1.00	-.07	.19	1.91	.06
WC x SD x GR2	3814.6	.42	-.12	.17	1.71	.09
WC x SD x GR3	-78.0	-.00	-.16	-.00	-.03	.98

Note. GR1 = 1 for female subjects rating male programmers; zero otherwise
GR2 = 1 for male subjects rating female programmers; zero otherwise
GR3 = 1 for female subjects rating female programmers; zero otherwise

Table 32

Results of Multiple Regression Analysis: Evaluative Intensity Score as a Function of Work Contact (WC), Status Differential (SD), and WC x SD: Male Programmers

Male Subjects

Multiple R	.59	Analysis of Variance	df	F	p
R Square	.34	Regression	3		
Standard Error	38083.00	Residual	25	4.35	.05

Variable	B	Beta	r	Partial r	t	p
Work Contact	2364.0	.29	-.29	.19	1.18	.25
Status Differential	7859.8	.49	-.04	.35	2.16	.05
Work Contact x Status Differential	-2904.2	-.95	-.47	-.51	-3.14	.01

Female Subjects

Multiple R	.16	Analysis of Variance	df	F	p
R Square	.03	Regression	3		
Standard Error	51646.2	Residual	21	.19	.90

Variable	B	Beta	r	Partial r	t	p
Work Contact	1020.0	.19	.12	.06	.29	.78
Status Differential	2235.6	.11	-.04	.09	.41	.69
Work Contact x Status Differential	20.4	.02	-.10	.02	.02	.98

Table 33

Results of Multiple Regression Analysis: Evaluative Intensity Score as a Function of Work Contact (WC), Status Differential (SD), and WC x SD: Female Programmers

Male Subjects

Multiple R	.38	Analysis of Variance	df	F	p
R Square	.14	Regression	3		
Standard Error	45118.4	Residual	24	1.35	.28

Variable	B	Beta	r	Partial r	t	p
Work Contact	-2354.9	-.53	-.34	-.25	-1.34	.19
Status Differential	-3516.9	-.19	-.13	-.16	-.90	.40
Work Contact x Status Differential	910.4	.23	.28	.10	.55	.59

Female Subjects

Multiple R	.25	Analysis of Variance	df	F	p
R Square	.06	Regression	3		
Standard Error	64902.4	Residual	23	.51	.68

Variable	B	Beta	r	Partial r	t	p
Work Contact	-1616.1	-.11	-.09	-.11	-.55	.59
Status Differential	-342.9	-.01	-.10	-.01	-.06	.96
Work Contact x Status Differential	-2982.2	-.23	-.22	-.20	-.97	.34

term that had a significant weight was for male subjects rating MP.)

For male subjects rating MP, the weight for the status differential variable (0.49) was also significant ($t(29) = 2.16$, $p<.05$), with a sign opposite to that of the weight of the interaction term. For this group, status differential by itself predicted evaluative intensity score, that is, as the status of MP relative to that of male raters increases, evaluative score became more favorable. Work-related contact, however, interacted with status to produce the opposite effect: as status differential (job status of target greater than that of observer) increased, high contact resulted in more negative evaluative scores and low contact in more positive scores. As job status differential became more equal, the effect of contact became less pronounced, resulting in evaluative scores in the midrange. Here is an illustrative comment by one subject who had a moderately negative evaluative intensity score, and who reported daily work contact with 25 male programmers and a job status moderately lower than the target:

> Most are arrogant and narrow-minded. They refuse to adapt to the social requirements of a particular situation (e.g., they dress weirdly). They are more analytic and intelligent than average. They often act silly and are sometimes lazy. (male subject, data analyst, insurance).

Results concerning hypothesis 3b. Hypothesis 3b states: Frequency of non-work-related contact interacts with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

This hypothesis is not supported. None of the multiple regression analyses yielded significant F ratios, and none of the beta weights for any of the terms in any of the equations attained significance.

Summary of results concerning hypotheses 3a and 3b. As hypothesized, frequency of work-related contact (number of male or female programmers reported by the subject) interacted with status differential to predict evaluative intensity score, but this relationship was conclusively demonstrated only for male subjects rating male programmers. That is, as job status of target relative to that of observer increased, more negative evaluative scores resulted with high levels of contact. There was no relationship between evaluative score and the interaction between status differential and non-work-related contact.

Results concerning hypothesis 4. Hypothesis 4 states: Level of cooperation interacts with frequency of contact (work-related and/or non-work-related) and with status of observer relative to that of computer

programmers in predicting the evaluative dimension of the stereotype.

The results do not support this hypothesis. When the contact measure used in the analyses was work-related contact, none of the multiple regression analyses yielded significant F ratios, and none of the beta weights for any of the terms in any of the equations attained significance.

When non-work-related contact was substituted in the equation, the results were somewhat ambiguous. The phase one multiple regression analysis involving all subjects was not significant (R square = 0.11, $F(7,59) = 1.08$, $p<.39$), although there was a marginally significant beta weight (-1.43) for the interaction term Cooperation x Non-work contact ($t(67) = -1.94$, $p<.06$).

Significance of R square was attained, however, when the fully saturated model was used. For work-related contact, the R square = .54, ($F(24,42) = 2.08$, $p<.05$). The beta weights for five of the 31 terms attained significance; all of these terms contained group membership variables. When non-work-related contact was entered into the equation, the R square (0.57) was significant ($F(27,39) = 1.89$, $p<.05$). Four of the 31 terms in the equation failed to meet the

minimum tolerance levels for inclusion and were omitted from the equation. Three terms which included the cooperation variable had significant beta weights but they also included group membership variables. This pattern suggested that the slopes differed by sex of target and/or sex of observer. When the analyses were done for each of the sex of target/sex of subject groups, however, none of the regression equations reached significance.

Results concerning hypothesis 5. Hypothesis 5 states: Level of competition interacts with frequency of contact (work-related and/or non-work-related) and with status of observer relative to that of computer programmers in predicting the evaluative dimension of the stereotype.

The results offer partial support for this hypothesis. Competition was shown to interact with status differential, but not with either of the contact measures, in determining evaluative intensity score.

Table 34 shows the results for the phase one multiple regression analysis employing all subjects and using work-related contact. R square (0.22) was significant ($F(7,59) = 2.42$, $p<.05$). The beta weight (-0.59) for the Status differential x Competition interaction term was significant ($t(67) = -2.02$,

Table 34

Results of Multiple Regression Analysis: Evaluative Intensity Score as a Function of Work Contact (WC), Status Differential (SD), Competition (COMP), WC x SD, WC x COMP, SD x COMP, and WC x SD x COMP: Male and Female Programmers Combined, All Subjects

Multiple R	.47	Analysis of Variance	df	F	p
R Square	.22	Regression	7		
Standard Error	48702.6	Residual	59	2.42	.05

Variable	B	Beta	r	Partial r	t	p
Work Contact	1393.6	.24	-.09	.08	.73	.47
Status Differential	9097.8	.45	-.12	.22	1.90	.06
Competition	4389.0	.19	-.12	.12	1.02	.31
Work Contact x Status Differential	-199.2	-.10	-.25	-.04	-.31	.76
Work Contact x Competition	-778.3	-.45	-.20	-.16	-1.37	.18
Status Differential x Competition	-3579.4	-.59	-.29	-.23	-2.02	.05
Work Contact x Status Differential x Competition	-96.6	-.11	-.35	-.04	-.35	.73

$p<.05$). In addition, the change in R square (0.09) was significant ($p<.05$) when this interaction term was entered into the equation after all of the single terms. As job status of programmers relative to that of subject increased, high levels of competition resulted in more negative evaluative scores while low levels of competition resulted in more positive scores.

Comments by subjects are illustrative of the evaluative direction consistent with the prediction. For example, one subject who reported a high level of competition and a job status much lower than that of the target (male programmers) stated:

> Avoid at all costs except when necessary. Very few are helpful, [they] feel too superior to answer a simple question, even if it only takes two seconds. (female subject, reports reviewer, computer administration, insurance).

Another subject who reported a high level of competition and a job status equal to that of the target (female programmers) felt differently:

> They are always ready to help others and are very attentive to your needs. (female subject, student, part-time banquet assistant sales manager).

One subject who reported no competition and a job status moderately higher than that of the target (female programmer) repeated many of the positive traits on the list and stated:

> If you scratch one, there's usually a nice person underneath. (female subject, director of marketing, telecommunications).

When a fully saturated model was employed to test the effect of competition in interaction with work-related contact and status differential, R square (0.59) was significant ($F(27,39) = 2.05$, $p<.05$). None of the beta weights for any of the terms involving competition approached significance, with the exception of the quadruple interaction term Competition x Work contact x Status Differential x GR3 (female subject rating FP).

When the multiple regression analyses were done by sex of target/sex of subject groups, the only equation to reach significance was for male subjects rating male programmers (R square = 0.60, $F(7,15) = 3.17$, $p<.05$). However, none of the beta weights for any of the interaction terms involving competition was significant. There was a significant beta weight (0.82) for the single competition variable ($t(23) = 2.27$, $p<.05$). For male subjects rating MP, higher levels of competition were associated with more favorable evaluative scores, a relationship not demonstrated via the simple correlation between the two variables ($r(23) = .11$, $p<.62$).

When non-work-related contact was substituted,

none of the R square's for any of the regression analyses reached significance. Nevertheless, when the beta weights for the interaction terms were analyzed, two were significant. In the fully saturated model, the beta weight (-1.33) for the Competition x Status differential interaction term was significant ($t(67) = -2.22$, $p<.05$). For male subjects rating male programmers, the beta weight (-1.48) for that interaction term was significant ($t(23) = -3.15$, $p<.01$). In addition, the beta weight for the competition variable (0.80) was significant ($t(23) = 2.42$, $p<.05$).

Summary of results concerning hypotheses 4 and 5. With respect to the interaction between cooperation, status differential and contact (workrelated or non-work-related), no definitive relationship with evaluative score was established. When competition was substituted for cooperation in the equations, a general relationship between evaluative score and the interaction between competition and status differential was found. As job status of target increased relative to that of observer, high levels of competition were associated with more negative evaluative scores while low levels of competition were associated with more positive scores. No relationship was demonstrated

between evaluative scores and the interaction between any of the contact measures and cooperation and competition.

Chapter IV

Discussion and Conclusions

This chapter first presents a summary of the findings concerning the descriptive and evaluative components of the stereotype of computer programmers, followed by the findings concerning the variables that have been shown to be related to the evaluative component of the stereotype. The chapter continues with a discussion of the results as they bear on theoretical issues concerning the definition of a stereotype, the measurement of stereotypes, and practical problems in an organizational context.

Descriptive Component of the Stereotype

Programmers have been described in the popular literature as competent, emotionally controlled, socially deviant, and psychologically abnormal (Bolter, 1984; Brandon, 1968; McClellan, 1984; Rosenberg, 1986; Slaughter, 1982; Turkle, 1984; Weizenbaum, 1976). The results of the present study are for the most part consistent with this image. Multivariate and univariate tests of the differences between the target and comparison groups (male programmers vs. males in general, and female programmers vs. females in general) were used to determine which traits comprised the stereotype of the target groups. The analyses revealed

that both male and female computer programmers in comparison with males and females in general were seen by male and female observers as more likely to be intelligent, logical, diligent, perfectionistic, level-headed, and quiet, and less likely to be incompetent, short-tempered, emotional, popular, and interesting. Other traits characteristic of the four broad dimensions mentioned in the popular literature were assigned to the target groups by sex of target and/or sex of observer.

Let us briefly consider each of these dimensions in terms of how generally the traits are attributed to one or both target groups. (It may be helpful to refer to Table 11 during the following discussion.)

Competence. As the list of characteristics above shows, both male and female programmers were seen by both sexes as having a competence-related cluster of traits. The results are not surprising insofar as these traits are associated with successful fulfillment of job requirements.

Emotional control. Because observers have been shown to view computers as both "cold" and "efficient" (Chapanis, 1982; 1984), it was anticipated that traits consistent with emotional control would be assigned by extension to computer programmers. Although both

targets were seen by both sexes as more likely than the comparison groups to be level-headed, and less likely to be short-tempered and emotional, male observers rating male targets attributed to them fewer additional traits involving emotional control than were attributed to male targets by female subjects, or to female targets by both sexes. For example, female programmers rated by males and females, and male programmers rated by females, were seen as less likely than the comparison groups to be touchy, childish, and temperamental.

Social deviance. Although both male and female programmers, in comparison with males and females in general, were seen by both sexes as more likely to be quiet, and less likely to be popular and interesting, females played down the lack of social orientation in their stereotype of male programmers. Additional traits implicating this dimension were assigned to female programmers by both sexes and to male programmers only by males. These observers saw the target relative to the comparison group as more likely to be lonely, dull, and anti-social, and less likely to be likeable.

Psychological abnormality. Although it was anticipated on the basis of the popular literature that

a psychological deviance factor would emerge, the results show that traits consistent with this factor were assigned only to male targets, and only by male observers. Male programmers, in comparison with males in general, were seen by males as more likely to be neurotic, and less likely to be normal. Interestingly, female observers saw male programmers, in comparison with males in general, as less likely to be neurotic.

Therefore, although the stereotype of male and female programmers contained the same number of significant differentiating traits, (contrary to the predition made in Hypothesis 1b), the pattern differed by sex of target and/or sex of subject. Although there was some overlap, additional traits were often selectively assigned. There was much more of a discrepancy between males and females in the traits that comprised the stereotype of male programmers than in the traits ascribed to female programmers.

Evaluative Component of the Stereotype

Many of the above-mentioned descriptive differences in the stereotype of male and female programmers by sex of subject are understandable in terms of the finding of a significant interaction between sex of target and sex of observer on the evaluative dimension ($F(1, 160) = 7.04$, $p<.01$). The

evaluative intensity score of the stereotype was more positive when sex of observer differed from that of the target. Male observers had a significantly more negatively charged stereotype of male programmers than did female observers ($t(82) = 2.86$, $p<.01$), although there were no differences between male and female observers in their evaluative intensity scores when they rated female programmers. An exploration of each of the descriptive dimensions in terms of their evaluative ratings may shed some light.

Competence. Both male and female observers attributed the same pattern and number of traits involving competence to both male and female programmers. These traits all have a positive valence and account for the finding that the mean evaluative intensity scores for sex of target/sex of observer groups all have positive signs. The evaluative differences in the stereotype by sex of target and/or sex of observer are therefore not accounted for by this dimension.

Emotional control. All of the traits that exemplify this dimension have positive valences as they apply to computer programmers. As previously mentioned however, male observers of male programmers did not assign as many of these traits as other sex of

observer/sex of target combinations. Therefore, the finding that male observers had a less positive image of male programmers than did female observers is partially accounted for by differences in the emotional control factor.

Social deviance. The image of the programmer is clearly negative with respect to social deviance. In general, the stereotype of the programmer as an anti-social, unpopular, and uninteresting "loner" has been sustained. These results contradict Schneiderman's (1980) contention that the image of the computer programmer as social isolate is "becoming only a wild caricature of reality" (p. 24). Nevertheless, female observers rating male programmers did not assign them as many negatively charged traits having to do with social deviance as were assigned to the other observer-target groups. Therefore, this difference in the pattern of traits implicating social deviance assigned to male programmers by male and female observers helps to account further for differences in the evaluative dimension.

Psychological abnormality. The most pejorative aspect of the stereotype in the anecdotal literature has to do with psychological dysfunction. As previously mentioned, the only sex of target/sex of

observer group to yield stereotypic traits indicative of psychological abnormality was male programmers rated by male observers. Females rating male programmers actually saw them, in comparison with males in general, as better adjusted (i.e., less likely to be neurotic).

Miscellaneous traits. Three additional positively charged traits were assigned to male programmers by female observers and not by male observers. Because of the demand for their talents and the high salaries they command, it was expected that programmers would be seen as self-centered. Traits related to this characteristic were not ascribed to any target group, and females actually saw male programmers, in comparison with males in general, as less likely to be egotistical, pompous, and selfish. The ascription of these additional positive distinctive traits also contributed to the more positive stereotype of male programmers by females than by males.

If the results of the present study had not been analyzed by sex of observer in interaction with sex of target, the picture would have been oversimplified, if not misleading. There was no support for the prediction made in hypothesis 2 that male programmers would be viewed more favorably than female programmers. There were no differences in the valence of the

stereotype of male and female programmers collapsed across sex of observer. Only when the results were broken down by sex of observer did the evaluative picture emerge most clearly.

In summary, evaluative scores generated by male and female observers of male and female programmers were accounted for by differences in the descriptive dimension. Although there was a significant interaction between sex of observer and sex of target with respect to the evaluative dimension of the stereotype, sex of observer had less of an effect on the stereotype of female programmers than that of male programmers. There were no differences between males and females in the valence of their stereotype of female programmers.

With respect to male programmers, females had a more positively charged stereotype of males than did males. This difference in valence was due to the differential assignment to the target by male and female observers of clusters of traits having to do with emotional control, social deviance, and psychological abnormality.

Sex-role Congruence Theory

The term "role-deviate" (Gutek & Cohen, 1987) has been used to describe a situation in which there is a

mismatch between social or occupational role and traditional sex-role. One possible explanation for the pattern of results found in this study is that males may view male programmers as "role-deviates." Males saw male programmers, compared with males in general, as less likely to be masculine. Matheson and Strickland (1987) found a stereotype of lesser heterosexual orientation among computer scientists. This trait was not used in the present study, but if male observers were to have a similar stereotype of computer programmers, they may be extending the notion of sex-role deviance to other traits that imply social and psychological deviance.

Interestingly, females did not see male programmers, compared with males in general, as less likely to be masculine (and did see them as less likely to be feminine). For female observers, therefore, the implication is that male programmers are engaging in an occupation congruent with the traditional male sex-role. That females had a relatively positive stereotype of male programmers, assigned them fewer traits having to do with social deviance, and failed to predicate of them any traits implicating psychological deviance is consistent with this notion.

Although the Sex of target x Sex of observer

interaction was significant with respect to the evaluative dimension of the stereotype, males and females did not significantly differ in the valence of their stereotype of female programmers, as they did when rating male programmers. Because both male and female observers viewed female programmers, compared with females in general, as less likely to be feminine, it may be that both sexes see the target engaging in a sex-role incongruent occupation to some degree.

Nevertheless, although the difference was not significant, the mean evaluative intensity score of the stereotype of female programmers was more negative for females than for males, and the first factor extracted for females rating female programmers consisted almost entirely of negative differentiating traits. When these observations are made in the context of the significance of the interaction between sex of target and sex of observer, there appears to be some support for the phenomenon of female prejudice against competent females (Deaux & Taynor, 1973; Denmark, 1980; Durkin, 1985; Goldberg, 1968; Pheterson et al., 1971). Although they may feel that female programmers are engaging in a sex-inappropriate occupation, males appear to penalize them less than females.

An interpretation of the results based upon the

theory of sex-role congruence is speculative, however, and calls for empirical verification. Kalin & Hodgins (1984) have pointed out that many studies of sex-role stereotyping have failed to take account of sex-role incongruence. Although their review of the relevant literature showed that most studies of occupational suitability did not find that targets were denigrated for engaging in out-of-role behavior, they did not report on results by sex of subject. The results of the present study suggest that more attention needs to be paid to potential interaction effects between sex of target and sex of subject.

Social Cognition Theory

Researchers in the area of social cognition have shown that role information modifies the stereotype of males and females in general (Brewer, Dull, & Lui, 1981; Deaux & Lewis, 1984; Eagly & Steffen, 1984; Eagly & Wood, 1982; Kalin & Hodgins, 1984; Locksley et al., 1980). Although the present study did not attempt to test the social cognition model of stereotyping directly, the results are consistent with the general principle that "role schemata play a critical role in intergroup perception" (Fiske & Taylor, 1984, p. 165.) As Deaux and Lewis (1984) have pointed out, the process of stereotyping involves a "sequence of inferences" (p.

1002). People will estimate the probability that a male or female will have certain traits. With more specific information (e.g., occupational role), the inferences will differ and be independent of the gender label. In the present study, for a large number of traits, there were significant differences between the percentages assigned to the male or female programmer and to males or females in general. These findings attest to the ability of the subcategory, (i.e., occupational role) to modify the inferences made by observers with respect to the superordinate category (i.e., gender label).

In accordance with the social cognition model, and with previous research that has shown: (a) that the stereotype of female targets with specific role information diverged more from the superordinate gender category than did the male subcategory (Deaux et al., 1985), and (b) that the traits associated with employed females are closer to the traditional sex-role stereotype of males than of females, especially concerning competence (Durkin, 1985; Etaugh & Petroski, 1985; Geis et al., 1984; Shinar, 1978), hypothesis 1b predicted that female programmers differ from females in general on a greater number of traits than male programmers differ from males in general. Although the

results did not support this hypothesis, the stereotype of female programmers contained traits at variance with the traditional stereotype of females without role information. Female programmers were perceived to differ from females in general on a competence-related cluster of traits. Furthermore, Broverman et al. (1972) and Spence and Helmreich (1978) found that the stereotype of traditional females consisted of traits indicative of communal and emotional tendencies. Compared with females in general, female computer programmers were seen as less likely to have traits related to these tendencies. It is only because male programmers were seen to differ from males in general on a partially different cluster of traits than those distinguishing female programmers from females in general, that the hypothesis was not supported. Nevertheless, the results are consistent with a social cognition model of sex-role stereotyping.

Because the social cognition model is a relatively recent theoretical formulation, there is little research on how male and female observers differ with respect to sex of target. The sex-role appropriateness or inappropriateness of the occupational role categories of stimulus persons has often been assumed rather than empirically verified. In future studies,

subjects should be asked for their perceptions about whether the role category is congruent with the sex of the target.

Although the recent research on this model and the cognitive processess underlying social perception have been prolific, it has been carried out primarily at the abstract level. It is now time to apply these general principles to the study of specific target groups. For example, the network model of social stereotypes holds that a central concept, or "node," (e.g., target group), is connected in cognition to other nodes by associative links (Wyer & Carlston, 1979). Some researchers have suggested that these links apply not only to traits but also to features of the target such as behavior and physical characteristics (Ashmore & DelBoca, 1979; Andersen & Klatzky, 1987). These features may legitimately be said to constitute elements of a stereotype.

In summary, the popular image of the computer programmer as a person who is highly intelligent, competent, and emotionally controlled, but who is psychologically and socially maladjusted, has been both supported and undermined by the results of this study. The popular image is reflected only in the results for male programmers and only by male observers in this

study. Although both male and female targets were positively stereotyped by both male and female observers with respect to a competence-related cluster of traits, they were not universally stereotyped with respect to emotional control, social deviance, and psychological abnormality.

The results of the present study contradict the conclusion reached by Shinar (1978) that there is consensus between male and female observers with respect to their perceptions of stimulus persons in various occupations, even when the sex of the stimulus person is specified and the occupations are sex-typed. Because the present study found a substantially different pattern of results with respect to both the descriptive and evaluative aspects of the stereotype of male and female targets, future studies on sex-role stereotyping may no longer ignore sex of observer.

The results are consistent with theories of sex-role congruence and social cognition models of stereotyping.

Effect of Social Structure Variables on the Valence of the Stereotype

The present study attempted to uncover a relationship between the valence of the stereotype of computer programmers and factors in the social

structure that have been shown to be related to the stereotyping of other groups (i.e., work-related contact, non-work-related contact, status differential, cooperation, and competition).

Contact and status differential. The precise nature of the relationship is inconclusive, especially with respect to the contact variable. Several researchers have claimed that other variables, such as status differential, modify the effect of contact. The equal-status contact hypothesis predicts that contact among observers whose status is equal to the target leads to more favorable stereotypes than when status is unequal (Allport, 1954; Deutsch & Collins, 1951; Wilner et al., 1952; Stephan & Rosenfield, 1982; Wuthnow, 1982). There is a noticeable dearth of studies, however, that have directly tested the effect of these variables in interaction with one another. The present study represented an attempt to rectify this shortcoming.

Before there is a discussion of the results using the variables in interaction, a question may be posed: how predictive of the evaluative dimension of the stereotype are job status differential and frequency of contact as isolated variables? With respect to contact, none of the multiple regression analyses

demonstrated any relationship between the valence of the stereotype and this variable, and none of the simple correlations between contact and evaluative intensity score attained significance (see Tables 24, 25, 26, and 27). With respect to status differential, it was shown to be related to the evaluative score; its beta weight was positive implying that unequal status led to a more favorable stereotype than did equal status (see Tables 29 and 31). None of the simple correlations between job status differential and evaluative intensity score, however, reached significance. All of these results suggest that there is little support for a hypothesis that attempts to predict the valence of a stereotype from these variables in isolation.

The picture changes, however, when the effect of the interaction between contact and status differential is tested. A multiple regression analysis that attempted to link frequency of work-related contact and job status differential in interaction with evaluative intensity score was significant for males rating male programmers ($F(3,25) = 4.35$, $p<.05$). Although the multiple regression fell short of significance ($p<.12$), when the results were analyzed for all subjects rating both targets, the beta weight for the interaction term

Status differential x Work contact was significant ($t(67) = -2.06$, $p<.05$), just as it was when males rated male targets ($t(29) = -3.14$, $p<.01$). The negative sign suggests support for the equal-status contact hypothesis: level of contact interacted with status differential such that, as perceived job status of target exceeded that of observer, high levels of contact were associated with a more negative stereotype.

It is unclear why the effect was not unequivocally demonstrated for other sex of target/sex of observer combinations besides male observers of male programmers. The relatively small number of subjects relative to the number of variables in the regression equations may have precluded significance. (Significance was attained when all observations were collapsed together.)

Because the stereotype of computer programmers has been shown to vary qualitatively and evaluatively by sex of observer and/or sex of target, it would not be surprising if factors such as status and contact might interact differentially for male and female observers in predicting the nature of the stereotype. Or the results may reflect actual differences by sex such that, for some observer-target groups, the valence of

the stereotype is not related to status differential and contact, either by themselves or in interaction.

When non-work-related contact was substituted in the analysis for work-related contact, no effects were obtained. Although non-work-related was significantly and positively related to work-related contact for both males rating male programmers and for females rating male programmers, the former type of contact did not interact with status in predicting the valence of the stereotype.

These results, however, should not be taken as undermining support for the equal-status contact hypothesis. For all sex of observer/sex of target groups, larger percentages of observers gave a response of zero to the number of programmers with whom they had non-work-related contact than to the same measure of work-related contact. In addition, as Tables 20 and 21 show, there was less variability among subjects on their responses to the measure of non-work-related contact than to the measure of work-related contact. Therefore, from a purely statistical viewpoint, it is questionable whether any effects would be demonstrated, (i.e., the work contact variable gives a better test of the contact hypothesis).

Furthermore, the effectiveness of the non-work-

related contact measure in interaction with status differential may be questioned insofar as these variables tap unrelated social structures. Job status differential and work-related contact are generally involuntary factors both directly applicable to the organizational environment. Non-work-related contact is generally voluntary and part of the social environment. It is far more likely that the stereotype of computer programmers arises from perceptions about their occupational role than about their social role. Therefore, the failure to demonstrate a relationship between the valence of the stereotype of computer programmers and non-work-related contact in interaction with status differential should weigh less than the positive finding with respect to the work-related contact measure in interpreting the results of this study as consistent with the equal-status contact hypothesis.

Cooperation and competition. What can be said about the ability of cooperation and competition, either singly or in interaction with contact and/or status, to predict the valence of the stereotype? The only term in any of the regression equations that reached significance was the Status differential x Competition interaction term for male subjects rating

male programmers. More negative evaluative intensity scores were associated with high competition and a high status differential, (i.e., when the occupation of the observer is lower than that of the target). This result provides some support for a relative deprivation theory interpretation, although caution is advised since the mean responses to the question on competition reflect relatively low levels.

The valence of the stereotype does not appear to vary as a function of the interaction between cooperation and either status differential or frequency of contact, whether work-related or non-work-related. The only relationship between cooperation and the evaluative intensity score occured when male observers rated female programmers: the simple correlation was positive and significant. The stereotype of the female programmer was more favorable when higher levels of cooperation were reported between the male observer and the target. Recall that cross-sex observers had a more positive stereotype of the target than those of the same sex. It could be that males are "rewarding" females for demonstrating behavior consistent with the traditional sex-role stereotype of females. However, the small number of subjects (13) may limit the generalizability of the observed relationship.

More research is necessary to assess precisely how competition and cooperation affect the nature of the stereotype. It would be interesting to include the terms "cooperative" and "competitive" among the potentially stereotypic traits to determine how male and/or female programmers are perceived relative to males and females in general.

Additional Theoretical, Methodological, and Practical Implications of the Results

The most important contribution of the present research is the demonstration of a stereotype of computer programmers and the observation of differences in the stereotypic response patterns by sex of target and/or sex of observer. The significance, however, extends beyond these findings. The results of the present study may be used also to: (a) clarify theoretical issues concerning the definition of a stereotype; (b) describe methodological shortcomings and assess the viability of the measurement techniques employed; and (c) suggest practical solutions to problematic relationships between programmers and non-programmers, especially in the same work environment. Recommendations for future research in these areas are also made.

Theoretical issues concerning the definition of a

stereotype. The stereotype of computer programmers consisted of a set of differentiating traits about which there was some degree of consensus. Many of these traits have a relatively positive valence, while others are quite unfavorable. As such, the results are consistent with a definition of a cultural stereotype that does not presuppose that a stereotype is primarily pejorative in nature (Ashmore & DelBoca, 1979, 1981; Mackie, 1973). The present study is among the first to separate the descriptive and evaluative components of the stereotype of a specific target group. It is clear that future research in the area of stereotyping should maintain the distinction between these two components.

Besides negativity, accuracy has also been eliminated as an inherent part of the definition of a stereotype. The present research did not make any assumptions concerning the truth or falsity of the demonstrated stereotype. Whether the perceptions of others match the self-ascriptions or actual behavior of computer programmers is a separate empirical question with which future research might concern itself.

With respect to consensus, the present research does not provide any definitive answers. Unlike the results obtained by previous researchers, (e.g., Katz and Braly, 1935), there was a relatively high rate of

agreement among observers with respect to the direction of the significant traits that comprise the stereotype of computer programmers.

The measurement of a stereotype and related methodological issues. There were both positive and negative consequences associated with the decision to use the diagnostic ratio to select the traits that constitute a stereotype of computer programmers. Conceptually, the diagnostic ratio represents a substantial improvement over the simplistic adjective checklist method. There are some difficulties, however, that make the implementation of the diagnostic ratio less than straightforward.

The benefits of using the diagnostic ratio include permitting observers to predicate the presence or absence of particular traits among a target group relative to a comparison group. In addition, the evaluative intensity of a trait may be obtained by examining its magnitude and direction with respect to an objective measure of the valence of the trait. Observers appear to have no difficulty specifying percentages for both target and comparison groups, which become respectively the numerator and denominator of the ratio.

On the negative side, a substantial number of

transformations of the raw data appear to be necessary before a ratio may be calculated that accurately reflects the intentions of the subjects. For example, the percentages given by observers had to be assigned to intervals in order to (a) attenuate the effect of extraordinarily large ratios that result from raw scores at extreme ends of the percentage scale, and (b) account for patterns of responses (e.g., numerator and/or denominator of zero) for which the calculation of the diagnostic ratio is mathematically impossible or misleading. Furthermore, a logarithmic transformation of the already transformed raw percentages is subsequently necessary in order to balance the magnitudes of diagnostic ratios greater than 1.0 with those less than 1.0.

Because of the number of transformations necessary, it was decided not to rely exclusively on the diagnostic ratio. Therefore, a test of the significance of the ratio was supplemented with a test of the differences between the means of the target and comparison group for each trait. The high rate of agreement between the two measures with respect to significance levels restores a certain faith in the power of the diagnostic ratio to detect stereotypic traits despite the necessity of the transformations.

Nevertheless, the simple difference score seems to offer all of the benefits of the diagnostic ratio without the added overhead. Although, in future research, one might choose to use the difference score rather than the diagnostic ratio, the ratio does represent an important contribution to quantifying the measurement of a stereotype.

The method of contrasting the target with a comparison group highlights a new methodological issue, especially with respect to consensus: the trade-off between frequency and intensity. Whether the diagnostic ratio or a simple mathematic difference is calculated, it is primarily its magnitude that determines significance. Although a high degree of variance will preclude attaining significance, it is conceivable that a large mean score may be carried by a small number of subjects who make large distinctions, in the same direction, between the target and comparison groups. In the present study, some observers saw no differences between programmers and the population in general, and some even indicated a direction opposite to that of the predominant one for stereotypic traits.

Because of this phenomenon the distinction between a cultural and a personal stereotype now takes on

critical significance. Although individual differences in tendency to stereotype were not the primary focus of the present research, an attempt was made to quantify the evaluative dimension for each observer and to relate this aspect to social interaction variables. An overall evaluative intensity score was calculated for each observer by summing the result for all traits of the product of the observer's difference score and its valence (Anderson, 1968). Although it facilitates a straightforward approach with respect to the regression model, the use of a single score obscures the richness of the pattern of evaluative responses. For example, the same evaluative score might be assigned to observers who had extreme positions on an equal number of positive and negative traits and to those who were relatively neutral on all traits.

Future research might consider the identification of a personal stereotype that allows subjects to be classified more precisely with respect to the evaluative dimension of the stereotype. For example, the "within-person" variance of valence scores might be used as a measure of the evaluative homogeneity of the stereotype. Alternatively, a categorical procedure might be devised perhaps akin to that adopted by Spence and Helmreich (1978) in their study of masculinity and

femininity. In their system, a subject is placed into one of four quadrants based upon their sex-role orientation: predominantly masculine, predominantly feminine, androgynous (high scores on both masculinity and femininity scales), or undifferentiated (low scores on both scales). Observers may be similarly classified with respect to the valence of their personal stereotype of a particular target group: predominantly positive, predominantly negative, mixed (high positive and high negative), or neutral (low positive and low negative).

It may also be feasible to develop a classification scheme with respect to the descriptive component of the stereotype. Although there are limitations in subjecting the data in the present study to a factor analysis, the results may be used to suggest a systematic sampling of traits for each potential factor in future research. There are almost certainly individual differences between observers in the pattern and number of traits they predicate of the target. Observers might then be classified as high or low on tendency to stereotype overall, or high or low on specific factors.

These classifications might then be used as variables in a discriminant model that also

incorporates potentially relevant social structure variables. In addition, personality researchers might explore the relationship between an individual measure of the tendency to stereotype and other personality traits.

Another methodological issue that needs to be addressed is the current accuracy of the valence ratings of the traits used in the present study. Although they have been shown to have extremely high inter- and intra-subject reliability coefficients (Anderson, 1968), an issue arises whether the evaluative ratings assigned by observers have changed significantly in the last two decades. Anderson's trait list was used because there was none more recent that contained a comprehensive number of traits relevant to the target population. Current verification of the reliability of the ratings is certainly desirable. It was assumed that for the purposes of the present study, the valence of the traits selected has not changed substantially. Traits such as intelligent, selfish, and interesting, or dull, neurotic and anti-social, have intuitively obvious positive and negative valences respectively. In the present study, there was an attempt to select an equal number of positive and negative traits. Therefore, it

is hoped that any changes in the 1968 valences would be comparable across both groups of traits.

Because of the possibility of changes in the valence ratings over time, an attempt was made in the present study to refrain from interpreting the valence of the stereotype in absolute terms. The evaluative dimension was calculated primarily to assess relative differences among observers as a function of other variables and to determine whether there is a significant difference between the evaluative ratings of male and female programmers. Although the present study uses the precise value obtained by Anderson in the calculation of an evaluative intensity score, the results are summed across all traits for each subject. In the event a small subset of the traits may have altered their position on the evaluative scale, their contribution to the total score should be minimal, and their effect balanced across all subjects.

Most researchers have failed to quantify the positivity or negativity of the traits constituting an observed stereotype. In its use of an objective scale, the present study represents an improvement over those studies that have subjectively inferred the valence from the descriptive component. It is important to note that the descriptive component of the stereotype

of male and female programmers remains separate from, and is not dependent on, its evaluative score.

Another issue directly related to trait selection is the need to control for the possibility of demand effects accounting for the results. If all of the traits selected are predicted to differentiate the target from the comparison group in one direction only, that is, the target is predicted to have more of all of the traits than the comparison group, the results might be due to the desire of the subject to guess the hypothesis and comply with a perceived "demand" to give the appropriate response. The selection of some traits opposite in direction to the predicted one should help control for this phenomenon. In the present study, 35 percent of the traits in the list were selected to meet this criterion. Future research should make a systematic attempt to select an equal number in each direction. The list of differentiating traits in Table 11 reveals that both directions are represented about equally.

Another issue to be addressed is whether the stereotype of computer programmers that has emerged from the present study might overlap with that of other occupational groups, such as engineers, musicians, or scientists. The present study has demonstrated that

male and female computer programmers are significantly different from males and females in the general population. The design did not include comparisons with other occupational groups. Future research might concern itself with using other occupational groups as comparison groups against which the target is compared. The traits used in the present study were selected because of their pervasive mention in publications whose subject matter is computers and computer programmers. Even if the stereotype of computer programmers were to overlap with that of other occupational groups, its validity would not be compromised. Andersen and Klatzky (1987) have concluded that the predictive power of a stereotype is sustained even when redundant traits are predicated of different social categories, although they did not attempt to quantify the proportion of redundant to non-redundant traits.

One final methodological issue to be addressed is whether the salience of the gender variable in the data collection procedure had any effect on the results. The gender variable was explicit both as a qualifier of the programmer target group and in the instructions to the subjects, which informed them that half would be asked to respond to male programmers and half to female

programmers. The possibility arises that calling attention to the sex of the target might have caused subjects to exaggerate the differences in their perceptions of male and female programmers. Three considerations, however, minimize this possibility: (a) Subjects were not asked to compare male programmers with female programmers, (b) subjects selected a large number of traits as characteristic of both male and female programmers, and (c) the free-form comments yielded only a small number of instances in which subjects made explicit references to the alternative gender target. The design of the present study did not permit a definitive evaluation of whether the results would differ if the same subject was asked to respond to both male and female targets. Future research might be concerned with this issue.

Practical implications. Computer programmers constitute a significant and salient occupational group. As such, they interact with non-programmers with varying degrees of frequency in the course of their work. The results of the present study have demonstrated support for the notion that many observers have formed opinions about the personal attributes of this group. The favorability of these attitudes is related to various aspects of the relationship between

programmers and observers such as status differential, both by itself, and in interaction with, frequency of contact and with competition.

Organizations might do well to acknowledge that a stereotype of computer programmers is likely to be held by non-programmer co-workers and that it may have the potential to affect work relationships, productivity and morale. Although programmers may be viewed relatively favorably with respect to job-related traits, they are likely to be viewed negatively with respect to other traits. If the negative aspects of the stereotype are related to factors in the working environment, the organization may propose formal solutions to reduce the salience of status symbols, lessen competition, or otherwise improve the quality of the relationship between programmers and non-programmers. As Matheson and Strickland (1987) have pointed out, an awareness that a stereotype contains one or more negative factors might actually lead to a change in its valence.

It was originally intended to conduct this research within one or two major business organization, such as a bank or insurance company, where many programmers are employed and there is a high probability of obtaining a sufficient range on the

social structure variables. Even though many firms were contacted and almost all expressed an interest in the nature of the study, none was willing to cooperate. Perhaps the results of the present research might induce organizations in the future to permit this type of research on their premises. They should benefit substantially from the knowledge of the results obtained from within their own environment.

Conclusion

Computer programming as a discriminable occupation has existed for no more than a few decades. In this relatively short period of time, a stereotype of the members of this group has emerged in the popular literature and its existence has been confirmed by the results of this study.

The stereotype is more complex than predicted. The valence of the stereotype has been shown to be related to aspects of the relationship between programmers and non-programmer observers. This finding has implications for how organizations handle the perceptions about perceived job status differences among those who have a large degree of contact with computer programmers, and see themselves in competition with them for company resources.

Although there was some degree of overlap between

the stereotype of male and female computer programmers, and by male and female observers within each target group, both the descriptive and evaluative components of the stereotype were shown to differ by sex of target and sex of observer. Perhaps one of the most important conclusion of the present research is that one may no longer ignore sex as a variable in stereotyping research.

Appendix A

Questionnaire

Questionnaire on Attitudes toward Computer Programmers

The questions on the following pages deal with your impressions of the most common type of computer programmers. They are referred to as *application programmers* and they are generally responsible for designing, writing, testing, and documenting the set of instructions which the computer uses to manipulate data for specific applications such as money transfer in banking, payroll, or airline reservations. They work in government, academia, and business settings. Please have this group of people in mind (not computer operators) when you answer the questions.

Please note that one-half of the people receiving this questionnaire will be asked to give their views about only *male applications programmers* and the other half will be asked about only *female applications programmers*. The questionnaire you have received was determined by a random process.

Please answer the following questions as candidly as possible. Please do *not* answer as you think others will answer. We are interested in *your own personal opinions*. Once again, please be assured that your responses are totally anonymous.

1. Think of the *male applications programmers* you know or with whom you have had some contact. If you do not know any *male applications programmers*, please give your impression based upon whatever information you have.

   For each of the following personality traits, please give your own personal opinion of the percentage (%) of *male applications programmers* and of *males* in general, who you believe have the indicated trait. You may use any % you wish--any number from 0% (to indicate that you feel that none of the designated group has the trait) up to and including 100% (to indicate that you feel that all of the group has the trait). Even if you are uncertain about a particular trait, *please put your best estimate in every space so that no questions are omitted.*

TRAIT	% OF *MALE* PROGRAMMERS WHO HAVE THIS TRAIT	% OF *MALES* IN GENERAL WHO HAVE THIS TRAIT
likeable	_____%	_____%
intelligent	_____%	_____%
materialistic	_____%	_____%
shrewd	_____%	_____%
independent	_____%	_____%
creative	_____%	_____%
masculine	_____%	_____%
short-tempered	_____%	_____%
unconventional	_____%	_____%
anti-social	_____%	_____%
quiet	_____%	_____%
misfit	_____%	_____%
shy	_____%	_____%
feminine	_____%	_____%
dull	_____%	_____%
popular	_____%	_____%
temperamental	_____%	_____%
level-headed	_____%	_____%
cold	_____%	_____%
egotistical	_____%	_____%

PLEASE CONTINUE ON THE REVERSE SIDE

TRAIT	% OF *MALE* PROGRAMMERS WHO HAVE THIS TRAIT	% OF *MALES* IN GENERAL WHO HAVE THIS TRAIT
pompous	_____%	_____%
interesting	_____%	_____%
eccentric	_____%	_____%
perfectionistic	_____%	_____%
touchy	_____%	_____%
opinionated	_____%	_____%
selfish	_____%	_____%
dominating	_____%	_____%
proud	_____%	_____%
lonely	_____%	_____%
witty	_____%	_____%
childish	_____%	_____%
realistic	_____%	_____%
cultured	_____%	_____%
modest	_____%	_____%
diligent	_____%	_____%
incompetent	_____%	_____%
logical	_____%	_____%
aggressive	_____%	_____%
neurotic	_____%	_____%
emotional	_____%	_____%
normal	_____%	_____%

2. For approximately what percentage of the traits were you reasonably certain of your ratings? Please circle one of the following:

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% none

3. Briefly, and in your own words, describe *male applications programmers* and how you feel about them. If necessary, continue on back of page 1.

IF YOU ARE PRESENTLY EMPLOYED (FULL-TIME OR PART-TIME), PLEASE ANSWER QUESTIONS 4 THROUGH 9; OTHERWISE SKIP TO QUESTION 10.

4. Considering your organization as a whole, please circle a number from 1 to 9 which expresses your opinion of how much status or prestige is associated with the job of the *male applications programmer.*

1	2	3	4	5	6	7	8	9
very low status/ prestige				moderate status/ prestige				extremely high status/ prestige

5. Considering your organization as a whole, please circle a number from 1 to 9 which expresses your opinion of how much status or prestige is associated with *your own job.*

1	2	3	4	5	6	7	8	9
very low status/ prestige				moderate status/ prestige				extremely high status/ prestige

6. With approximately how many *male applications programmers* do you have *work-related* interaction? _____

If your answer to question 6 is 0, please skip to Question 10.

7. There are approximately 260 business days during the year. Please give your best estimate of the number of days per business year on which you have *work-related* interaction with *male applications programmers.* _____

On the *average* how many hours per day? _____

PLEASE CONTINUE ON THE REVERSE SIDE

8. Please circle a number from 1 to 9 which reflects how much cooperation there is in your *work-related* interaction with *male applications programmers.*

1	2	3	4	5	6	7	8	9
extreme lack of cooperation		moderate lack of cooperation		neutral		moderate amount of cooperation		extreme amount of cooperation

9. Please circle a number from 1 to 9 which reflects your opinion of how much competition you have with *male applications programmers* in your organization in order to obtain raises, bonuses, promotions or recognition for your work.

1	2	3	4	5	6	7	8	9
extreme lack of competition		moderate lack of competition		neutral		moderate amount of competition		extreme amount of competition

10. With approximately how many *male applications programmers* do you have *non-work-related* interaction? (For example, as acquaintances, friends, relatives, those with whom you socialize.) _____

If your answer to Question 10 is 0, please skip to Question 12.

11. Please give your best estimate of the number of days per year on which you have *non-work-related* interaction with *male applications programmers.* _____

On the *average* how many hours per day? _____

12. All things considered, how do you feel about the effect of computers on society. Please circle a number from 1 to 9.

1	2	3	4	5	6	7	8	9
extremely positive		moderately positive		neutral		moderately negative		extremely negative

13. Please put an X on the line which best indicates how frequently you presently use a computer for each of the following activities.

	Frequently	Sometimes	Never
Word Processing	_____	_____	_____
Playing Computer Games	_____	_____	_____
Graphics	_____	_____	_____
Statistical Analysis	_____	_____	_____
Data Organization	_____	_____	_____
Communications	_____	_____	_____
Other (please explain)			
_____	_____	_____	_____

13. Do you presently own a personal computer? YES_____ NO_____

14. Would you please give a brief profile of yourself? We are interested in the characteristics of the person completing this questionnaire.

    a) Your sex (Circle one) M F

    b) Your age _____

    c) Your occupation _____

    d) Your type of business _____

    e) Your title _____

    f) Please indicate your annual salary to the nearest $1,000: $_____,000.

THANK YOU VERY MUCH FOR YOUR HELP

Appendix B

Factor Analyses of Difference Scores of Significant Traits by Sex of Target and Sex of Subject

Male Programmers - Male Subjects

FINAL STATISTICS:

VARIABLE	COMMUNALITY	*	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
		*				
intelligent	.82254	*	1	5.08406	23.1	23.1
logical	.73139	*	2	3.21829	14.6	37.7
short-tempered	.82833	*	3	3.06983	14.0	51.7
level-headed	.76752	*	4	2.66162	12.1	63.8
diligent	.71402	*	5	1.20183	5.5	69.3
incompetent	.86603	*	6	1.08855	4.9	74.2
perfectionistic	.77286	*				
quiet	.76714	*				
emotional	.72354	*				
popular	.80159	*				
interesting	.59310	*				
dominating	.86416	*				
creative	.82062	*				
aggressive	.85925	*				
witty	.45238	*				
normal	.79189	*				
shy	.84568	*				
dull	.78066	*				
neurotic	.51271	*				
anti-social	.69569	*				
likeable	.66931	*				
masculine	.64480	*				

Male Programmers - Male Subjects

VARIMAX ROTATION 1 FOR EXTRACTION 1 IN ANALYSIS 1 - KAISER NORMALIZATION.

VARIMAX CONVERGED IN 15 ITERATIONS.

ROTATED FACTOR MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
emotional	.84004	.02113	.08594	-.03212	.06423	-.06983
level-headed	-.68578	-.19790	-.03717	.23219	-.28460	-.34895
logical	-.64518	-.01925	.03655	.50937	-.01814	-.23161
interesting	.61398	.03893	-.36203	.11464	-.21543	.15489
normal	.47276	.08948	-.42228	-.04375	-.46457	.40536
shy	.24424	.83345	.24244	-.05589	.09178	-.14512
quiet	-.02973	.81663	.11015	.23321	-.10330	.14893
masculine	-.05474	-.64893	-.25657	.04528	.08086	.38247
dominating	.10470	-.60134	.47551	.22367	.23627	.39953
likeable	-.20020	-.17544	-.73345	.04653	-.01608	.24100
dull	-.37055	.31748	.73226	-.01194	-.01630	-.07714
neurotic	-.37202	.01005	.53126	.15848	.24348	.08701
anti-social	-.16028	.42708	.48597	.32715	.37839	.03500
creative	-.05889	-.32468	-.00997	.82196	.12832	-.13983
perfectionistic	-.23391	.35211	.00414	.76737	-.07076	-.01696
diligent	-.03164	.06524	.09471	.70344	-.26817	.36475
lonely	.03548	.12528	.45812	.46361	.04132	.09441
intelligent	-.08774	.05863	.12983	.22255	-.85530	.11610
short-tempered	-.03662	.01636	.23821	.08324	.84980	.20223
incompetent	.05237	-.38943	.38098	.04286	.59936	-.45323
aggressive	.22022	-.20813	-.02135	.12335	.01804	.86628
popular	.56613	-.13796	-.25172	-.20135	-.09066	.59155

Male Programmers - Female Subjects

FINAL STATISTICS:

VARIABLE	COMMUNALITY	*	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
intelligent		*				
logical	.86520	*	1	5.54822	23.1	23.1
short-tempered	.80208	*	2	2.62228	10.9	34.0
level-headed	.67735	*	3	2.43087	10.1	44.2
diligent	.81285	*	4	1.99603	8.3	52.5
incompetent	.78494	*	5	1.70005	7.1	59.6
perfectionistic	.75243	*	6	1.33096	5.5	65.1
quiet	.67177	*	7	1.17485	4.9	70.0
emotional	.78201	*	8	1.12463	4.7	74.7
popular	.68843	*				
interesting	.70333	*				
dominating	.83300	*				
creative	.77270	*				
aggressive	.69715	*				
neurotic	.72041	*				
feminine	.80296	*				
selfish	.61476	*				
touchy	.76061	*				
childish	.81095	*				
egotistical	.73736	*				
realistic	.84975	*				
pompous	.73779	*				
materialistic	.64397	*				
temperamental	.63873	*				
	.76737	*				

Male Programmers - Female Subjects

VARIMAX ROTATION 1 FOR EXTRACTION 1 IN ANALYSIS 1 - KAISER NORMALIZATION.

VARIMAX CONVERGED IN 21 ITERATIONS.

ROTATED FACTOR MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8
selfish	.80961	.04468	-.04608	.08977	-.10618	-.02977	.15445	-.24199
touchy	.79997	.21261	-.06172	-.19915	-.09019	-.14790	-.06314	.21983
pompous	.69622	.14771	.24247	.05104	-.15093	.08996	-.20808	-.04320
dominating	.64907	.22462	.07025	.10585	-.16407	.49779	-.00858	-.10013
egotistical	.53528	.36284	.45349	.27826	-.20217	.15784	-.19383	-.21244
level-headed	-.11635	-.76727	.02217	-.10860	.32044	-.10063	.25314	.14641
short-tempered	.19147	.71588	-.13153	-.27527	.14964	-.06442	.07622	-.04962
temperamental	.42425	.64303	.29634	.12479	.05984	-.16992	.04269	-.19057
childish	.48063	.53884	.33789	.20563	.05987	-.21561	-.07894	.05697
logical	.15227	-.53663	-.50590	.36648	.10355	.00858	.29561	-.04993
aggressive	.05244	.14205	.80423	-.15513	.02308	.04267	-.05658	.14515
popular	-.01461	-.00104	.73526	.06047	.39328	.04287	.04838	.00256
materialistic	.30569	-.18980	.60627	-.06498	-.10748	.07622	-.26760	-.22021
creative	.00120	-.08056	-.00061	.79282	-.09024	-.06276	-.14127	.17336
perfectionistic	.12389	-.12446	-.15639	.67705	-.09959	-.28424	.25038	.06827
interesting	-.18228	-.17764	.18316	-.19571	.82365	-.12727	-.00464	-.05036
emotional	.08670	.09700	.00544	-.12735	.76073	-.25424	-.08994	-.06167
incompetent	-.07602	-.12258	-.20957	-.30419	-.06385	.73646	-.06427	-.21117
neurotic	.42505	-.11195	-.06222	-.07658	-.27176	.70385	-.14205	.10287
quiet	-.31936	-.03969	-.24810	.18119	-.01718	-.02751	.75647	-.10180
feminine	.29185	-.15953	.01736	-.16771	-.20282	-.05018	.64767	.11216
realistic	-.30101	-.18971	-.04062	.02104	.21942	.45801	.53448	.25595
diligent	-.03549	-.15457	-.13114	.11571	-.13660	-.15613	.02103	.82808
intelligent	-.15234	-.04703	-.20734	.45892	-.28484	.21203	.12342	.66698

Female Programmers - Male Subjects

FINAL STATISTICS:

VARIABLE	COMMUNALITY	*	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
intelligent	.80496	*	1	6.48345	28.2	28.2
logical	.77899	*	2	3.11090	13.5	41.7
short-tempered	.79949	*	3	2.40798	10.5	52.2
level-headed	.77699	*	4	1.90766	8.3	60.5
diligent	.84584	*	5	1.46334	6.4	66.8
incompetent	.69658	*	6	1.15011	5.0	71.8
perfectionistic	.80890	*	7	1.01541	4.4	76.3
quiet	.75112	*				
emotional	.80501	*				
popular	.70205	*				
interesting	.79798	*				
lonely	.77738	*				
dull	.76923	*				
anti-social	.79426	*				
likeable	.80694	*				
feminine	.71385	*				
touchy	.74894	*				
childish	.88814	*				
realistic	.81002	*				
materialistic	.63413	*				
temperamental	.56769	*				
independent	.59497	*				
selfish	.86540	*				

Female Programmers - Male Subjects

VARIMAX ROTATION 1 FOR EXTRACTION 1 IN ANALYSIS 1 - KAISER NORMALIZATION.

VARIMAX CONVERGED IN 11 ITERATIONS.

ROTATED FACTOR MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
incompetent	-.76415	-.13556	.23771	-.11614	-.01161	.07119	-.13814
logical	.74820	-.33865	.22750	.09231	.05411	.20218	-.02065
level-headed	.74013	-.25466	.00822	-.06269	-.19842	.34134	-.06680
independent	.72660	-.03764	.06341	.02486	.23038	.00794	-.08840
temperamental	.03231	.67918	.29909	-.07878	.03817	-.04044	.08131
touchy	-.25858	.65071	.23025	-.43226	-.09126	-.04894	.08982
emotional	-.26055	.60398	.16863	-.07275	-.35308	.04568	.46027
materialistic	-.43342	.55494	.32297	-.11389	-.00249	.14354	-.02093
selfish	-.40343	.47821	.46332	.03610	.18936	-.31681	-.34896
interesting	.04109	.23970	.81063	-.04417	-.19775	-.01731	-.20091
short-tempered	-.09826	.21270	.80188	-.07644	.05879	.15801	.25945
likeable	.11107	.18536	.73320	-.24768	-.33087	-.21821	-.06500
anti-social	-.00879	.10854	-.16194	.82955	.23227	.01156	-.11811
lonely	-.10381	-.37838	-.28248	.57985	.19861	.16962	-.11498
realistic	.42261	-.17650	.21068	.63222	.06524	-.37705	.09881
quiet	.36218	-.33881	-.01737	.60540	.03192	.17925	.32433
popular	.03142	.48319	.04491	-.52553	-.40173	-.10942	-.12663
dull	-.09601	.05385	-.16413	.27931	.80368	.01363	.07788
feminine	-.21350	.19373	.22594	-.17156	-.68915	.22649	.15503
perfectionistic	.27123	.13106	.27096	.20647	.52745	.49818	-.27518
diligent	.10637	-.00787	-.06146	-.03552	-.10235	.87728	-.20802
intelligent	.18481	-.44417	.01514	-.04918	.50523	.54271	.14521
childish	-.22370	.14055	-.04596	.01490	.01257	-.31969	.84478

Female Programmers - Female Subjects

FINAL STATISTICS:

VARIABLE	COMMUNALITY	*	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
intelligent	.82249	*	1	5.24713	21.9	21.9
logical	.80580	*	2	4.34268	18.1	40.0
short-tempered	.67944	*	3	2.37361	9.9	49.8
level-headed	.73433	*	4	1.89744	7.9	57.8
diligent	.63039	*	5	1.47666	6.2	63.9
incompetent	.74869	*	6	1.31629	5.5	69.4
perfectionistic	.75959	*	7	1.14528	4.8	74.2
quiet	.72403	*				
emotional	.77624	*				
popular	.77930	*				
interesting	.74973	*				
lonely	.80322	*				
dull	.78272	*				
anti-social	.70280	*				
likeable	.74262	*				
feminine	.56005	*				
touchy	.74661	*				
childish	.67112	*				
realistic	.74548	*				
materialistic	.76081	*				
temperamental	.71270	*				
witty	.76576	*				
cold	.82895	*				
independent	.76621	*				

Female Programmers - Female Subjects

VARIMAX ROTATION 1 FOR EXTRACTION 1 IN ANALYSIS 1 - KAISER NORMALIZATION.

VARIMAX CONVERGED IN 11 ITERATIONS.

ROTATED FACTOR MATRIX:

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
dull	.83263	-.09707	.19400	-.05260	.11515	.14334	-.07623
lonely	.78061	.35580	.07665	.16936	-.04087	.17372	.02956
anti-social	.77967	-.09486	-.03406	-.04643	-.17459	.10155	.20447
cold	.73819	.03898	.15090	.17967	.22405	-.41682	.05928
quiet	.68620	.32946	-.13894	-.03020	-.28878	.07900	.18644
interesting	-.65510	.40192	-.03226	-.01564	.23457	.01577	.32014
likeable	-.64438	.33400	-.16154	.37108	-.05720	.20027	.09306
popular	-.64268	.42426	.22878	.33424	.11809	-.03555	.08373
feminine	-.52398	-.28439	.32084	.24005	-.04769	.18502	-.08688
realistic	-.03156	.81489	-.00862	-.18946	.06350	.01008	.20084
level-headed	.01258	.73472	-.26439	-.24011	-.13903	-.21789	.00155
childish	-.00151	-.59188	.38902	.07187	-.12581	-.34706	.16738
touchy	.21943	-.10084	.80499	-.07096	-.08687	-.11203	-.12307
temperamental	.00779	-.03946	.80210	.09597	.16677	-.16895	-.04645
emotional	-.38372	-.26013	.66190	.13993	.05705	.31684	-.00064
incompetent	.18953	-.10059	.04781	.82651	.06196	-.05958	-.09924
diligent	.17837	.27877	-.06544	-.69187	.10586	.15623	.04783
witty	-.37028	-.07995	-.16074	-.02051	.74660	-.17325	-.09256
materialistic	.02429	.02410	.39051	.08138	.73380	-.24533	-.04332
independent	.28501	.24700	-.11165	-.43805	.58220	-.03373	.28199
perfectionistic	.26389	-.08864	-.03935	-.11055	-.13278	.79441	-.14004
short-tempered	.26496	-.16677	.45066	.12054	-.18966	-.56933	-.06073
intelligent	-.13188	-.14997	-.12598	-.19741	.08576	.20425	.82383
logical	-.04858	.43176	-.03650	.02173	.03296	-.05126	.78199

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