Computer anxiety: An examination of its correlates and

a test of two possible treatment strategies

by

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INTRODUCTION[1]

In the decade and a half since the development of the microprocessor, these tiny wafers of silicon, which contain more computing power than a roomful of electronics did thirty years ago, have been placed in televisions, microwave ovens, telephones and children's toys. When microprocessors were combined with external memory and input/output devices, a new type of computer, the microcomputer, was born. Sales of these units have been phenomenal. In 1980, the microcomputer sales of 24 companies totaled 724,000 units. By 1983, Apple Computer alone had sold over one million microcomputers (Brod, 1984).

Today, microcomputers keep track of our credit ratings, total our purchases at the grocery store, help keep our homes and offices secure, and tell us when we are getting the best possible performance from our automobile engines. In his book The Third Wave, Toffler (1980) places the microcomputer at the center of the third wave of civilization (the first two being the agricultural and industrial revolutions). He writes of how microcomputers in the home will soon be as

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[1]The Iowa State University Committee on the Use of Human Subjects in Research reviewed this project and concluded that the rights and welfare of the human subjects were adequately protected, that risks were outweighed by the potential benefits and expected value of the knowledge sought, that confidentiality of data was assured and that informed consent was obtained by appropriate procedures.

commonplace as indoor bathrooms or television sets. He also
says that the "information explosion" will make various types
of information available to people via a computer terminal
inside their homes. This information ranges from financial
market quotations, to an online version of the <u>Academic
American Encyclopedia</u>.

The explosion in sales of microcomputers for home use
has been due, to a great extent, to the low cost of these
machines. The price of microcomputers currently ranges from
less than $100 to nearly $10,000, with most sales involving
systems in the $1000 to $5000 price range. The low cost of
these units allows them to be purchased as one would purchase
a video cassette recorder or stereo system.

In less than ten years, the use of computers in
education has gone from the nearly exclusive domain of
advanced college level students to kindergartners learning
how to read. The number of computers in the nation's primary
and secondary schools doubled in the years 1982 to 1984 to
over 350,000 (Brod, 1984).

In the work place, companies are automating in an effort
to increase productivity and profits (Seaward, 1983). This
automation has paved the way for vast productivity gains in
both manufacturing and service industries. In manufacturing,
computer controlled robots have taken over jobs that are
either hazardous or highly repetitive. In service
industries, automation has allowed for fast and efficient

recording of transactions in banks, airlines, hotels,
restaurants, libraries and retailers. Computers linked
together over telephone lines have allowed certain groups of
people, such as the disabled and individuals with young
children, to "telecommute", i.e., work in their homes, thus
improving organizational productivity while actually
decreasing the number of in-office employees. "Third Wave
white-collar work, ... will not require 100 percent of the
work force to be concentrated in the work-shop" (Toffler,
1980, p. 199).

Unfortunately, this "computer revolution", described by
Brod (1984, p. 4), as "the massive upheaval and restructuring
of society by technology" is not being universally accepted.
Two basic sources for this resistance to computers and
automation have been identified (Howard, 1983). The first
source is the lack of knowledge of the computer's
capabilities. This resistance can be remedied by education.
The second source of resistance is a possible innate fear of
computers and technology. This latter condition has been
recognized under several names by researchers. Technostress,
computerphobia, cyberphobia, and computer anxiety are all
terms used to describe the same basic condition: an
apprehension towards the use of this new technology. This
latter source of resistance to computers is not as easy to
recognize or treat as the former.

In this study the author intends to do the following: First, examine possible causes and correlates of this phenomenon (hereafter referred to as computer anxiety). Included will be an examination of the implications of computer anxiety for organizations, the impact that computers have had on individuals and society, and how system implementation methods, individual attitudes, and personal factors play a part in computer anxiety.

Second, results of a research study which attempts to identify possible correlates of computer anxiety will be presented and discussed.

Third, a laboratory experiment provides the vehicle for examining whether or not computer anxiety can be reduced through training.

A REVIEW OF THE LITERATURE

Implementation of Computers into Organizations

What does the fact that some individuals suffer from computer anxiety mean to managers in organizations wishing to implement computer-based information systems? To begin with, it means that these system implementations must be well thought out in order to have any chance of succeeding. There are several factors that management must take into consideration to insure successful implementation of a computer-based information system.

Faerber and Ratliff (1980) point to four reasons for lack of success in implementing a computerized information system in an organization. These are: unrealistic expectations of the computer's capabilities, inadequate systems design, invalid cost/benefit analysis, and resistance by some employees to computer induced change. This last reason is of particular interest to the present study as this resistance may be rooted in computer anxiety. Faerber and Ratliff feel that an honest pre-implementation appraisal of the effects the system will have on jobs will help smooth the implementation process. Hussain and Hussain (1985) support this notion:

> Without such a policy, valuable employees who feel their jobs threatened may leave the firm. Usually the best workers leave first, even before the new system is

installed, thereby adding to the problems of conversion. (p. 242)

Lucas (1981) introduced the idea that attitudes towards the system, the technical characteristics of the system, decision style, and personal and situational factors are four variables which are vital to the success of an information system implementation. Figure 1 depicts the conceptual framework developed by Lucas to show the variables which can affect information system implementation.
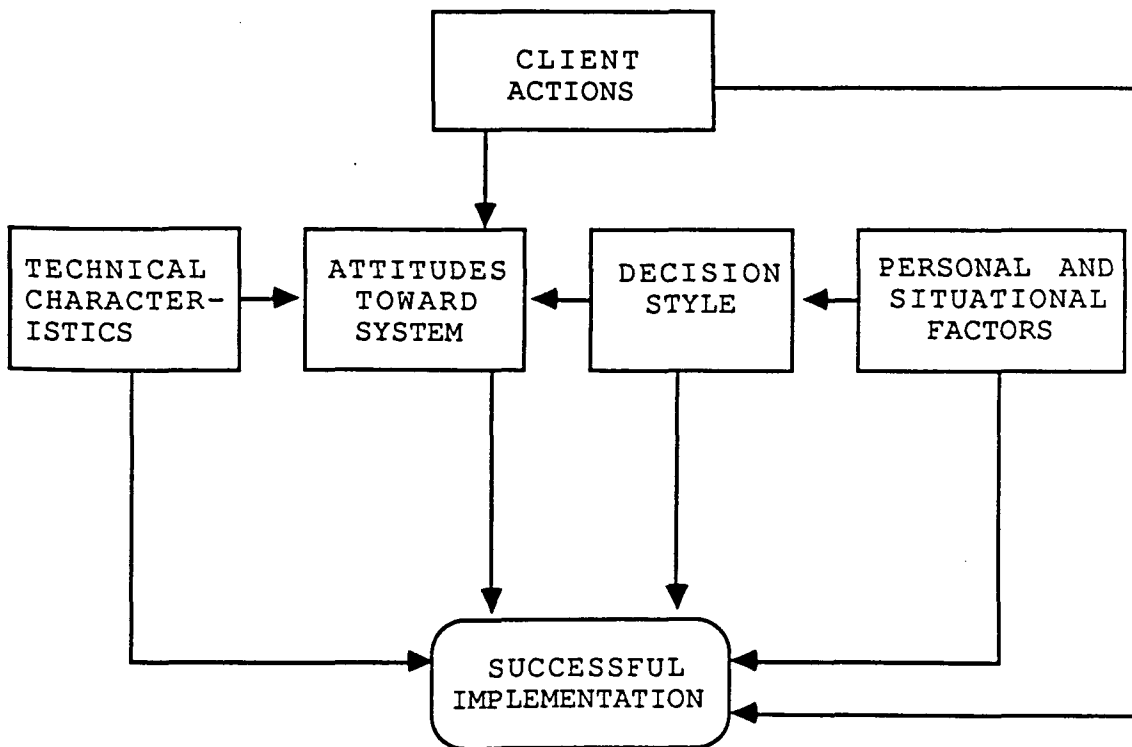
Figure 1. Relationship Among Implementation Factors
          (Lucas, 1981, p. 103)

From this figure, we can see that all of the implementation factors in the Lucas framework influence

attitudes towards the system, either directly or indirectly. This indicates that attitudes toward the computer - and possibly levels of computer anxiety - can be influenced by how the system is implemented.

This hypothesis is supported by Collins (1983), who has divided the information system implementation process into three phases: definition activity, development activity and implementation activity. Of these three activities, definition and implementation are highly people-oriented while the development activity is technology-oriented.

Figure 2 graphically represents this idea with the Systems Project Life Cycle (SPLC) V-Curve. On the vertical axis, the percentage of effort devoted to people factors is depicted. The horizontal axis displays the three activities involved in a systems implementation.

Hussain and Hussain (1985) note that:

A new system is feasible only when ... employees are willing to make changes in procedures, to accept experimentation, to operate in an atmosphere of change, and to accept the risk of making errors, should the system design prove faulty. (p. 250)

Adherence to the Faerber and Ratliff (1980) concept of pre-implementation appraisal can help insure that these conditions are met.

In a study by Rafaeli (1986), it was shown that job involvement and organizational commitment were positively related to an individual's attitude toward using computers in

the work place. These findings would suggest that there are broad organizational issues to consider during a system implementation.
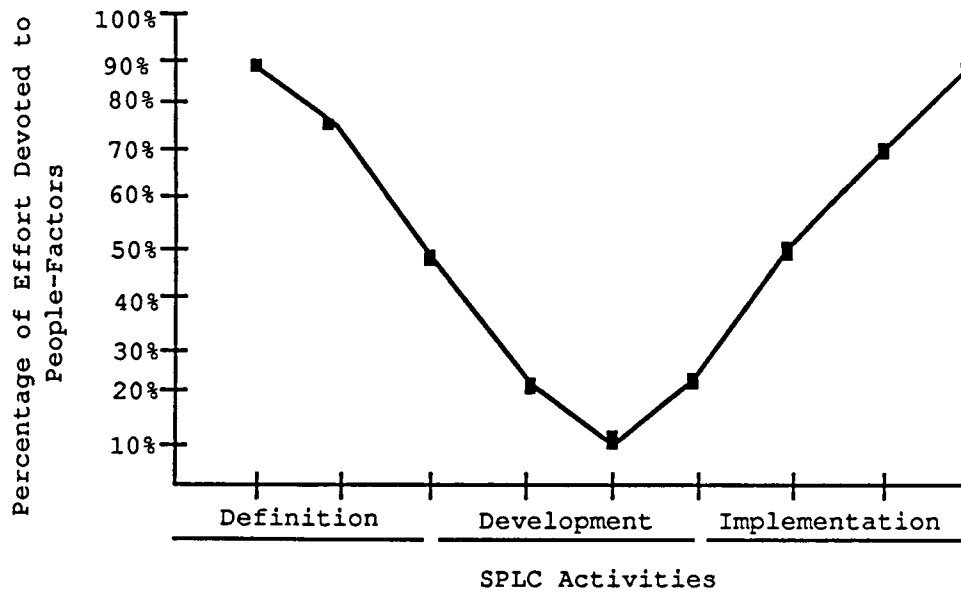
Figure 2. SPLC V-Curve (Collins, 1983, p. 32)

Technostress

Technostress is defined by Brod (1982, p. 754) as "a condition resulting from the inability of an individual or organization to adapt to the introduction and operation of new technology". Technostress may occur in either the definition or implementation phases of Collins' V-Curve and reduce the effectiveness of the implementation of a new computer system in the work environment. It occurs in these phases as opposed to the development phase because the development phase is dominated by computer professionals.

These individuals presumably do not suffer from computer anxiety because they have made the voluntary choice to work with computers. Brod (1984, p. 18) accuses many of these computer professionals of being "Technocentered" - "They begin to adopt a mindset that mirrors the computer itself".

Technostress is a three phase process. In the first phase, when the automated system is first implemented, some employees will master the operation and use of the computer (i.e., become functional with the system) with relative ease. Many other employees, however, will not. After a time, these non-functional users will begin to alter their patterns of system use. They will go back to manual systems (typewriters and calculators) to get their work done or restrict their activities which involve use of the computer system. This is the avoidance phase.

In the second phase of technostress, information flow is disrupted. In the pre-implementation days, every manager in the organization produced a proportional amount of information. After the introduction of the computer system, computer-functional managers will produce an increased volume of information, while non-functional managers' output will not increase, and may in fact dwindle (due to increased pressure they have put on themselves by choosing to do their jobs without the aid of the computer). This imbalance in the flow of information to subordinates may result in some not

receiving all of the information they need to properly

perform their jobs, causing undue pressure.

DEMANDS OF A TECHNOLOGICAL
WORK ENVIRONMENT

STRESS

TECHNOSTRESS

DECREASED
PRODUCTIVITY

INCREASED
ERRORS

INCREASED
STRESS

DELAYED
SCHEDULES

INCREASED
ERRORS

MANAGEMENT
PRESSURE

DEMORALIZED
USER

INCREASED
OVERTIME
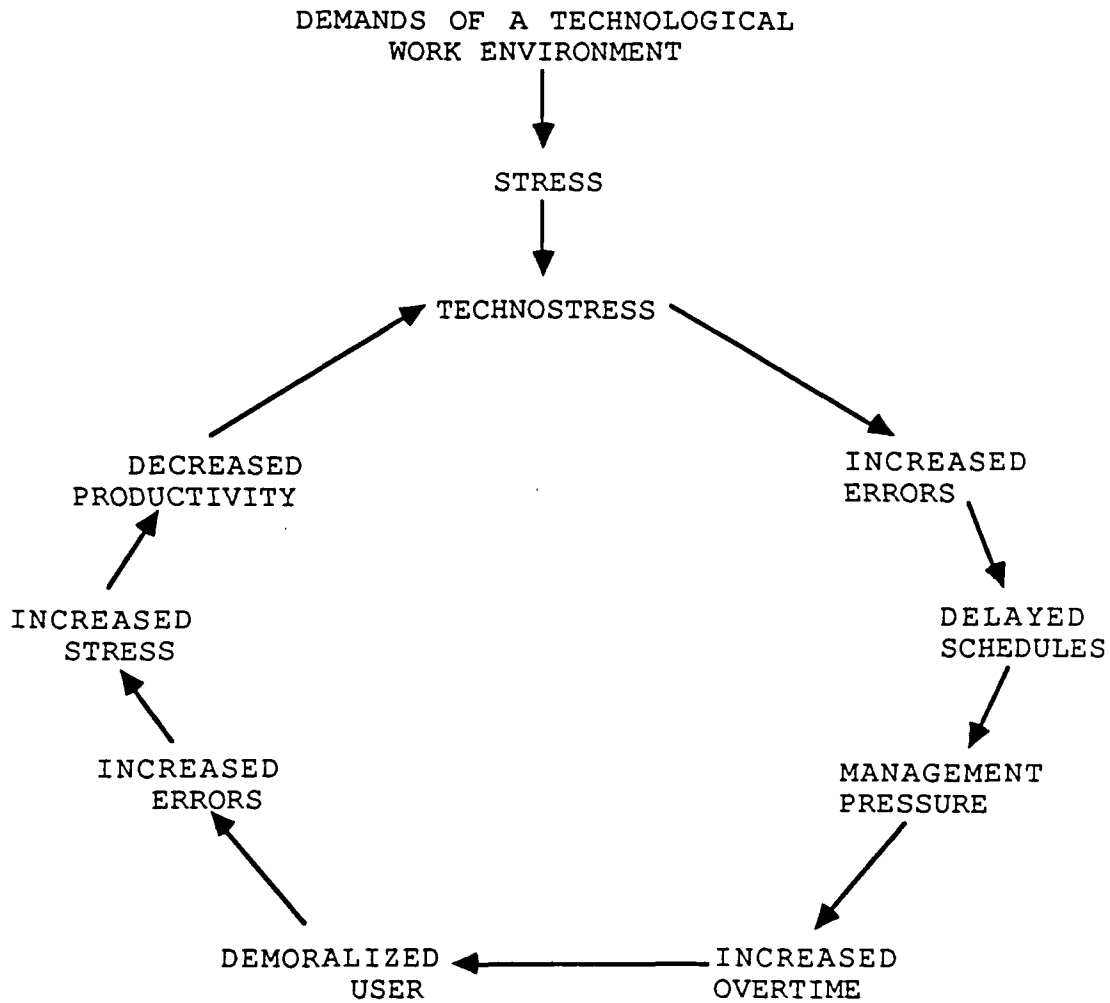
Figure 3. Technostress Error Cycle
(Brod, 1982, p. 755)

The third phase of technostress finds an increase in

error rates. This takes place because non-functional

employees will forget or violate necessary procedures that

they have not taken the time to learn properly. Time spent

re-learning system procedures leads to less actual productive

computer usage time, which leads to more errors due to

backlogs, increased stress, and decreased productivity. Thus

begins what Brod refers to as the "Technostress Error Cycle"

(see Figure 3).

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┌────────────────────┐   ┌────────────────────┐   ┌────────────────────┐
│       HUMAN        │   │     ATTITUDES      │   │     PERSONAL       │
│      VERSUS        │──▶│    TOWARD THE      │◀──│     FACTORS        │
│      MACHINE       │   │      SYSTEM        │   │                    │
│                    │   │                    │   │ - Math anxiety and │
│ - Computers in the │   │ - Computer anxiety │   │   gender           │
│   work place       │   │ - Individual       │   │ - Exposure to and  │
│ - Increased        │   │   attitudes        │   │   usage of         │
│   performance      │   │   toward computers │   │   technology       │
│   and stress       │   │ - Societal         │   │ - Computer         │
│ - Ergonomics       │   │   attitudes        │   │   knowledge        │
│ - Training         │   │   toward computers │   │ - Locus of control │
└────────────────────┘   └────────────────────┘   │ - Personality      │
                                                    │   rigidity         │
                                                    │ - Trait/state      │
                                                    │   anxiety          │
                                                    │ - Self-esteem      │
                                                    │ - Powerlessness    │
                                                    └────────────────────┘

                     ┌──────────────────────────┐
                     │        SUCCESSFUL        │
                     │     IMPLEMENTATION       │
                     │                          │
                     │ - Positive attitude      │
                     │   toward computers       │
                     │ - Decreased learning     │
                     │   time                   │
                     │ - More efficient use     │
                     │ - Increased performance  │
                     └──────────────────────────┘
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Figure 4. Implementation Factors Related to Computer
Anxiety (adapted from: Lucas, 1981, p. 103)

What causes technostress, a form of computer anxiety, to

occur in some employees and not others? The present study

will attempt to address this issue.

Although it deals with the specific activity of implementing an information system into an organization, Lucas's (1981) model can be adapted to illustrate the nature of human resistance to computers in general. This adaptation is made in Figure 4, and examined below.

Attitudes Toward the System

The most important variables to consider during a system implementation are the attitudes toward the system displayed by the organization's employees. If these attitudes are poor and cannot be changed, then the implementation has little, if any, chance of success. "If people are scared silly of computers, automation won't take hold" (Day, 1985, p. 66).

Computer anxiety

What exactly is computer anxiety? To answer this question, we must first understand what is meant by the concept of anxiety in general. Anxiety is a construct developed by psychological researchers in order to explain a particular behavorial phenomenon. Constructs - hypothetical entities which have no actual physical existence - are widely used to explain human behavior (Levitt, 1967).

Anxiety is defined by The American Heritage Dictionary (1985, p. 117) as: "Intense fear or dread lacking an unambiguous cause or a specific threat." A closely related construct, the phobia, is defined by the same source (p. 935)

as: "A persistent, abnormal or illogical fear of a specific

thing or situation". Turner (1984) writes "Anxiety is an

explanatory term which allows prediction from a variety of

situations to a complex and variable set of reactions" (p.

52). May (1950, p. 190) distinguishes between anxiety and

fear by saying: "fear is a reaction to a specific threat

while anxiety is unspecific, 'vague', 'objectless'". He goes

on to state that "anxiety is the apprehension cued off by the

threat to some value which the individual holds essential to

his existence as a personality" (p. 191).

Howard (1983) notes that psychologists have debated the

precise definition of anxiety for almost 80 years, and it is

not likely that the debate will end soon. Levitt (1967, p.

7) points out: "The range of possible definitions [of

anxiety] is, in principle, unlimited, and, in practice, very

broad."

These authors continually mention the future orientation

of anxiety as an important aspect of the phenomenon. This

apprehension toward the future can be rational or irrational,

permanent or transitory. When the apprehension is

proportionate to the actual danger, the anxiety is considered

to be rational or "normal". But, if the apprehension is not

proportionate to the objective danger, then it is said to be

irrational or "neurotic" (Howard, 1983).

Spielberger (1966) puts forth the idea that there are

two major types of anxiety: trait anxiety and state (or

situational) anxiety. Trait anxiety refers to the basic tendency in an individual to be anxious. This anxiousness is a personality characteristic that does not change significantly over time (Howard, 1983). It is a condition which exerts a constant influence on an individual's behavior (Levitt, 1967).

State anxiety, on the other hand, is a condition that varies in intensity and duration. It is not aimed at an individual's environment in general, as is trait anxiety, but rather towards a specific portion of that environment. Cambre and Cook (1985) note that the relationships between computer anxiety and state and trait anxiety need to be explored further and classified in order for computer anxiety to be accurately defined. An attempt will be made to do this in the present study.

In dealing with anxiety as it relates to computers, there are several names which researchers have used. Sanford Weinberg (as reported by Paul, 1982) considers fear of computers a phobia when it prohibits people from functioning normally where computers are concerned. True computerphobes (dubbed cyberphobes by Weinberg; Anderson, 1983; Business Week, 1982; Schwed, 1985) can be observed to suffer from the same symptoms that plague claustrophobes (individuals who fear enclosed spaces) and agoraphobes (individuals who fear open spaces). These symptoms can include nausea, sweaty palms and high blood pressure (Herdman, 1983). Technostress,

which was discussed earlier, is another name for this phenomenon.

In summary, computer anxiety is a real, albeit possibly irrational, condition. This condition may affect as much as thirty percent of the United States work force today (Paul, 1982). Any phenomenon which can have an adverse effect on such a potentially large percentage of the work force deserves attention. Efforts must be aimed at finding methods designed to limit its effects and thus increase organizational productivity.

Several studies have looked into the causes and correlates of computer anxiety. Jordan and Stroup (1982) developed a test to predict fear of computer use. Rohner (1981) developed a scale to test for computer anxiety in teacher education students. Maurer (1983) expanded the Rohner scale for use in the general population. Raub (1981) and Prell (1984) both used a sample of college undergraduates in studies of the correlates of computer anxiety. Dambrot, Watkins-Malek, Silling, Marshall, and Garver (1985) developed a scale to examine the gender differences in attitudes toward computers. Several of these studies were used as a foundation for the present study.

Individual attitudes toward computers

As Figure 5 shows, attitudes toward computers and computer anxiety influence each other through factors

internal to the individual. From this figure, it appears that a positive attitude toward computers should be related to a low level of computer anxiety, while a negative attitude would correlate with a high level of computer anxiety.

Exactly how a positive attitude towards computers is formed is a question that is not easily answered. Because of its two-way relationship with computer anxiety, it is difficult to postulate which comes first, computer anxiety or a negative attitude toward computers. (Howard (1983) and Raub (1981) speculate that computer anxiety causes an individual to have a negative attitude toward computers. This hypothesis raises the question of what causes computer anxiety. It is possible, however, that an individual's first experience with a computer, either direct or indirect (e.g., hearing about a co-worker's experience), can influence that individual's attitude toward computers and, through the other internal factors, affect the individual's level of computer anxiety. This theory is supported by Davidson and Walley (1985) who cite a case in which an employee refused to approach the computer again after an initial negative experience.

```
          Impact of computers
                on society
            Locus of control
              Self-Esteem
             Personality
Attitudes                                        Computer
Toward           Math anxiety                    Anxiety
Computers
              State anxiety
              Trait anxiety
          Computer knowledge
             and experience
                 Gender
```
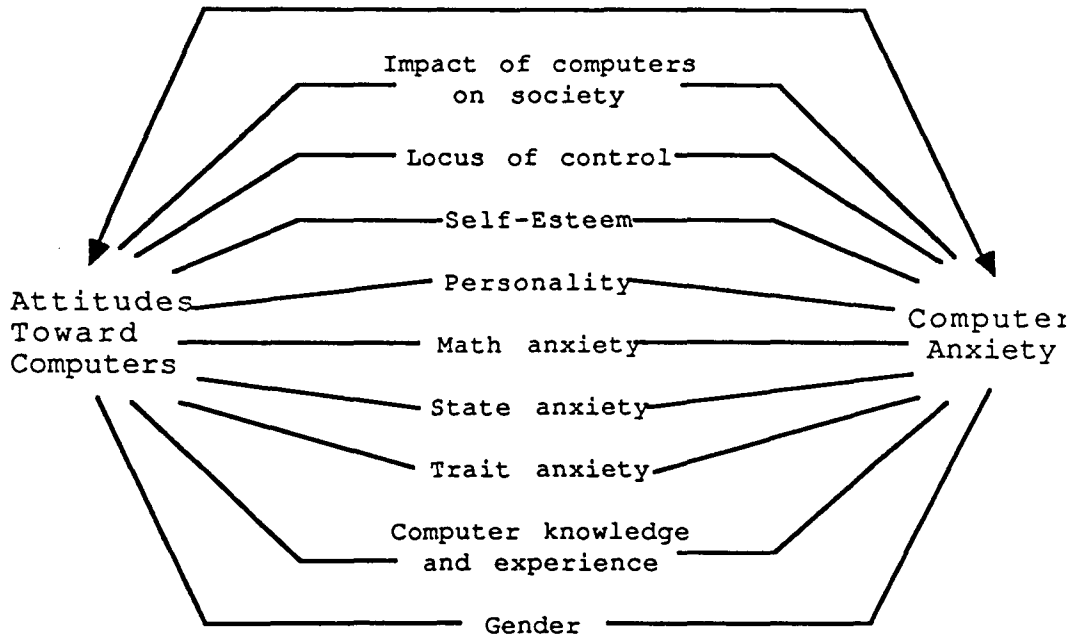
Figure 5. Relationship Between Computer Attitudes and
           Computer Anxiety   (adapted from: Howard,
           1983, p. 20)

Societal attitudes toward computers

   While computers are quickly making themselves virtually
indispensable in today's society, the acceptance of these
revolutionary machines is by no means universal. A non-
scientific study of the general public conducted by Ahl
(1975) showed that while most people were optimistic about
the benefits that computers can bring to society, nearly all
of the adults in the study (91.6%) felt that people cannot
escape the influence of computers. This feeling of
helplessness will be further addressed in the section of this
study dealing with increased performance and stress.

Lichtman (1979) replicated Ahl's (1975) study using a sample of educators. This study showed that teachers were slightly more likely to blame computers for errors than were adults in the general public (72% vs. 67%). Teachers were also less likely than adults in the general public to agree that computers would improve education (64% vs. 87%). This may well be attributed to a fear on the part of the teacher of being replaced by a computer (this phenomenon will also be further discussed in the section on increased performance and stress).

Lee (1970), in a scientific study of the general public (n = 3000), explored what computers mean to people as well as what general beliefs the public holds about computers. From this study, Lee concluded that there are two basic perspectives from which individuals look at computers. These are the "Beneficial Tool of Man Perspective", and the "Awesome Thinking Machine Perspective". Typical statements that characterized the "Beneficial Tool of Man Perspective" included; "They make it possible to speed up scientific progress and achievements." and "They will bring about a better way of life for the average man." Statements that characterized the "Awesome Thinking Machine Perspective" included; "Someday in the future, these machines may be running our lives for us." and "There is no limit to what these machines can do."

While these two perspectives are not exactly polar

opposites (Lee views the "Awesome Thinking Machine

Perspective" as not totally negative), they still show two

widely differing views as to the usefulness and acceptability

of computers in society. The actual data analyzed in this

study are over twenty years old, and it would be highly

interesting to replicate it in an effort to discern the

changes in social attitudes toward computers brought about by

the advent of the microprocessor. This task is, however,

beyond the scope of the present study.

Danziger (1985) points out the fact that there is

widespread ambivalence regarding computing:

> On the one hand, the computer is presented as the great
> facilitator, loyal and tireless in its efforts to
> eliminate the drudgery of labor and to apply its genius
> to the service of rational life. On the other hand, the
> computer is ominous and threatening, the central
> artifact in a brave new world where human needs for
> individuality and privacy, for meaningful work, and for
> a sense of mastery over the environment are crushed.
> (p. 3)

Why are computers being seen as a threat to society by

so many individuals "all of the sudden"? After all,

computers have been in existence since the 1940s. Naisbitt

(1984) offers a possible answer to this question:

> The reason is simple: its [the microprocessor's]
> widespread applicability. Earlier computer technology
> could be applied to some products, electronics, and
> large-scale office equipment, for example, but not
> others. Microprocessors can improve almost anything,
> and are consequently far more threatening. (p. 23)

Human Versus Machine

As we can see from Figure 4, the second set of factors to take into account on the road to a successful computer-based information system implementation is the Human vs. Machine characteristics of the implementation as they relate to individuals within the organization. When dealing with computer anxiety, it is important to consider the individual's level of involvement in the human/machine interaction. By simply existing, computers make many people uneasy. Some of these individuals are bothered by the fact that computers are capable of performing several hundred million calculations per second, thus vastly "out-thinking" humans. Cancro and Slotnick (1970) postulate that this resentment towards the computer is activated because individuals feel that the computer threatens their individual self-worth and uniqueness. This point is also brought out in Lee's (1970) study by individuals who hold to the "Awesome Thinking Machine Perspective" of computers. These individuals feel that computers downgrade humans in much the same way that people felt humans were downgraded when Darwin introduced his theories on natural selection and evolution in the 19th century.

Computers in the work place

How do people react when they are confronted with computers in the work place? The reaction of course varies

with the individual and the situation, but definite patterns
have been noted. According to Widmer and Parker (1983):

> To some, the computer is a game, a marvel, an instrument
> to be explored and exploited. Others view the computer
> as a threat to their self-esteem and possibly their
> jobs. (p. 23)

Many employees feel that it is the company, and not
themselves, that will benefit the most from the introduction
of computer technology into the work place (The Wall Street
Journal, 1983). They feel that the computer will take away
their jobs (Rubin, 1983), or else they feel that it is
beneath them to use the computer (Capron & Williams, 1984).
This last symptom specifically affects middle and upper level
managers who simply refuse to sit down at a computer
keyboard. This may be true because of computer illiteracy.
A 1981 study by Booz, Allen & Hamilton, Inc. estimates that
ninety percent of the middle managers and executives in the
US today are computer illiterate (as cited by Business Week,
1982; Gardner, Render, Ruth & Ross, 1985; Mitchell, 1983).

This "executive computer anxiety" has been divided into
four distinct categories: fear of change, fear of typing,
fear of failure, and fear of power loss (Small Business
Report, 1984). The group most susceptible to this type of
computer anxiety is those individuals between the ages of 40
and 60. Executives younger than 40 have, for the most part,
either had some exposure to computers or have accepted the
fact that the computer will be important to their careers.

Executives over 60 have reached their present position

without the direct aid of the computer, and they may feel

that they will be able to complete their careers without

having to work with computers. In an article by Zemke

(1984), Richard Byrne states: "There are executives out

there looking forward to their retirement with the idea that

maybe they can avoid learning to do this [run a computer] by

retiring in time" (p. 35).

These ideas are supported by Bralove (1983), who states

"executives feel that sitting at a computer terminal ill-

suits the executive image" (p. 22). "Some executives

responsible for running entire companies regard the idea of

using a personal computer as either demeaning or a waste of

time" (Fersko-Weiss, 1985, p. 68). Another major reason many

executives resist direct use of the computer is that they may

fear the loss of creative control in decision making. The

computer provides structured, abundant data. Many executives

prefer to make decisions with more ambiguous data, especially

when their only justification for making the decision is the

"gut feeling". If a decision proves to be the wrong one, and

the information supplied by the computer does not support the

decision, the executive may have to do a good deal of

explaining to his/her superiors (Wrege, 1982).

Many firms are devising methods to combat computer

anxiety in their upper level management. For example,

Boston's First National Bank established a walk-in computer

center where executives can learn about computers and even take units home with them in order to work with them away from the prying eyes of underlings (Taylor, 1982).

One possible cause of computer anxiety in the work place may be "information 'overload' - too much technology too fast" (Raub, 1983, p. 16). Due to the rapid advances in computer technology, most individuals have not been able to keep up with the changes. Thus, individuals may feel that they are too far behind to catch up, and thus they become apprehensive and anxious.

Increased performance and stress

Levitt (1967) points out that stress is a term used frequently in reference to anxiety. Stress is an outward reaction caused by some internally perceived stimulus. In the context of the present study, it is the computer that brings on this stress.

Perrow (1983) notes that performance in organizations which make use of high technology systems can be improved in three ways:

1) by demanding higher skills and levels of performance from employees,

2) by reducing operating tasks to passive monitoring of semi-automated systems, or

3) by completely automating functions (this is referred to as "removing the man from the loop").

All three of these methods are possible contributors to computer anxiety.

Demands by management for higher employee skill levels tend to place increased levels of on the job stress on employees. This is true because from the perspective of management, higher skill levels go hand-in-hand with higher performance levels. As Gutman (1986, p. C9) notes: "Computer people don't go home early. They go home later. ... And when they do go home they take their work home with them". Riaz Khan and Schapira (1983) cite an instance where management took advantage of the increased productivity of a computerized clerical staff by increasing the staff's workload. This sort of manipulation by management can reinforce attitudes that automation is a no-win situation for the employee.

This management expectation of higher worker performance is what causes the increased stress as employees strive to meet the raised standards. When this happens, frustration can build in the employee, who may feel that his/her current performance is in line with current rewards, and does not feel that the expected performance increase is worth the perceived rewards for this increase. This is an operationalization of Vroom's (1964) Valence-Instrumentality-Expectancy (VIE) theory of employee motivation (as reported by Steers & Porter, 1983). This employee frustration is, in turn, channeled toward the perceived cause of the stress;

i.e., the computer. Continued pressure from management creates more stress and frustration, and thus, a computer anxiety-stress cycle begins (see the section on Technostress). Johansson and Aronsson (1984) suggest that this stress can be lowered by reducing system response times and by eliminating pure data entry tasks, which can quickly become tedious and boring.

On the other hand, reduction of job duties to the level of monitoring semi-automated processes tends to cause individuals to lose self-esteem. Jokes from fellow employees about being an "errand boy for the computer", can bring about a loss of self-worth in a highly trained individual. Frustration and stress build from here.

Finally, being "removed from the loop" symbolizes the threat that employees fear the most when faced with impending automation: losing their jobs to a computer. Several studies (Ahl, 1975; Lee, 1970; Lichtman, 1979) point to this as a great fear (or cause of anxiety) on the part of individuals toward computers. The stress at this level is, obviously, the greatest, but, in any one of these three cases, the employee feels that he/she is the one who loses (The Wall Street Journal, 1983).

Walton (1985) supports Perrow's (1983) arguments and goes even further by stating:

> If the [implementation of the] technical system decreases skill requirements, the meaning of work may become trivial, and a loss of motivation, status, and

self-esteem may result. ... In some circumstances those
who suffered counterattacked the system.
     If the system increases specialization and
separates the specialty from interdependent activities,
then jobs may become repetitive and isolated, and fail
to provide workers with performance feedback. Such jobs
produce alienation and conflict.
     If the system increases routinization and provides
elaborate measurements of work activity, job occupants
may resent the loss of autonomy and try to manipulate
the measurement system. The fact of measurement itself
can put excessive pressure on individuals and can strain
peer relationships. (pp. 559-560)

Confronted with a forced implementation situation, many

individuals have a distinct feeling of helplessness, a

feeling that the computer is in complete control of their

working lives and destinies. In retaliation, some of these

individuals, as noted by Walton (1985), lash out at the

source of their frustration. Stories abound of employees

working to undermine the computer. They include unconscious

sabotage caused by not properly learning system procedures

and policies (Brod, 1982), voluntary early retirement in

order to avoid the stress brought on by having to learn how

to use a computer late in the career (Schwed, 1985), and

outright destruction of computer equipment (Capron &

Williams, 1984; Howard, 1983). The present study addresses

the issue of computer anxiety in an effort to find training

methods designed to decrease the level of stress related to

computer anxiety in individuals who are required to use

computers in their jobs and thus increase overall

organizational productivity.

Ergonomics

Ergonomics is defined by Webster's New Collegiate
Dictionary (1979, p. 384) as being "of or relating to
biotechnology." Biotechnology is defined by the same source
as "the aspect of technology concerned with the application
of biological and engineering data to problems relating to
man and the machine" (p 110). In other words, ergonomics is
concerned with the actual physical interaction of people and
machines, or in the present context, people and the computer.

The major ergonomic issues dealing with computers are
the physical strains and hazards caused by the use of the
computer. Chief among these hazards is concern over possible
radiation leakage from video display terminals (VDTs). VDTs
comprise the bulk of computer output devices. Many
individuals, such as travel agents and order entry clerks,
work in front of a VDT eight hours a day. While there have
been many government reports (e.g., Office of Finance and
Management, 1984) showing no harmful side effects from the
use of VDTs by workers, many groups (including unions), are
still skeptical (Herdman, 1983).

In addition to VDT concerns, use of office furniture
that is of poor ergonomic design can create problems in an
information system implementation. More often than not,
computer terminals are placed on the same desk that was used
by the employee for typing or writing. This may force the
employee into uncomfortable and harmful positions when they

attempt to use the computer equipment. Common ailments
reported include "swollen muscles and joints, sore shoulders,
hand cramps, neck pressure, numbness, and back pain"
(Herdman, 1983, p. 31).

The total physical environment in which a computer
terminal is placed, comfortable desks, including easy to
adjust chairs, and proper lighting, must be carefully planned
to conform to individual needs. If these ergonomic concerns
are not taken into consideration during the system
implementation process, employees who may possess a good
mental attitude toward using the computer may still turn away
from its use due to the physical factors.

Training

Using the computer in some phase of the learning process
has been referred to by many names. Computer-assisted
instruction (CAI), computer-based education (CBE), computer-
based instruction (CBI) and computer-based learning (CBL) are
just a few of the terms used in the literature. For the
purposes of this study, the author will use the term
computer-based training (CBT).

CBT has become an integral part of modern training
programs (Hultgren, 1984). It is predicted that by 1990,
about 10% of all training in industry will be some form of
CBT, while by the year 2000, this number will increase to 50%
(Selden & Schultz, 1982). Still, recent research indicates

that as many as 50% of all corporate trainers have little or no experience in CBT (Training, 1985).

Figure 6 shows the potential for CBT in the way of time savings in training. Skill level percentage is plotted on the vertical axis (B), while time is plotted on the horizontal axis (A). From this figure, it is easy to see that CBT offers a distinct time advantage in training, especially at higher skill levels (greater than 50%).

While the advantages of using the computer in the training process appear to be obvious, computer anxiety presents a roadblock because computer anxious individuals are likely to be unresponsive to a training program which integrates computers. As Raub (1983) points out: "Anxiety research has documented that when anxiety levels are high, concentration is low and learning is inhibited" (p. 17). Therefore, even with the great potential training time savings using CBT, wholesale adoption of this technology has not taken place. Some reasons for this include poor economic conditions, high front-end development and equipment costs, untested technology and resistance to change (Selden & Schultz, 1982).
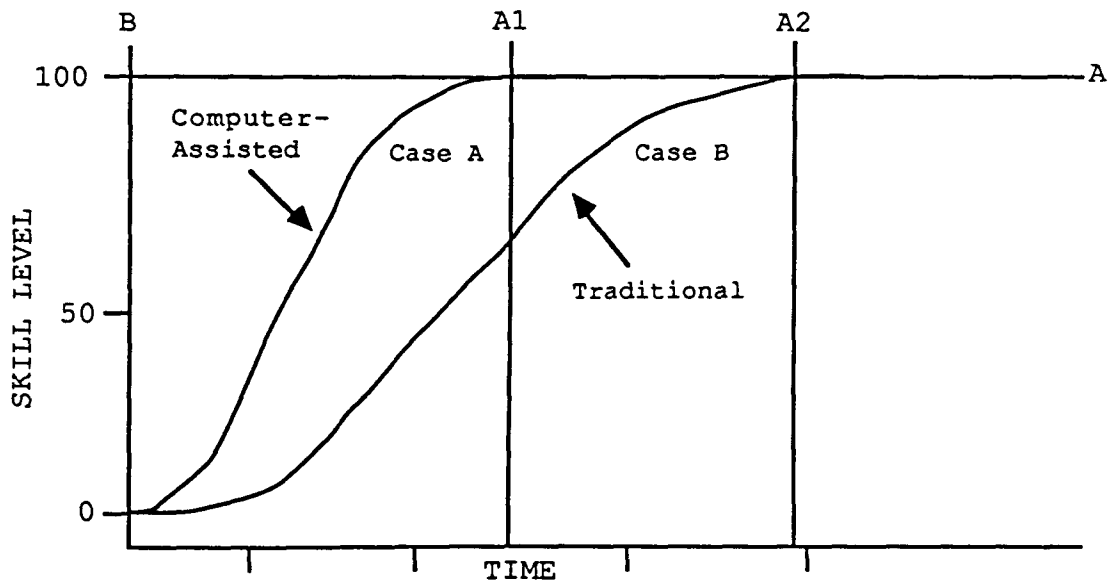
Figure 6. Potential for CBT (adapted from: Selden & Schultz, 1982, p. 61)

Bloom (1985) puts forth the idea that computer anxiety is part of a larger cycle of an individual's thinking, feeling and acting, while non-anxious (productive) patterns of behavior also form a cycle. Bloom has developed these ideas into a model for helping individuals learn about computers with a minimum of anxiety. The two cycles and how they interrelate are presented graphically in Figure 7.

According to Bloom, it does not matter where either cycle starts, because the individual will remain there until the cycle is disrupted in some way.
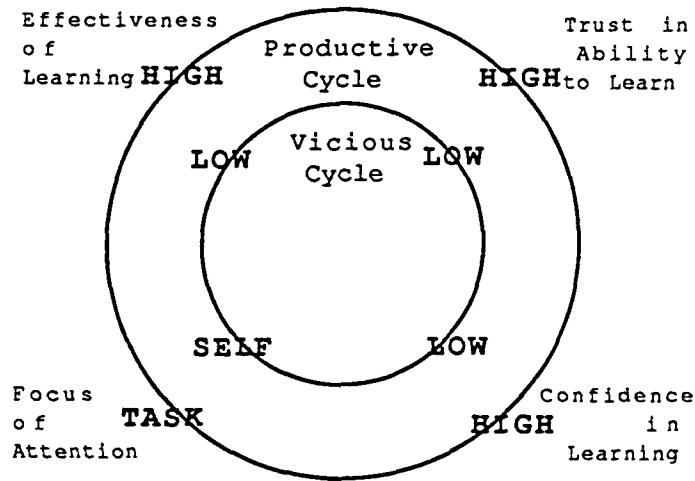
Figure 7.   The Vicious and Productive Cycles of
            Thinking, Feeling and Acting   (Bloom, 1985,
            p. 91)

Computer anxious individuals find themselves caught up
in the vicious cycle, which inhibits their ability to learn
about the computer and lowers their confidence in learning to
use the machine. Being caught in this cycle also moves the
individual's attention away from learning and thus decreases
the effectiveness of the training. Bloom proposes an
"anxiety management" approach to computer training. This
approach involves a program framework with three major
elements: education, skill building, and practice. Bloom
feels that this framework "can enhance the chances of
breaking the vicious cycle patterns" (Bloom, 1985, p. 92).

In order to ensure the further adoption of CBT,
continued research must be done in the field in order to
confirm the findings of researchers such as Selden and

Schultz, and at the same time, find methods of reducing computer anxiety in individuals as they undergo CBT.   .

Personal Factors

According to Figure 4, the third set of factors which need to be taken into account when working toward a successful computer-based information system implementation consists of the Personal Factors. (One way to identify individuals who experience computer anxiety is to place them in front of a computer terminal and observe how they react. This solution has the obvious drawback of being inefficient. An organization cannot afford to indiscriminately hire or place people for jobs in which they must interact with a computer only to later discover that these individuals are unable to work efficiently with the system because they suffer from computer anxiety.

(A more feasible way to identify individuals who suffer from computer anxiety is to first identify correlates of the phenomenon. If computer anxiety can be related to easily identifiable variables, then the process of identifying sufferers of this affliction will be made easier. Once this identification is made, then the organization will be able to either train these individuals, or place them in jobs which do not require direct interaction with computers.) The following variables have either been shown by past research to be related to computer anxiety or show promise as possible

correlates and will be further researched in the present study: math anxiety, gender, exposure to and usage of computer technology, computer knowledge/experience, locus of control, state/trait anxiety, personality rigidity, self-esteem and powerlessness.

Math anxiety and gender

These two personal factors are closely tied together in the literature. Research on computer anxiety has its roots in the study of math anxiety (Howard, 1983). Math anxiety can be defined as an internally held belief that one cannot do well in math (Christiansen, 1982). Tobias (1978, p. 44) writes: "The first thing people remember about failing at math is that it felt like sudden death." She goes on to note that: "Paranoia comes quickly on the heels of the anxiety attack" (p. 45).

As opposed to the liberal arts, where creative solutions are encouraged, mathematics requires a "right" answer. The same is true of computers. While many systems are highly forgiving in their error processing, there is still a limited range of responses which a computer can be programmed to accept in any given situation.

Tobias (1978) states that there are three main myths about math anxiety:

1) math aptitude is a gift,

2) people who are able to do math do it instantly, and

3) math is a male domain.

Tobias' research has helped to dispel the first two of these myths. However, research has discovered a strong gender effect in math anxiety. In the same study, Tobias found that even though 49% of all high school students were female, only 10% take any elective math beyond geometry. Christiansen (1982) found that SAT math scores of males averaged 48 points higher than those of females. And now, as Bakon, Nielsen and McKenzie (1983) put it: "There is growing evidence that the long documented gap between male and female participation in elective math and physical science courses is now being replicated in computer labs" (p. 27).

This gender effect most likely finds its roots in the basic conditioning of children. Females are conditioned to believe that math is not important to their careers, and that computers are part of the male domain of math, electronics and machinery (Dambrot, Watkins-Malek, Silling, Marshall & Garver, 1985). Women who excel in math are seen by many, females as well as males, as being unfeminine (Laws, 1979). This conditioning is furthered by the fact that women who fear math and computers assume others of their sex feel the same way they do, and that this fear is a normal condition (Dambrot et al.). Even in an area as seemingly innocuous as a video games arcade, the number of males involved vastly exceeds that of females (Christiansen, 1982).

Dale, as reported by Christiansen, 1982, argues that women tend to associate mistakes with being morally incorrect. They are therefore afraid to commit themselves to action when there is a significant possibility of making an error, which the process of mathematics requires. Men, on the other hand, are conditioned, by team and contact sports, to allow for incorrect decisions. Males also receive more support and pressure from significant others to succeed in areas involving math and technology than do females (Raub, 1981).

There is every reason to believe that people in general, and women in particular, who have had problems with math will find working with computers even more difficult and threatening because math and quantitative ability are integral parts of a computer science curriculum (Dambrot et al., 1985). Part of this assumption is supported by recent research. Prell (1984) reports a significant relationship between math anxiety and computer anxiety in both males and females (r = .31, $p \leq$ .01 in each case). Dambrot et al. report similar results in the relationship between math anxiety and computer aptitude (r = .36, $p \leq$ .001 in males, and r = .33, $p \leq$ .001 in females). The findings of Raub (1981) also fall in line with this general trend (r = .29, $p \leq$ .001). Neither Dambrot et al. nor Prell report a significant difference in levels of math anxiety between males and females. Raub's findings of the relationship between math anxiety and gender,

however, support the gender gap assumption (r = .34 for males, and r = .21 for females; $p \leq .001$). To summarize, math anxiety is seen as a strong correlate of computer anxiety, and recent research is not conclusive as to the notion that females are more prone to suffer from it than males.

Exposure to and usage of computer technology

While it is true that it would be extremely difficult, if not impossible, for an individual to completely avoid computer technology in today's society, there are nonetheless different levels of exposure to the computer. Individuals with high levels of exposure could be characterized as owning or using personal computers in the home or work place, consistently using automatic teller machines (ATMs) to do their banking, or enjoying video games. Individuals with low levels of exposure, on the other hand, would not be involved in the above activities and would have a distinct disinterest in becoming involved with computer technology even if they were given the opportunity to do so. Sufferers of computer anxiety would presumably have a low level of exposure to computers and technology, while those who do not experience this affliction would have higher levels of exposure, or would indicate interest in receiving exposure.

Prell (1984) looked into the area of exposure to computers in relation to computer anxiety. Specifically, his study measured subject's self-reported levels of ATM usage

and frequency of video game playing. Neither of these factors proved to be significant predictors of computer anxiety, and therefore, they will not be measured in the present study.

Koester and Luthans (1979) found that individuals who have had very little direct exposure to computer technology were influenced to a greater extent by the computer and its output than by more traditional information forms, such as mimeographed data. Individuals with computer experience reacted differently. These individuals were more pessimistic about computer generated data when compared to the more traditional forms. This study suggests that the more exposure to computers an individual has, the less apt they are to hold the computer in awe (the "Awesome Thinking Machine Perspective"). By extrapolation, these individuals are less likely to suffer from computer anxiety, possibly, in part, because they do not see the computer as a threat to their control of decision making in the organization.

Computer knowledge/experience

The phrase "ignorance is bliss" does not apply to computers. With the increasing role computers are taking in our society, an individual can no more afford to be totally ignorant about computers and their capabilities than he/she can be functionally illiterate and still expect to be able to function at an effective level in today's world.

But just as it is unnecessary for an individual to know
how a carburetor - or a computer controlled fuel-injection
system - works in order to drive a car, it is also
unnecessary for that same individual to understand digital
theory or binary arithmetic in order to take advantage of the
benefits of computers. What _is_ necessary is a basic
knowledge of how computers work in order to understand, among
other things, that when a "computer error" is made, a large
percentage of the time it is due to some human error. Raub
(1983) notes that computer anxiety can be caused by limited
knowledge, and thus these fears may be based on
misconceptions.

Individuals with even a rudimentary knowledge of
computers and the way they work would most likely be less apt
to suffer from computer anxiety. This is the case because
they will understand the limitations as well as the
capabilities of computers, that computers do not "think", nor
are they "smarter" than humans. In other words, individuals
with some knowledge of computers will not look at computers
from the "Awesome Thinking Machine Perspective".

Locus of control

Locus of control is a concept developed by Rotter in
1966 to measure perceived control of reinforcement. This and
other measures were developed after researchers discovered
that individuals reacted differently to success or failure

when the outcome of the task they were to perform was said to be due to either skill, i.e., factors internal to the individual, or chance, i.e., factors external to the individual (Lefcourt, 1981).

Past research (as cited by Lefcourt, 1981) has found that perceived control of reinforcement is positively associated with access to opportunity. Individuals who are given opportunities to attain valued positive outcomes are more likely to hold internal control expectancies than individuals who do not have access to these opportunities. Individuals who are deprived of such things as status holding positions, group memberships, etc., are often found to hold fatalistic, external control beliefs. Thus, some individuals have learned to believe that valued reinforcement occurs only by chance, and that they have no control over their fate, while others believe that they control their own fate (Lefcourt, 1982).

In this study, it is being postulated that locus of control enters into the discussion of computer anxiety because those individuals who hold external control perceptions (externals) should be more likely to suffer from computer anxiety than individuals who hold internal control perceptions (internals). This is true because externals would believe that they have no control over activities which involve computers. Internals, on the other hand, would

presumably feel that the computer is just another tool with which they can extend their own influence.

State/trait anxiety

As discussed in the section on computer anxiety, two forms of anxiety have been identified: trait anxiety (A-trait) and state anxiety (A-state) (Spielberger, 1966). Spielberger, Gorsuch, Lushene, Vagg and Jacobs (1983) postulated that individuals who are high in A-trait are more apt to exhibit A-state elevations than low A-trait individuals because these individuals see a broader range of situations as dangerous or threatening. If this is in fact the case, then it should also be true that those individuals who exhibit high A-trait should also be more likely to suffer from computer anxiety. This is true because high A-trait individuals are more anxious toward the environment in general, and therefore more likely to exhibit anxiety toward a specific part of their environment. It is being postulated in the present study that computer anxiety is actually an anxiety state. Therefore, individuals who suffer from computer anxiety should exhibit an A-state elevation when confronted with a situation in which they must make use of a computer.

Personality rigidity

Rigidity is a concept developed by Rehfisch in 1958 to test for various personality characteristics. These characteristics included constriction and inhibition, intolerance of disorder and ambiguity, social introversion, and anxiety (Robinson & Shaver, 1973). Individuals who score high on this scale (rigid) tend to be submissive, low in leadership qualities, unoriginal, and relatively deficient in cognitive and motivational factors associated with intellectual competence and achievement (Rehfisch, 1958).

Keeping in mind past research, the present study hypothesizes that individuals who score high on a personality rigidity test should be more likely to suffer from computer anxiety than those with low rigidity scores. This is because trait anxiety is one of the characteristics constituting rigidity. As discussed in the previous section, if an individual is more anxious in general, they will be more apt to suffer from anxiety towards a specific area, in this case, computers. Also, computers are perceived as being analytically oriented, and if rigid individuals are truly deficient in cognitive factors associated with intellectual competence, then these individuals are more likely to fail in their experiences with computers.

Self-esteem

Self-esteem has been defined as a "liking and respect for oneself which has some realistic basis" (Robinson & Shaver, 1973, p. 45). The construct examines attitudes toward the self. While this researcher is unaware of the use of this construct as a direct correlate of computer anxiety, it raises many interesting possibilities. If it is true that organizational automation can bring about a lowering of self-esteem (as discussed in the section on Increased performance and stress), then it is logical to assume that individuals who are low in self-esteem would tend to be more prone to suffer from computer anxiety than high self-esteem individuals. This would be the case if high self-esteem individuals are, in fact, more confident about themselves and their abilities than are individuals with low self-esteem. Thus, all other things being equal, high-esteem individuals should be less likely to fear computers.

Powerlessness

Powerlessness is a concept developed by Neal and Seeman in 1964. It is similar to Rotter's (1966) Locus of Control concept except for the fact that locus of control seeks to measure an individual's perceptions of control over his/her own life, while powerlessness measures "expectancies for control of events" with the events being in terms of society (Robinson & Shaver, 1973, p. 260).

Several studies (Ahl, 1975; Lee, 1970; Lichtman, 1979) point to the fact that some individuals fear computers are taking over our society, and that no one will be able to stop them. It is quite possible that this fear of computer take-over contributes to computer anxiety. This could happen if an individual rationalizes: "Computers may take over everyone else, but they won't get me!" and thus, avoids computers because of his/her fear of them.

If the above assumption is correct, then by extrapolation, we may be able to theorize that individuals with high levels of powerlessness would be more apt to suffer from computer anxiety than those individuals with low levels of powerlessness (i.e., high power individuals).

METHODOLOGY

Sample

The subjects in this study were students in a mass lecture of an introductory level management course at Iowa State University. These students voluntarily participated in this study. They were compensated by receiving extra credit quiz points in the course. 199 students (105 males, 94 females) participated in Phase One of this study, and a subset of these (95 - 43 males, 52 females) participated in Phase Two.

Experimental Design

Figure 8 graphically depicts the design of the present study. In Phase One, the pre-test phase, the subjects were given a questionnaire battery incorporating the following scales: Fennema & Sherman's (1976) Math Anxiety Scale, Rotter's (1966) Locus of Control Scale, Rehfisch's (1958) Rigidity Scale, Spielberger et al's. (1983) Trait Anxiety Inventory, Coopersmith's (1967) Self-Esteem Inventory, Neal and Seeman's (1964) Powerlessness Scale, Dambrot et al's. (1985) Computer Attitude Scale (CATT), Howard's (1983) Computer Knowledge Scale, Raub's (1981) Computer Experience Scale, and Maurer's (1983) Computer Anxiety Index (CAIN). At the same time, the following personal demographic data were collected: age, gender, self-reported math GPA and overall

GPA, an indication of the subjects' familiarity with

Wordstar, and an indication of the subject's preferred mode

of learning, with the choices being classroom lecture/demo or

self-paced programmed (tutorial) learning.

PHASE ONE   PHASE TWO   PHASE THREE

```
┌─────────────┐      ┌─────────────────┐       ┌──────────────┐
│  Pre-Test   │─────▶│  Control Group  │──────▶│  Post-Test   │
│  (90 mins)  │      │      (C)        │       │  (30 mins)   │
└─────────────┘      │ No instruction  │       └──────────────┘
                     │    or task      │
                     └─────────────────┘
                     ┌─────────────────┐
                     │Lecture/Demo (A) │ (45 mins)
                     │ Tutorial  (B)   │
                     └─────────────────┘
                     ┌─────────────────┐
                     │    Measure      │ (10 mins)
                     │     State       │
                     │    Anxiety      │
                     └─────────────────┘
                     ┌─────────────────┐
                     │    Complete     │
                     │    Assigned     │ (2 hrs)
                     │      Task       │
                     └─────────────────┘
```
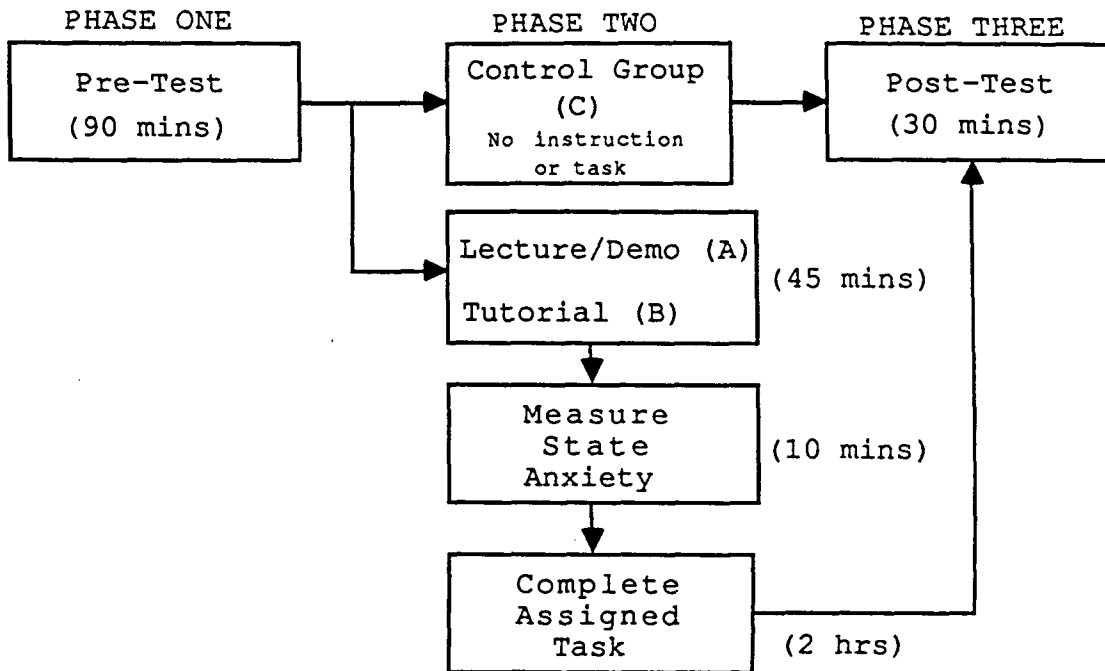
Figure 8. Study Design

For Phase Two, the subjects with no knowledge of

Wordstar were assigned to one of three groups. Group A was

instructed in the use of Wordstar using a traditional

classroom lecture/demo format. Group B was given the task of

learning how to use Wordstar by using a modified version of a

Wordstar tutorial program created by a staff member of the

Computation Center at Iowa State University. Group C was

used as a control group and did not participate in Phase Two.

Those subjects who were conversant with the Wordstar software also did not participate in Phase Two. Immediately after their training, the subjects in Groups A and B were tested on their level of state anxiety using Spielberger et al's. (1983) State-Anxiety inventory. Subjects then were asked to use the word processor to edit a short manuscript provided by this researcher (see Appendix C). Subject performance in this task was measured by determining the number of errors made in the editing process, and the number of questions the subject asked the proctor during the task portion of Phase Two. These two measures were used as surrogate performance measures.

In Phase Three, the Post-Test phase, the Dambrot et al. (1985) Computer Attitudes Scale (CATT) and the Maurer (1983) Computer Anxiety Index (CAIN) were re-administered to all three groups, and the subjects who participated in Phase Two were asked to rate the possibility that they will continue to use the Wordstar software for their own needs.

Concepts

Figure 9 shows how each of the concepts highlighted in the model presented in Figure 4 were explored in the present study.

CONCEPT	MEASURED IN PHASE
Attitudes Toward Computers	One & Three
Human vs. Machine	One, Two & Three
Personal Factors	One & Two
Successful Implementation	Three

Figure 9. Study Concepts

Instrumentation

Attitudes toward computers

Subjects' attitudes toward computers were measured
during Phases One and Three of the study. Two scales were
used to obtain this measure. The first scale administered
was Dambrot et al.'s (1985) Computer Attitude Scale. This
scale consisted of 20 statements, 9 positive and 11 negative,
about computers. Each statement was rated on a five-point
Likert-type scale ranging from 1 (Strongly Disagree) to 5
(Strongly Agree). Scoring of this scale was done by
reversing the points given to the positive items, and
calculating an average score. Scores could fall in a range
from 1 to 5 with a high score indicating a negative attitude
toward computers. Dambrot et al. report an internal
consistency reliability (coefficient α) of .84.

The second instrument used to determine attitudes toward computers was Maurer's (1983) Computer Anxiety Index. Maurer's scale has its roots in a study done by Rohner in 1981. Rohner was interested in developing a scale to measure computer anxiety in prospective teachers. The Rohner instrument consisted of 10 statements, some dealing with opinions about computers in general and others dealing specifically with the utilization possibilities of computers in the classroom. The subjects responses to these statements were recorded using a five-point Likert-type scale.

Maurer modified and expanded this scale into a 26 item index relating to general attitudes toward computers using a six-point Likert-type scale. A score for this scale was obtained by reversing the points given to the negatively worded statements and then taking an average of the 26 items. Possible scores were from 1 to 6, with a high score indicating high levels of computer anxiety. Maurer feels that this index is suitable for use with the general population and reports an internal consistency reliability (α) rating of .94 and a test/retest reliability of .90.

Human versus machine

The human versus machine interaction characteristics of the present study were measured during each of the three phases. In Phase One, subjects were asked if they had any working knowledge of the word processing program Wordstar.

In addition, they were asked which type of learning situation they would prefer, a traditional classroom lecture/demo environment, or an individualized self-paced programmed learning environment.

The subjects were told that for the learning portion of the study (Phase Two) every effort would be made to match their preferences to the treatment group in which they were placed. In actuality, the selection of Group A and Group B for Phase Two was done as follows: First, the cases were sorted using the subject's score on the Dambrot et al. (1985) scale (Variable name DAMB-A), administered during Phase One. These sorted cases were then divided according to the subject's knowledge of Wordstar (Variable name KNOW2). Those subjects who reported either no knowledge (KNOW2 = 1) or limited knowledge (KNOW2 = 2) of Wordstar were then randomly divided between Groups A and B. Those subjects with significant knowledge of Wordstar (KNOW2 = 3, 4, or 5) were not placed in either of these groups.

Group A (n = 35) was instructed in the use of Wordstar and a printer using a lecture/demo format. This instruction was performed by this researcher, who has an extensive background in computer software training. Group B (n = 44) was given the task of learning how to use the same word processor by using a modified version of a Wordstar tutorial program created by a staff member of the Iowa State University Computation Center. Group B subjects' training on

the use of the printer consisted of a one page self-explanatory hand out. The lecture/demo was designed to be a verbalization of the tutorial program.

Group C (n = 16) was used as a control and did not participate in Phase Two of the study. Group C was established by over-booking training sessions and not seating those individuals who had a score close to the median of the DAMB-A variable (neither computer anxious or non-anxious). These individuals who did not receive the training took the Phase Three Post-test immediately and then were dismissed.

During the training portion Phase Two, subjects were allowed to take as many notes as they wanted, and they were permitted to use these notes during the task portion of Phase Two. Specifically, the subjects in both groups were asked to enter a manuscript supplied by the researcher into Wordstar. First, subjects were asked to enter the document in the exact form given, and then to make the corrections indicated in the copy. The corrections required the subjects to demonstrate a good working knowledge of the software. The subjects were then asked to obtain a hard copy printout of their two versions of the manuscript. Subject performance was later evaluated by calculating the number of errors made transcribing the manuscript (the second version), and the number of questions asked of the proctor during the the completion of the task. The number of errors was the average number obtained from two separate raters. The correlation

between raters was .86. The number of questions were tallied by the proctor during the task portion of Phase Two. The existence of these performance measures was not reported to the subjects until the study was completed.

Personal factors

Nine instruments were used to determine personal factors. Eight of these scales were administered during Phase One of the study while the ninth was administered during Phase Two. The first scale was Rotter's (1966, as cited by Robinson & Shaver, 1973) Scale to Measure Internal Versus External Control. This scale consisted of 29 forced-choice questions. Six of these items were "fillers", while the other 23 were operational internal versus external belief statements. Each respondent was asked whether they agreed or disagreed with each statement. Statements were coded such that a "0" indicated an internal locus of control and a "1" indicated an external locus of control. An average scale score was reported for each respondent. An estimated internal reliability (coefficient a) of .70 has been reported for this scale using a sample of college students (Robinson & Shaver).

The second personal factor measured was personality rigidity. This was done by using Rehfisch's (1958, as cited by Robinson & Shaver, 1973) Rigidity Scale. The original scale consisted of 39 true-false items, divided into 8

subscales. Of these, the following subscales were deemed
inappropriate for the present study because they were not
seen to pertain in any way to computer anxiety:
"Conservatism and conventionality" (8 items), "Misanthropy
and parsimony" (3 items), "Emphatic concern with work and
study" (2 items), and "Miscellaneous" (2 items). The
remaining 24 items were used in the present study. Rigidity
scores ranged from 0 to 1, with 0 indicating low rigidity and
1 indicating high rigidity. Corrected split-half reliability
for the original scale is reported to be .72 (Robinson &
Shaver).

Coopersmith's (1967, as cited by Robinson & Shaver,
1973) 27 item Self-Esteem Inventory measured the fourth
personal factor. Respondents were asked to describe whether
a series of statements reflecting self-esteem were "like me"
or "unlike me". Responses were scored such that 0 indicated
low self-esteem and 1 indicated high self-esteem.
Coopersmith reports a .90 split-half reliability among
elementary school students for a longer version of the
instrument (Robinson & Shaver). Additionally, variants of
the Inventory have been used successfully in occupational
research (as cited by Cook, Hepworth, Wall, & Warr, 1981).

Neal and Seeman's (1964) Powerlessness Scale was used to
measure the fifth personal factor. The scale consists of
seven forced-choice items. One point was scored for each
powerless response and then an average score was calculated.

These scores range from 1 to 2. A split-half reliability of .70 is reported (Robinson & Shaver, 1973).

In order to measure the subject's level of math anxiety, the Fennema and Sherman (1976) Math Anxiety Scale was used. This scale consisted of 12 statements, six negatively worded and six positively worded, which were rated using a five-point Likert-type scale with responses ranging from Strongly Disagree (assigned one point) to Strongly Agree (assigned five points). Points on the positive items were reversed and an average score was calculated. Scores could range from 1 to 5. The higher the score, the higher the subjects' level of math anxiety. A split-half reliability of .92 has been calculated for this instrument (Howard, 1983).

The sixth scale used in the variable of personal factors was Howard's (1983) Computer Knowledge Scale. This scale consisted of 10 objective questions about computers. Scoring involved assigning one point for each correct answer, thus, scores range from 0 to 10. According to Howard, construct validity of the test was established by the wording of the questions. No indication of reliability is reported by Howard.

Raub's (1981) Computer Experience Scale was used to evaluate the subjects' level of computer experience. This instrument consists of one six item scale with responses ranging from "I have no experience using a computer" to "I earn (or supplement) my living with my knowledge of computer

software or hardware". Scores on this scale range from 1 to 6.

The final scale used to measure personal factors was Spielberger et al.'s (1983) State-Trait Anxiety Inventory (STAI). This inventory actually consists of two instruments. The A-Trait inventory and the A-State inventory. Each instrument consisted of 20 statements, answered on a four-point Likert-type summated scale. The scoring was done by reversing points given to positive items and calculating an average score. Scores may range from 1 to 4, with a high score indicating high anxiety.

The A-Trait inventory measured trait anxiety, or an individual's normal level of anxiety, while the A-State instrument measured state anxiety, the level of anxiety an individual feels when confronted with a particular situation. The A-Trait instrument was administered during Phase One while the A-State instrument was administered right after the subjects were told about the manuscript transcription task in Phase Two.

Finally, the following self-reported information was collected during Phase One: age, gender, overall GPA, and math GPA.

Successful implementation

Identification of those who suffer from computer anxiety is a first step. However, the major question asked by

organizations is, "Can these individuals be treated so that they will become productive members of our organization?" The present study attempts to answer this question in Phases Two and Three.

In the first part of Phase Two, the subjects were divided into two groups in order to receive computer training. Group A received this training in a classroom environment (i.e., the lecture/demo treatment), while Group B received hands-on experience (i.e., the tutorial treatment). Because assignment to these groups was perfectly random, each group contained individuals who were computer anxious as well as individuals who were not.

In the latter part of Phase Two, after the subjects completed their assigned task, the number of questions they asked during the task, as well as the number of errors in the manuscript were determined. These ratings acted as a surrogate measure of how well they understood the training received.

In Phase Three, the computer attitudes scale of Dambrot et al. (1985) and Maurer's (1983) computer anxiety index were re-administered. Additionally, the subjects were asked to rate the possibility that they would again use Wordstar in light of the training they had received. The change in computer attitudes/anxiety from Phase One to Phase Three, as well as the subject's acceptance of the computer training (as

indicated by the subject's willingness to use Wordstar again)
served as indicators of the success of the training.

Research Questions

The following research questions will be addressed by
this study:

1. Is computer anxiety more prevalent in females than
   in males?

2. Are "powerless" individuals more likely to suffer
   from computer anxiety?

3. Are individuals who display low levels of self-
   esteem more likely to suffer from computer anxiety?

4. Are individuals rated as external on Rotter's Locus
   of control scale more likely to have higher levels
   of computer anxiety than those rated as internal?

5. Are "rigid" individuals more likely to suffer from
   computer anxiety?

6. Is there any relationship between computer anxiety
   and math anxiety?

7. Is computer experience related to computer anxiety?

8. Are individuals who have more knowledge about
   computers less likely to to suffer from computer
   anxiety?

9. Is computer anxiety related to trait anxiety?

10. Is computer anxiety related to state anxiety?

11. Can computer anxiety be alleviated by training?

12. Does computer anxiety affect performance?

RESULTS

Statistical Summary

Table 1 gives the abbreviations for each variable used in the study. More complete information on the instruments can be found in Appendix A.

Table 1. Variable Abbreviations Used in Statistical Analysis

VARIABLE	ABBREVIATION
Dambrot et al. Computer Attitudes	
Phase One	DAMB-A
Phase Two	DAMB-B
Maurer Computer Anxiety Index	
Phase One	MAU-A
Phase Two	MAU-B
Spielberger et al. State Anxiety . . .	STATE
Spielberger et al. Trait Anxiety . . .	TRAIT
Fennema & Sherman Math Anxiety	MATH
Coopersmith Self-Esteem	EST
Rotter Locus of Control	LOC
Rehfisch Personality Rigidity	RIG
Raub Computer Experience	EXP
Howard Computer Knowledge	HOW
Neal & Seeman Powerlessness	POW
Treatment Group	GROUP
Possibility of continued Wordstar usage .	NON-USAGE
Matching of subjects' treatment group	
preference	CHOICE

Table 2 is a summary of the statistics collected during the present study. The first phase of data analysis consisted of obtaining alpha coefficients for each scale used. Note that the Powerlessness scale was found to be unreliable ($a = .39$) and therefore was not used during the rest

of the analysis phase. All of the statistical analysis was
performed using the Statistical Package for the Social
Sciences (SPSS^X). Program listings can be found in Appendix
F.

Table 2. Descriptive Statistics

SCALE	N	MEAN	SD	α	RANGE
DAMB-A	199	2.23	.45	.84	1.15-3.60
DAMB-B	95	2.27	.53	.88	1.10-3.95
MAU-A	199	2.55	.57	.92	1.08-4.65
MAU-B	95	2.55	.73	.96	1.08-4.81
STATE	79	2.00	.53	.99	1.10-3.35
TRAIT	199	1.87	.61	.92	1.00-3.80
MATH	199	2.59	.88	.96	1.00-5.00
EST	199	0.77	.17	.83	0.00-1.00
LOC	198	0.43	.17	.79	0.09-0.78
RIG	199	0.45	.19	.71	0.04-0.96
EXP	199	3.45	.93	-^{a}	1.00-5.00
HOW	199	4.66	2.23	.70	0.00-10.00
POW	199	0.46	.21	.38	0.14-1.50

^{a}Computer Experience is a one item scale.

Hypothesis Testing

The research questions to be addressed during this study
are listed in the Methodology section on page 57.

<u>T-tests</u>

Research question one asks whether computer anxiety is
more prevalent in females than in males. In order to answer
this question, a t-test was performed. Results from this
analysis were mixed. Using the DAMB-A scale the male/female
difference is significant (M_{males} = 2.16, $M_{females}$ = 2.31, t =
-2.42, $p \leq .05$). However, significance was not found using

MAU-A, DAMB-B or MAU-B. These results would suggest there is
no difference in computer anxiety between males and females.
Interestingly, females in the sample were found to be more
math anxious than males (M_{males} = 2.45, $M_{females}$ = 2.75, t =
-2.47, $p \leq .05$), which is consistent with previous research on
math anxiety (Prell, 1984; Raub, 1981; Tobias, 1978).

Correlation analysis

Pearson product-moment correlations were used to
evaluate research questions two through ten. A complete
correlation matrix is shown in Table 3.

Powerlessness and computer anxiety   Research question
number two is, are "powerless" individuals more likely to
suffer from computer anxiety? As mentioned in the
statistical summary, the Neal and Seeman Powerlessness
instrument was found lack sufficient reliability for this
analysis to be meaningful.

Self-Esteem and computer anxiety   Research question
number three asks are individuals who display low levels of
self-esteem more likely to suffer from computer anxiety? The
scale EST was found to be significantly correlated with all
four measures of computer anxiety (DAMB-A: r = -.25, $p \leq .001$;
DAMB-B: r = -.35, $p \leq .001$; MAU-A: r = -.20, $p \leq .01$; MAU-B: r =
-.21, $p \leq .05$). Because a high score on EST indicates a high
level of self-esteem, these significant negative correlations

Table 3. Pearson Correlation Coefficients

	DAMBA	DAMBB	MAUA	MAUB	TRAIT	STATE	EST	LOC	RIG	HOW
DAMBA	1.0000	.8380***	.8342***	.8161***	.2776***	.5155***	-.2526**	.2053**	.2128**	-.2301***
DAMBB	.8380***	1.0000	.7587***	.9027***	.3229**	.5396***	-.3462***	.2599***	.2790***	-.2047
MAUA	.8342***	.7587***	1.0000	.7930***	.2216**	.4837***	-.1978**	.2162**	.2280***	-.2132**
MAUB	.8161***	.9027***	.7930***	1.0000	.2152*	.4530***	-.2056	.2483**	.2388	-.2032*
TRAIT	.2776***	.3229***	.2216**	.2152*	1.0000	.6454***	-.6355***	.3637***	.4516***	.0653
STATE	.5155***	.5396***	.4530***	.4530***	.6454***	1.0000	-.5543***	.2760***	.4960***	-.1201
EST	-.2526**	-.3462***	-.1978**	-.2056*	-.6355***	-.5543***	1.0000	-.3268**	-.4769***	-.0843
LOC	.2053**	.2599**	.2162**	.2483**	.3637***	.2760**	-.3268**	1.0000	.1901**	-.0861
RIG	.2128**	.2790**	.2280***	.2388*	.4516***	.4960***	-.4769***	.1901**	1.0000	.1347
HOW	-.2301***	-.2047*	-.2132**	-.2032**	.0653	-.1201	-.0843	-.0861	.1347	1.0000
MATH	-.2338***	-.3288***	.1702**	.2822**	.2309***	.1727	-.1811*	.2704***	.0900	-.2810***
EXP	-.2628***	-.2340*	-.2535***	-.2523**	-.0120	-.2514*	.0077	-.1544	-.0001	.5530***
QUEST	.3213***	.2489**	.3227***	.2102*	.0555	.2829**	.0562	.0369	-.0961	-.3087**
RATER1	.0134	.0896	.0048	.0675	.1442	-.0458	-.1177	.0817	.1496	-.0901
RATER2	.0487	.0891	.0249	.0781	.1224	-.1050	-.0584	.0536	.0752	-.1402
ERRORS	.0325	.0926	.0156	.0756	.1385	-.0793	-.0909	.0700	.1160	-.1199
NON-USAGE	.0311	.1747**	.0851	.1480	.2195**	.2418*	-.1882*	.1252	.1811*	-.1610

	MATH	EXP	QUEST	RATER1	RATER2	ERRORS	NON-USAGE
DAMBA	.2338***	-.2628***	.3213***	.0134	.0487	.0325	.0311
DAMBB	.3288***	-.2340*	.2489**	.0896	.0891	.0926	.1747*
MAUA	.1702**	-.2535***	.3227***	.0048	.0249	.0156	.0851
MAUB	.2822**	-.2523**	.2102*	.0675	.0781	.0756	.1480
TRAIT	.2309***	-.0120	.0555	.1442	.1224	.1385	.2195**
STATE	.1727	-.2514*	.2829**	-.0458	-.1050	-.0793	.2418*
EST	-.1811**	.0077	.0562	-.1177	-.0584	-.0909	-.1882*
LOC	.2704***	-.1544*	.0369	.0817	.0536	.0700	.1252
RIG	.0900	-.0001	-.0961	.1496	.0752	.1160	.1811*
HOW	-.2810***	.5530***	-.3087**	-.0901	-.1402	-.1199	-.1610
MATH	1.0000	-.3236***	.0853	.1495	.1666	.1931*	
EXP	-.3236***	1.0000	-.2932**	-.1122	-.1625	-.1429	-.0759
QUEST	.0853	-.2932**	1.0000	-.2128	-.1897	-.2084	.0376
RATER1	.1495	-.1122	-.2128	1.0000	.8606***	.9634***	.3451***
RATER2	.1714	-.1625	-.1897	.8606***	1.0000	.9656***	.3024***
ERRORS	.1666	-.1429	-.2084	.9634***	.9656***	1.0000	.3353***
NON-USAGE	.1931*	-.0759	.0376	.3451***	.3024***	.3353***	1.0000

*$p \geq .05$ **$p \geq .01$ ***$p \geq .001$.

suggest that, for this sample at least, there is a negative relationship between individual self-esteem and computer anxiety. Meaning that low self-esteem subjects tend to be more computer anxious than high self-esteem subjects.

Locus of control and computer anxiety   Locus of control, research question number four, was also found to be significantly related to all four computer anxiety scales (DAMB-A: r = .21; DAMB-B: r = .26; MAU-A: r = .22; MAU-B: r = .25; p≤.01 in all cases). These positive correlations support the contention that a strong belief in external control is associated with high computer anxiety. Thus, in this sample there is a significant positive relationship between an individual's locus of control and that individual's level of computer anxiety.

Personality rigidity and computer anxiety   Research question number five, dealing with personality rigidity, shows significant correlations with all four computer anxiety measures (DAMB-A: r = .21, p≤.01; DAMB-B: r = .28, p≤.01; MAU-A: r = .23, p≤.001; MAU-B: r = .24, p≤.05). A high score on the scale RIG indicates high rigidity, consequently, a significant positive relationship between personality rigidity and computer anxiety was reported for this sample.

Math anxiety and computer anxiety   Research question number six investigates the relationship between math anxiety and computer anxiety. This proposed relationship is supported by significant correlations between math anxiety

and all four computer anxiety measurements (DAMB-A: r = .23, $p \leq .001$; DAMB-B: r = .33, $p \leq .001$; MAU-A: r = .17, $p \leq .01$; MAU-B: r = .28, $p \leq .01$). Thus, a significant relationship between individual math anxiety and computer anxiety is supported for this sample.

<u>Computer knowledge/experience and computer anxiety</u>
The variables computer knowledge and computer experience as expressed in research questions number seven and eight, were both found to be significantly correlated with computer anxiety in this study. Table 4 shows these correlations.

Table 4. Computer Knowledge/Experience Correlations

	DAMB-A	DAMB-B	MAU-A	MAU-B
EXP	-.26***	-.23*	-.25***	-.25**
HOW	-.23***	-.20*	-.21**	-.20*

*$p \leq .05$ **$p \leq .01$ ***$p \leq .001$.

These negative correlations are consistent with the hypothesis that a higher knowledge of computers or a higher level of computer experience should be associated with lower levels of computer anxiety. These results suggest, in answer to research question seven, that there is a significant relationship between an individual's level of computer knowledge/experience and that individual's level of computer anxiety. EXP was also significantly correlated to the number of questions asked during the assigned task (r = -.29, $p \leq .01$), MATH (r = -.32, $p \leq .001$), and HOW (r = .55, $p \leq .001$).

<u>State/trait anxiety and computer anxiety</u>   Research

questions nine and ten address the issue of the correlation

between computer anxiety and state and trait anxiety. As

Table 5 shows, state and trait anxiety were correlated with

all four computer anxiety measures.

Table 5.   State/Trait Anxiety Correlations

	DAMB-A	DAMB-B	MAU-A	MAU-B
STATE	N/A	.54***	N/A	.45***
TRAIT	.28***	.32**	.22**	.22*

*p≤.05   **p≤.01   ***p≤.001.

<u>Continued usage</u>   Research question eleven asks

whether or not computer anxiety can be treated by training.

A surrogate measure of computer anxiety treatment in the

present study is the variable NON-USAGE. This variable

measures subject's intention to use Wordstar again in light

of their training. A high score on this variable indicates a

low likelihood of continued Wordstar usage. As shown in

Table 6, NON-USAGE correlated with Phase Two computer anxiety

(DAMB-B and MAU-B), trait anxiety (TRAIT), state anxiety

(STATE), personality rigidity (RIG), math anxiety (MATH) and

number of errors in the task manuscript (ERRORS). From these

correlations, we see that continued Wordstar usage, for this

sample, is closely related to an individual's anxieties. The

higher these anxieties, the less likely the subject was to

use Wordstar again. Subjects with an external locus of

control belief or rigid personalities were also less likely
to use Wordstar again. Additionally, NON-USAGE correlated
with the number of errors in the manuscript, with those
subjects committing a high number of errors being less likely
to use Wordstar again.

Table 6. NON-USAGE Correlations

DAMB-B	.17**
MAU-B	.15[a]
TRAIT	.22**
STATE	.24*
MATH	.19*
ERRORS	.34***

[a]$p \leq .08$ *$p \leq .05$ **$p \leq .01$ ***$p \leq .001$.

Regression analysis

The third phase of statistical analysis involved derivation
of regression equations using all of the personality
variables and demographics obtained in Phase One of the
study, as well as the state anxiety measure and the treatment
group assignment, from Phase Two, as predictor variables in
predicting Phase Two computer anxiety scores. Table 7 shows
the equations obtained. Next, Phase One computer anxiety was
allowed to enter into the equations as a possible predictor.
The resulting equations are shown in Table 8.

Table 7. Regression Analysis One
(Without Phase One computer anxiety as a predictor variable)

DEPENDENT VARIABLE: Phase Two computer anxiety (DAMB-B)

R^2: .34   adjusted R^2: .32

PREDICTOR VARIABLE(S):

	b	T	Sig T
State Anxiety (STATE)	.50	5.18	p≤.001
Math Anxiety (MATH)	.23	2.34	p≤.05

DEPENDENT VARIABLE: Phase Two computer anxiety (MAU-B)

R^2: .25   adjusted R^2: .23

PREDICTOR VARIABLE(S):

	b	T	Sig T
State Anxiety (STATE)	.42	4.09	p≤.001
Math Anxiety (MATH)	.21	2.11	p≤.05

DEPENDENT VARIABLE: Number of Questions asked during
                   assigned task (QUEST)

R^2: .44   adjusted R^2: .40

PREDICTOR VARIABLE(S):

	b	T	Sig T
Treatment Group (GROUP)	-.43	-4.78	p≤.001
Computer Knowledge (HOW)	-.23	-2.47	p≤.05
State Anxiety (STATE)	.45	4.04	p≤.001
Self-Esteem (EST)	.34	3.00	p≤.01
Gender (SEX)	.26	2.81	p≤.01

DEPENDENT VARIABLE: Continued Wordstar usage (NON-USAGE)

R^2: .08   adjusted R^2: .07

PREDICTOR VARIABLE(S):

	b	T	Sig T
State Anxiety (STATE)	-.29	-2.57	p≤.05

66

Predicting computer anxiety   Of all the measures obtained during the present study, only two were found to be significant predictors of computer anxiety. These were state anxiety and math anxiety. Even though state and math anxiety were strong predictors of computer anxiety, there still is, in the best case, 66 percent of unexplained variance. Thus, while these two constructs are a start, there is room for a good deal more research in predicting computer anxiety.

Predicting number of questions   Computer knowledge, treatment group, gender, and two personality characteristics entered into an equation which predicted almost 50 percent of the variance in the number of questions asked by subjects during completion of the assigned task. Computer knowledge was the strongest predictor, with a t-value of -2.85. This negative relationship between QUEST and HOW is consistent with the idea that the more that an individual knows about the computer to begin with, the fewer questions he/she will ask. Treatment group also had a negative relationship with number of questions asked. This implies that subjects in the lecture/demo group asked more questions than those in the tutorial group. Females in the sample were found to ask more questions than males. This difference was significant (t = -2.82, $p \leq .01$). State anxiety also enters into the equation, with the highly anxious asking more questions. Additionally, individuals with high self-esteem asked more questions than individuals with low self-esteem.

<u>Predicting continued usage</u>   State anxiety was the only variable to predict continued usage. Individuals with a high level of state anxiety were more apt to indicate that they would not use Wordstar again than those individuals with an internal control belief. The low R square value (.08) signifies that, for this sample, none of the predictor variables collected were adequate in predicting continued usage.

For the previous analysis, Phase One computer anxiety scores were intentionally left out of the list of predictor variables. This was done because a priori reasoning was that pre-experiment computer anxiety would be the strongest predictor of post-experiment computer anxiety, number of questions asked, and expression of continued usage. Table 8 shows the equations obtained when Phase One computer anxiety scores were allowed into the equations. This analysis was done in order to address issues of multicollinearity. As expected, Phase One computer anxiety was a significant predictor in all four of the equations.

Table 8. Regression Analysis Two
(With Phase One computer anxiety as a predictor variable)

DEPENDENT VARIABLE: Phase Two computer anxiety (DAMB-B)

R^2: .73   adjusted R^2: .73

PREDICTOR VARIABLE(S):

	b	T	Sig T
Phase One computer anxiety (DAMB-A)	.85	14.23	p≤.001

DEPENDENT VARIABLE: Phase Two computer anxiety (MAU-B)

R^2: .70   adjusted R^2: .69

PREDICTOR VARIABLE(S):

	b	T	Sig T
Phase One computer anxiety (MAU-A)	.80	12.34	p≤.001
Math Anxiety (MATH)	.15	2.24	p≤.05

DEPENDENT VARIABLE: Number of Questions asked during
                    assigned task (QUEST)

R^2: .39   adjusted R^2: .36

PREDICTOR VARIABLES:

	b	T	Sig T
Treatment Group (GROUP)	-.38	-4.11	p≤.001
Computer Knowledge (HOW)	-.29	-3.05	p≤.01
Phase One computer anxiety (MAU-A)	.29	3.13	p≤.01
Gender (SEX)	.23	2.42	p≤.05

DEPENDENT VARIABLE: Continued Wordstar usage (NON-USAGE)

R^2: .23   adjusted R^2: .20

PREDICTOR VARIABLES:

	b	T	Sig T
Phase One computer anxiety (DAMB-A)	-.42	-3.88	p≤.001
Computer experience (EXP)	.29	-2.61	p≤.05
Treatmen Group (GROUP)	.25	-2.45	p≤.05

Predicting computer anxiety   In predicting Phase Two computer anxiety, only the equivalent Phase One scale was used (i.e., DAMB-A was used to predict DAMB-B). As shown in Table 8, Phase One computer anxiety is the strongest predictor of Phase Two computer anxiety (t_{DAMB-A} = 14.23, $p \leq .001$; t_{MAU-A} = 12.34, $p \leq .001$). The entry of Phase One computer anxiety eliminated math anxiety from the DAMB-B equation while it eliminated state anxiety and entered math anxiety into the MAU-B equation. Additionally, R square rose greatly in both equations (from .34 to .73 in DAMB-B and from .25 to .70 in MAU-B).

Predicting number of questions   Both Phase One computer anxiety measures (DAMB-A and MAU-A) were allowed to enter into the equation predicting the number of questions asked. Only MAU-A proved to be significant. Entry of this variable eliminated state anxiety and self-esteem from the equation. Treatment group, computer knowledge, and gender entered into the equation. R square remained fairly consistent (.44 with vs. .39 without).

Predicting continued usage   Both Phase One computer anxiety measures (DAMB-A and MAU-A) were allowed to enter into the equation predicting continued usage. Only DAMB-A proved to be significant. Entry of this variable eliminated state anxiety from the equation, allowed computer experience and treatment group to enter the equation, and raised R square from .08 to .23.

From this analysis, it is clear, for this sample at least, that computer anxiety is an anxiety state, and that it is possible that there is a certain degree of multicollinearity between computer anxiety and state anxiety, math anxiety, self-esteem, and locus of control.

Analysis of variance

In order to answer research questions eleven and twelve, analysis of variance was used.

The ANOVAs performed consisted of a series of 2 X 2 X 2 factorial designs. The independent factors operationalized were type of training (lecture/demo or tutorial), a pre-experiment computer anxiety measure (split at the median), and the variable CHOICE. CHOICE reflects the extent to which subjects' Phase One preference for training group (variable name: DEM3) matched the training group to which they were actually assigned (i.e., lecture/demo or tutorial). Thus, CHOICE is a dichotomous variable; either MATCHED if preference and actual assignment were the same, or UN-MATCHED if they were not. Dependent variables in the analyses of variance were number of errors made in the assigned task (ERRORS), number of questions asked during completion of the assigned task (QUEST), self-reported intent of continued usage of Wordstar (NON-USAGE), and post-experiment computer anxiety measures (DAMB-B and MAU-B).

In the first step of the analysis of variance phase, a multivariate analysis of variance was performed in an effort to ascertain whether or not there was any justification for continuing with univariate analysis. Because two instruments were used in this study to measure computer anxiety, separate ANOVAS were run using DAMB-A and MAU-A as measures of the independent variable computer anxiety/attitudes. Figure 10 shows the manner in which subjects were distributed among the training groups. Tables 9 and 10 present a summary of MANOVA results for DAMB-A and MAU-A, respectively.

DAMBROT ET AL. (1985) CATT
MEDIAN = 2.20

GROUP	LOW CA	HIGH CA	ROW TOTAL
LECTURE/ DEMO	17	18	3 5 44.3%
TUTORIAL	25	19	4 4 55.6%
COLUMN TOTAL	4 2 53.2%	3 7 46.8%	7 9 100.0%

MAURER (1983) CAIN
MEDIAN = 2.54

GROUP	LOW CA	HIGH CA	ROW TOTAL
LECTURE/ DEMO	18	17	3 5 44.3%
TUTORIAL	22	22	4 4 55.6%
COLUMN TOTAL	4 0 50.6%	3 9 49.4%	7 9 100.0%

Figure 10. Phase Two Cross Tabulations

MANOVA   As shown in Tables 9 and 10, MANOVA results demonstrated significant main effects for computer anxiety (DAMB-A, MAU-A) and the type of training group on the dependent variables. When computer anxiety was operationalized using MAU-A, there was a significant interaction effect between computer anxiety and GROUP, as well as a three-way interaction between MAU-A, GROUP, and CHOICE. The exact nature of these effects is evidenced in the ANOVA analysis that follows.

Table 9. Dambrot et al. (1985) CATT MANOVA Summary (n=76)

Sources of Variation	(F-Value)
MAIN EFFECTS	
DAMB-A	11.556***
GROUP	2.948*
CHOICE	0.355
TWO-WAY INTERACTIONS	
DAMB-A X GROUP	1.588
DAMB-A X CHOICE	1.066
GROUP X CHOICE	0.617
THREE-WAY INTERACTIONS	
DAMB-A X GROUP X CHOICE	0.947

*p≤.05   ***p≤.001.

ANOVA   Both pre-experiment computer anxiety measures demonstrated main effects for number of questions asked and the two post-experiment computer anxiety measures. Subjects

with a higher level of computer anxiety asked more questions than those with a low level of computer anxiety ($M_{HIGH\ DAMB-A}$ = 7.41 vs. $M_{LOW\ DAMB-A}$ = 4.54, $p \leq .01$; $M_{HIGH\ MAU-A}$ = 7.38 vs. $M_{LOW\ MAU-A}$ = 4.32, $p \leq .001$). In addition, subjects with high pre-experiment levels of computer anxiety tended to have higher levels of post-experiment computer anxiety than did subjects with low levels of pre-experiment computer anxiety ($M_{HIGH\ DAMB-A}$ = 2.62 vs. $M_{LOW\ DAMB-A}$ = 1.88, $p \leq .001$; $M_{HIGH\ MAU-A}$ = 2.93 vs. $M_{LOW\ MAU-A}$ = 2.05, $p \leq .001$).

Table 10. Maurer (1983) CATT MANOVA Summary (n=76)

Sources of Variation	(F-Value)
MAIN EFFECTS	
MAU-A	9.533***
GROUP	2.311[a]
CHOICE	1.131
TWO-WAY INTERACTIONS	
MAU-A X GROUP	2.126[b]
MAU-A X CHOICE	1.377
GROUP X CHOICE	0.414
THREE-WAY INTERACTIONS	
MAU-A X GROUP X CHOICE	2.292[c]

[a]$p \leq .06$ [b]$p \leq .08$ [c]$p = .056$ ***$p \leq .001$.

Training group demonstrated a main effect for number of errors in the assigned task and number of questions asked

while completing the task. Subjects in the tutorial training group had more errors than subjects in the lecture/demo group ($M_{LECTURE/DEMO} = 2.29$ vs. $M_{TUTORIAL} = 3.65$, $p \leq .05$). Subjects exposed to the lecture/demo method of learning Wordstar asked more questions during completion of the task than those who learned the use of the program by tutorial ($M_{LECTURE/DEMO} = 7.65$ vs. $M_{TUTORIAL} = 4.69$, $p \leq .05$).

The two-way interaction of pre-experiment computer anxiety and CHOICE was significant for the number of errors in subject's manuscripts. This interaction ($F_{DAMB-A} = 4.13$; $F_{MAU-A} = 4.90$, $p \leq .05$), shows that highly anxious individuals had fewer errors when they matched their request with their actual treatment group (see Figure 11).
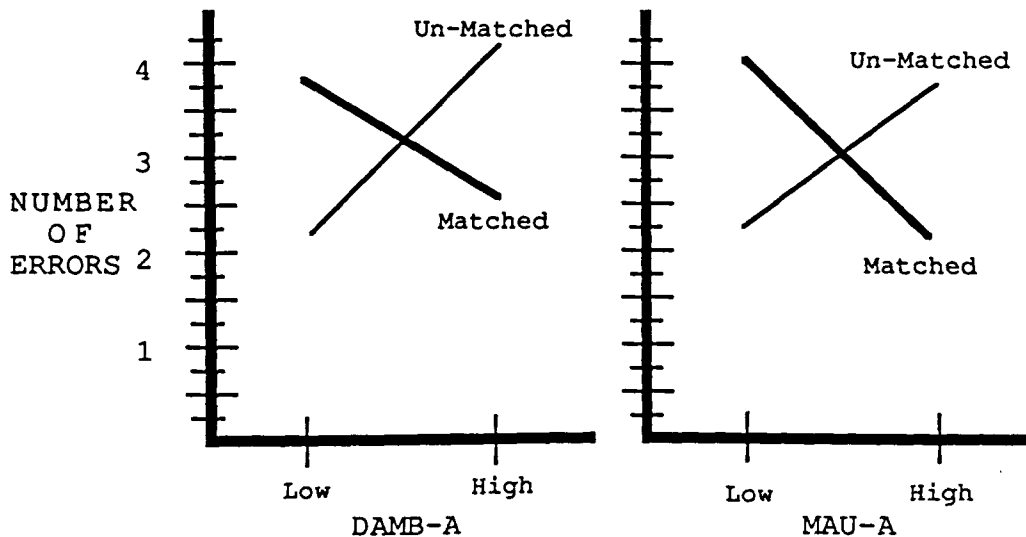
Figure 11. Two-Way Interactions on ERRORS

Finally, when computer anxiety is operationalized using MAU-A, there is a significant three-way interaction between MAU-A, GROUP, and CHOICE for NON-USAGE and MAU-B ($F_{NON-USAGE}$ = 4.51; F_{MAU-B} = 5.22, $p \leq .05$). These interactions are shown in Figures 12 and 13. Complete ANOVA summaries can be found in Tables 11 and 12.

Table 11. Dambrot et al. (1985) CATT ANOVA Summary
($n=76$)

Sources of Variation	ERRORS (F-value)	QUESTIONS (F-value)	NON-USAGE (F-value)	DAMB-B (F-value)	MAU-B (F-value)
MAIN EFFECTS	1.535	7.045***	1.987	18.382***	17.743***
DAMB-A	1.074	8.454**	5.732*	52.213***	51.296***
GROUP	3.976*	9.319**	0.581	1.351	3.094
CHOICE	0.001	0.040	0.295	0.364	0.003
TWO-WAY INTERACTIONS	1.508	1.027	0.584	1.185	0.263
DAMB-A X GROUP	0.105	1.924	0.039	3.029	0.313
DAMB-A X CHOICE	4.131*	0.727	0.935	0.297	0.444
GROUP X CHOICE	0.607	0.792	0.499	0.519	0.011
THREE-WAY INTERACTIONS					
DAMB-A X GROUP X CHOICE	0.192	1.967	2.082	0.381	1.357

*$p \leq .05$ **$p \leq .01$ ***$p \leq .001$.

While the main effect for MAU-A on MAU-B shown in Table 10 suggests that MAU-A can be used as a predictor for MAU-B, the three-way interaction effect (MAU-A X GROUP X CHOICE) presents a modified picture. This interaction (F = 5.22, $p \leq .05$) is depicted in Figure 12. Generally, subjects initially reporting low computer anxiety levels (MAU-A) tended to report significantly lower post-experiment computer anxiety (MAU-B) levels than did subjects initially classified

as highly computer anxious. However, subjects who asked for and received lecture/demo format for training reported no statistically significant difference in their post computer anxiety scores (MAU-B) (t = .97, $p \leq .361$). This result would suggest that pre-experiment (MAU-A) computer anxiety can be used as a predictor for post experiment computer anxiety (MAU-B) except for those subjects who requested and received the lecture/demo method of instruction.

Table 12. Maurer (1983) CAIN ANOVA Summary
(n=76)

Sources of Variation	ERRORS (F-value)	QUESTIONS (F-value)	NON-USAGE (F-value)	DAMB-B (F-value)	MAU-B (F-value)
MAIN EFFECTS	1.205	8.312***	1.853	12.604***	14.611***
MAU-A	0.054	11.351***	5.321*	35.174***	41.935***
GROUP	3.614[a]	9.820**	0.499	0.916	2.668
CHOICE	0.019	0.604	0.013	3.290[b]	1.823
TWO-WAY INTERACTIONS	1.751	1.695	1.003	2.101	1.378
MAU-A X GROUP	0.228	3.118	0.404	4.541*	1.605
MAU-A X CHOICE	4.895*	0.820	1.206	1.409	1.753
GROUP X CHOICE	0.577	1.174	1.004	0.013	0.355
THREE-WAY INTERACTIONS					
MAU-A X GROUP X CHOICE	1.071	2.861	4.509*	2.107	5.223*

[a]$p \leq .07$ [b]$p \leq .075$ *$p \leq .05$ **$p \leq .01$ ***$p \leq .001$.

This conclusion is supported by the other significant three-way interaction; that of MAU-A X GROUP X CHOICE on NON-USAGE. The main effect of MAU-A on NON-USAGE (F = 5.32, $p \leq .05$) suggests that those individuals with high pre-experiment levels of computer anxiety are less likely to

continue using the software after training than those with low pre-experiment levels ($M_{LOW\ MAU-A}$ = 1.53 vs $M_{HIGH\ MAU-A}$ = 1.93). This is the case except, once again, for those individuals who received their treatment group request for lecture/demo based training. In the case of these subjects, the subjects with high levels of MAU-A were more likely to say that they would again use Wordstar than those with low levels of MAU-A ($M_{LOW\ MAU-A}$ = 1.83 vs $M_{HIGH\ MAU-A}$ = 1.50) note these differences were not significantly different (t = .97, p=.361). This could possibly be due to the limited sample size of this subgroup (n = 18) (see Figure 13).
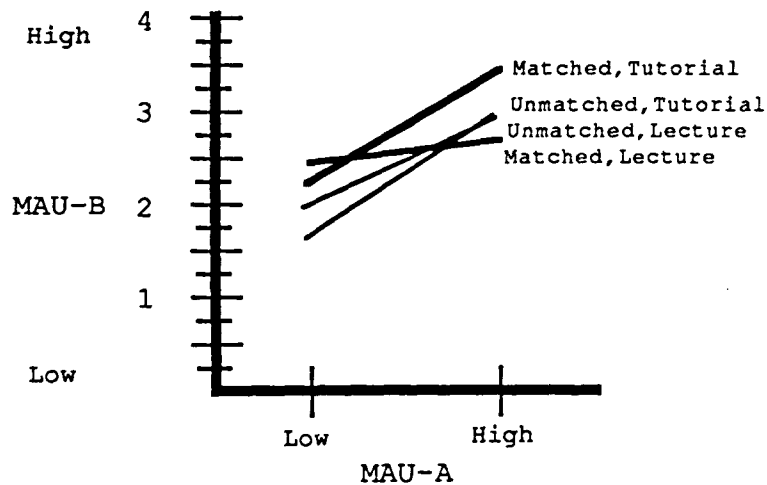
Figure 12. Three-Way Interactions on MAU-B

Because there were main effects between Phase One and Phase Two computer anxiety scores in all cases, there is sufficient reason to assume that there is a significant

relationship between an individual's Phase One and Phase Two
levels of computer anxiety.

With respect to performance, the main effects reported
in both the MANOVA and ANOVA steps present enough evidence
there is a significant relationship between training method
and the number of question a person will have while
performing a computer related task. However, insufficient
evidence exists to conclude that one training method is
better than another in reducing errors.
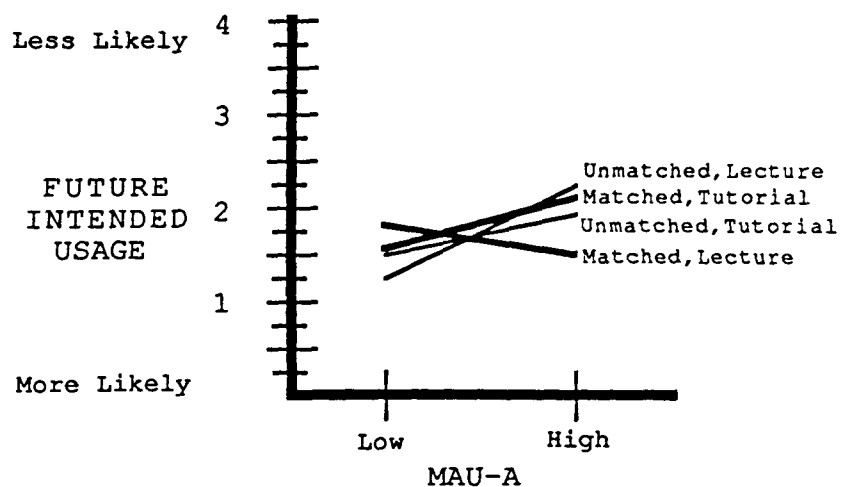
Figure 13. Three-Way Interactions on NON-USAGE

DISCUSSION

High technology and computers are here to stay. The organization that does not automate runs the risk of losing its competitive edge in the marketplace. The phenomenon of computer anxiety presents an obstacle to organizational automation. This obstacle must be overcome in order for computers to completely fulfill their promise. (Selden and Schultz (1982) predict that by the turn of the century, fifty percent of all industrial training will be computer based. This, combined with the fact that computers can be completely effective only when they are integrated into systems in which humans play an instrumental role, argues for increased research into computer anxiety. The purpose of the present study was to take a step towards the understanding and alleviation of computer anxiety. The results from this study point to some possible answers as to what computer anxiety is, and how it can be treated.

Study Findings and Implications

Interestingly, computer anxiety was not found to be related to gender. While this finding is consistent with Rohner (1981), studies by Raub (1981) and Prell (1984) found females to be significantly more computer anxious than males. The fact that this was not the case in the present study can

be partially explained by the fact that the present study
uses different instruments to measure computer
anxiety/attitudes than did the Raub or Prell studies. Both
Raub and Prell used a scale developed by Raub as a measure of
computer anxiety. The present study used two separate
computer anxiety/attitudes measures; the Dambrot et al.
(1985) and the Maurer (1983) scales. Problematic is the fact
that the Dambrot et al. study found gender effects. While
the present study did find a gender effect in the DAMB-A
variable (Phase One computer anxiety using the Dambrot et al.
measure), the weight of the evidence in this present sample
suggests no gender effects for computer anxiety exist. If
the findings of the present study can be replicated, it might
be discovered that computer anxiety is not gender related,
contrary to what previous research has suggested.

Another possible explanation for the conflicting gender
effects findings is that the Raub (1981) scale may be
measuring a slightly different construct than the Dambrot et
al. (1985) and Maurer (1983) scales. This statement is made
in light of the correlation between math anxiety (as measured
by the Fennema and Sherman Math Anxiety Scale) and computer
anxiety in the Raub and Prell (1984) studies and the present
study. In the Raub study, math anxiety was found to be
correlated with computer anxiety at $r = .29$ ($p \leq .001$). In the
Prell study, the math anxiety, computer anxiety correlation
was $r = .30$ ($p \leq .01$). For the present study the math anxiety,

pre-experiment computer anxiety correlations were as follows: DAMB-A, r = .23 ($p \leq .001$); MAU-A, r = .17 ($p \leq .01$). Thus, the Raub scale seems to be measuring something closer to math anxiety than either the Dambrot et al. or the Maurer scales. The gender effects in math anxiety have been shown in the present study as well as in the Raub and Prell studies.

Results from the present study show computer anxiety to be associated with several personality factors, including self-esteem, locus of control, personality rigidity, and trait anxiety. These findings are consistent with results obtained by Prell (1984), who used locus of control, personality rigidity and math anxiety as personality factors in his study.

The analysis of variance findings show that the type of training had a significant effect on the number of errors committed during the assigned task. Those highly anxious individuals who received the type of training they asked for committed fewer errors than the highly anxious subjects who did not have their treatment group request honored. Training method also affected the number of questions asked during completion of the assigned task, with those individuals in the lecture/demo group asking more questions than those trained by the tutorial. These results suggest that the type of training may have to be different for computer anxious people, e.g., trainees should be allowed to choose the method

of training when at all feasible, and a sufficient amount of time must be allowed for questions during the training.

Bloom's (1985) anxiety management approach to computer based training, which involves a framework of education, skill building, and practice, was not used in the present study. This is due, in part, to the time constraint. However, the major reason it was not used is because of a lack of expertise in this area of training.

Regression analysis showed computer anxiety to be related to state anxiety and math anxiety, with these two predictors explaining as much as 36% of the variance in computer anxiety (using the Dambrot et al., 1985, CATT). Multicollinearity among these two predictors and self-esteem, locus of control, and personality rigidity may explain why these latter variables did not enter into the regression equation, even though they each were significantly correlated with computer anxiety.

These correlation and regression findings would seem to indicate that computer anxiety is related to certain personality traits. While it is true that computer anxiety was found to be related to computer knowledge and computer experience – two factors that are more a function of prior experience as opposed to a personality factor – these correlations on the whole were lower than those of the personality factors (see Table 3, p. 60).

The results of this study suggest that computer anxiety is more likely a function of the immediate situation faced by an individual than a function of the environment in general. Stated differently, computer anxiety as a form of anxiety is probably more of a manifestation of state anxiety as opposed to trait anxiety. This statement is made in light of the regression analysis in which state anxiety is the strongest predictor of computer anxiety (see Table 7, p. 65). This supposition is in keeping with Spielberger's (1966) statement that state anxiety is aimed toward a specific portion of the environment, as opposed to the environment as a whole. This finding is important because, as noted by (Howard, 1983), trait anxiety does not change significantly over time. If computer anxiety is in fact an anxiety state, there is a chance that it can be treated. Although the present study was unable to establish any results pointing to the idea that computer anxiety per se can be treated, the results of this study imply that its effects may, in fact, be minimized through proper training.

Limitations of the Study

The test, treatment, re-test design of this study facilitated the investigation of the effects of exposure to computers on levels of computer anxiety. However, the study design did not allow for the discovery of what type of state anxiety computer anxiety actually is (state anxiety types

will be discussed in the section on future research). In addition, the fact that during the training phase of the study the lecture/demo was simply a verbalization of the tutorial program may not be externally valid. While the decision to do this was made in order to prevent study contamination, it is assumed that a computer tutorial written for an organization would be specifically tailored to the computer system involved.

Along these same lines, the time constraints imposed by the university environment forced the training phase of the present study to be relatively short. Presumably, individuals in organizations would be trained for more than one hour before they are expected to be productive with the computer. If a more in depth study - in terms of time - could have been performed, perhaps post-experiment computer anxiety scores would have been significantly lower than pre-experiment levels.

In deciding what software package to use for the training phase of this study, the main effort was placed on finding a package that could be easily learned in a limited amount of time and could be taught using either lecture/demo or tutorial. When these criteria were combined with the limited software available at Iowa State University, Wordstar was found to be the only suitable program. However, the study did not test for subject interest in Wordstar. Presumably, the greater the subject's interest in a

particular application, the better he or she will perform. An interest variable may also have allowed for better understanding and interpretation of the results surrounding the usage avoidance variable (NON-USAGE).

This study attempts to relate math anxiety with computer anxiety. It is possible that math aptitude would have been a better measure to use. Math GPA, a surrogate measure of math aptitude, was collected during Phase One. This variable was not used in the study because a substantial proportion of the sample did not report it.

The subjects of this study came from a fairly homogeneous group. This fact unfortunately brings the external validity of the entire study into question. However, two factors come to the study's defense. First, this study is experimental research, which is known for its low external validity. Second, all of the personality scales used in the study are widely known and have been used successfully with diverse groups of subjects. This means it may be possible for the scores on these scales obtained in the present study to be extrapolated to the general population.

The present study was originally designed to have a control group. This control group was supposed to allow for the discounting of any effects internal or external to the study. Unfortunately, not enough subjects signed up for the project to obtain a significant control group (n = 16).

The determination of which subjects were assigned to which group could have been made differently. For this study, the sample was divided at the median of the Phase One score on the Dambrot et al. (1985) scale. The sample could have been divided at the quartiles. In this case, the highly anxious would have been compared to the non-anxious during Phase Two, possibly creating a greater polarization of study results.

Phase Two itself contained several limitations. First, while the number of questions asked was recorded, the type of question asked was not. While no data were collected, it was noticed by the proctor that the questions asked by subjects exposed to the tutorial were more machine-oriented questions than the questions asked by subjects exposed to the lecture/demo. It would have been interesting to obtain definitive data on this because if a question, or question type, can be anticipated, it may be possible to tailor the training program to address it.

The second limitation in Phase Two was in the task itself. As detailed in Appendix C, the task involved transcription of the first part of chapter one of the book Where Eagles Dare by Alistair MacLean. Perhaps the task should have been more class work oriented. This would be the case if the training had taken place in a real organization. This objective could have been met by using subjects who needed to create a project for a class and giving them the

opportunity to learn how to use Wordstar in order to accomplish it.

The third limitation in Phase Two was in the way in which the errors in the task manuscript were counted. While it is true that two independent raters counted the errors for each subject, the method of determining what constituted an error was rather arbitrary. For example, when a cursory examination of the manuscripts determined that there were several spelling errors, it was decided by the raters not to count spelling errors in the manuscript error totals. The only actual errors that were counted were those which were discussed in the task instructions.

A major limitation of this study was brought about by its inability to address the question of which comes first, a poor attitude toward computers or computer anxiety. This question may have been addressed by using a scale such as the Howard (1983) Attitude Toward Microcomputers Instrument. This instrument was designed to measure actual attitudes toward computers as opposed to the computer anxiety construct measured by the Dambrot et al. (1985) and Maurer (1983) scales. The Howard scale was not used in the study in order to keep the test instrument at a reasonable length.

Future Research

One issue this study was not able to address is what type of an anxiety state computer anxiety actually is. Using

the duration and intensity of anxiety as dimensions, four "regions" of state anxiety can be created. These are depicted in Figure 14.

Region 1, Temporary-Normal state anxiety, can be observed in any situation of short duration in which most individuals would be expected to feel anxious. An example of this would be a job interview.

INTENSITY

	Normal	Neurotic
Temporary	Region 1	Region 2
Permanent	Region 3	Region 4

DURATION

Figure 14. Forms of State Anxiety

Test anxiety is a good example of Region 2, Temporary-Neurotic state anxiety. For many individuals, testing situations are intolerable, even if they are quite familiar and comfortable with the material over which they are to be tested. After the test is over, the individual is no longer anxious.

An example of Region 3, Permanent-Normal state anxiety, would be an avoidance of animals, in which an individual would try to avoid a situation (a confrontation with the

neighbor's dog or cat, for example) if it is reasonably
feasible. If it is not feasible, however, the individual
will still be able to endure the situation for as long as is
necessary.

Phobias fall into Region 4, Permanent-Neurotic state
anxiety. The individual will avoid the situation if
possible, and if it is not possible, the individual may
suffer an adverse reaction. For example, when a person who
suffers from claustrophobia finds himself in a small
windowless room, he will do almost anything to get out.
Serious sufferers may well have such an adverse reaction to
the situation that they faint. The term "Permanent" may in
fact be a misnomer, as it is possible for sufferers of Region
4 state anxiety to receive treatment. However, for the
present study, Permanent is used to convey the idea that this
particular form of state anxiety is not a short-term
affliction.

Oetting (1983) introduces the idea of concept-specific
anxiety. He defines it as "the anxiety associated with a
specified, clearly defined, and limited situation" (p. 2).
He goes on to say that computer anxiety is a manifestation of
this concept-specific anxiety. Within the framework
presented in Figure 14, concept-specific anxiety would most
likely fall into either Region 1 (Temporary-Normal) or Region
2 (Temporary-Neurotic) state anxiety.

Each of these state anxiety regions, with the possible exception of Region 1, are likely to have considerable effect on an individual. The possible implications to organizations of computer anxiety as an anxiety state are as follows: If computer anxiety falls into Regions 1 or 3, simple exposure to computers should be sufficient to make the individual a productive force in the organization. If computer anxiety falls into Region 2, a specific training program must be instituted in order to impress upon individuals the fact that computers are really nothing to fear.

If, however, computer anxiety falls into Region 4, Permanent-Neurotic state anxiety, then the only feasible solution to the problem of computer anxiety is an updating of selection and placement methods used by organizations. Personality testing using scales such as those used in this study should be employed in order to direct those individuals who display a tendency toward computer anxiety away from those jobs which require direct use of the computer.

It is quite possible that computer anxiety produces a different anxiety state in different individuals. Also, the prescriptions noted above should by no means be taken as the final word on how to deal with computer anxiety. They should merely be used as a framework for continued computer anxiety research.

Both of the computer anxiety instruments used in this study proved to be highly reliable. The most significant

results were found using the Maurer (1983) Computer Anxiety Index. In addition this instrument was used as a basis for the Dambrot et al. (1985) Computer Attitudes Scale. These two factors lead to the recommendation of the Maurer instrument as the instrument to use in future computer anxiety research. It must be noted that there are several other scales - for example the Raub (1981) scale - which have been successfully used in computer anxiety research. Clearly, there is a need for a definitive computer anxiety measurement instrument.

This study reaffirms past research which suggests computer anxiety is a real phenomenon. Results from past research conflict as to how to deal with computer anxiety. The present study suggests several possible directions for future research. These include the discovery of exactly what type of anxiety state computer anxiety really is, the development of a highly reliable and externally valid battery of tests to identify sufferers of computer anxiety, and the development of appropriate training methods designed to alleviate computer anxiety.

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APPENDIX A.

SUMMARY OF SCALES
USED IN INSTRUMENT BATTERIES

Summary of Instruments Used in Test Batteries

QUESTIONNAIRE	DESIGNED TO MEASURE	# OF ITEMS	RELIABILITY	VALIDITY	TYPE
(CATT) Dambrot (1985)	Attitudes toward computers	20	.79	***	5-point Likert
Rigidity Scale Rehfisch (1958)	Personality rigidity	27_1 (39)	.72	***	True/ False
Self-Esteem Inventory Coopersmith (1967)	Attitudes toward the self	25	.90	.60	True/ False
Powerlessness Neal & Seeman (1964)	Expectancies for control of events	7	.70	***	True/ False
Computer Knowledge Howard (1983)	Knowledge of computers	10	***	_2	Multi-Choice
(CAIN) Maurer (1983)	Computer anxiety	26	.94/.90[3]	***	6-point Likert
Math Anxiety Index Fennema & Sherman (1976)	Math anxiety	12	.92	***	5-point Likert
Computer Experience Raub (1981)	Computer experience	1	***	***	Multi-Choice
Scale to Measure Internal vs External Control Rotter (1966)	Perceived Internal vs External Control of Reinforcement	29	.55 to .72	-.07 to -.35	2-Item Forced Choice
Spielberger, et al. State-Trait Anxiety Inventory (1983)	Levels of State and Trait Anxiety	40	.90	.52 to .80	4-Point Likert

[1]Original scale consisted of 39 items divided into 8 subscales. This study uses four of the subscales, consisting of 24 items.

[2]Construct validity determined appropriate by Howard (1983).

[3].94 internal consistency reliability, .90 test/retest reliability.

APPENDIX B.

DIRECTIONAL WEIGHTINGS FOR INSTRUMENT BATTERIES

INDIVIDUAL INSTRUMENTS USED IN PHASE ONE
SECTION ONE (90 ITEMS)

PART A.   Personal Demographics (3)

PART B.   Self-Esteem Inventory (27) (Coopersmith, 1967.
(*) indicates high self-esteem)

PART C.   Powerlessness (7) (Neal and Seeman, 1964.
Answers of "True" indicates powerlessness)

PART D.   Internal-External Control (29) (Rotter, 1966.
Underlined answer indicates External Control
others are "fillers")

PART E.   Rigidity (24) (Rehfisch, 1958. True/False (*)
indicates rigid response)

SECTION TWO (91 ITEMS)

PART F.   Computer Experience (1) (Raub, 1981. Multi-
choice)

PART G   Word Processing Knowledge (2)   (Multi choice)

PART H.   Computer Attitudes (20) (Dambrot et al., 1985.
Five-point Likert-type scale)

PART I.   Computer Anxiety (26) (Maurer, 1983. Five-point
Likert-type scale)

PART J.   Computer Knowledge (10) (Howard, 1983. Multi-
choice)

PART K.   Math Anxiety (12) (Fennema and Sherman, 1976.
Five point Likert-type scale)

PART L.   Trait Anxiety (20) (Spielberger et al., 1983
Four point Likert-type scale.)

INDIVIDUAL INSTRUMENTS USED IN PHASE TWO
(67 ITEMS)

PART A.   State Anxiety (20) (Spielberger et al., 1983
Four point Likert-type scale.)

PART B.   Computer Attitudes (20) (Dambrot et al., 1985.
Five-point Likert-type scale)

PART C.   Computer Anxiety (26) (Maurer, 1983. Six-point
Likert-type scale)

PART D.   Continued Wordstar Usage (1)   (Multi-Choice)

Pre-test Phase Instrument Battery

SECTION ONE

PART A.   (VARIABLE NAME: DEM)
In this section, we are asking for some information about you. These questions are background information; they will not be used to identify anyone. They are included to help us determine what effect your experiences may have on your answers to other items in this questionnaire.

1. Approximately what is your overall GPA?
   (VARIABLE NAME: DEM1)

   A. 0.0-1.5   D. 2.6-3.0
   B. 1.6-2.0   E. 3.1-3.5
   C. 2.1-2.5   F. 3.6-4.0

2. Approximately what is your GPA in the math courses you have taken?   (VARIABLE NAME: DEM2)

   A. 0.0-1.5   D. 2.6-3.0
   B. 1.6-2.0   E. 3.1-3.5
   C. 2.1-2.5   F. 3.6-4.0

3. If given a choice, in which of the following ways would you rather learn new material?   (VARIABLE NAME: DEM3)

   A. In a traditional classroom setting
   B. On my own using a self-paced tutorial

PART B.   (VARIABLE NAME: EST)
For the following 27 questions, please fill in circle A if the statement is true in your case, or circle B if the statement is false in your case.

(B) 4. I often wish I were someone else.

(B) 5. I find it very hard to talk in front of a group.

(B) 6. There are lots of things about myself I'd like to change if I could.

(A) 7. I can make up my mind without too much trouble.

(A) 8. I'm a lot of fun to be with.

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(B) 9. I get upset easily at home.

(B) 10. It takes me a long time to get used to anything new.

(A) 11. I'm popular with people my own age.

(B) 12. My family expects too much of me.

(A) 13. My family usually considers my feelings.

(B) 14. I give in very easily.

(B) 15. It's pretty tough to be me.

(B) 16. Things are all mixed up in my life.

(A) 17. Other people usually follow my ideas.

(B) 18. I have a low opinion of myself.

(B) 19. There are many times when I'd like to leave home.

(B) 20. I often feel upset about the work that I do.

(B) 21. I'm not as nice looking as most people.

(A) 22. If I have something to say, I usually say it.

(A) 23. My family understands me.

(B) 24. Most people are better liked than I am.

(B) 25. I usually feel as if my family is pushing me.

(B) 26. I often get discouraged at what I am doing.

(A) 27. Things usually don't bother me.

(A) 28. I'm proud of my school work.

(A) 29. I'm pretty happy.

(B) 30. No one pays much attention to me at home.

PART C.   (VARIABLE NAME: POW)
For the following 7 questions, please fill in circle A if you
feel the statement is true, or circle B if you feel the
statement is false.

31. Those running our government must hush up many things
    that go on behind the scenes, if they wish to stay in
    office.

32. Having "pull" is more important than ability in getting
    a government job.

33. In order to get elected to public office, a candidate
    must make promises he does not intend to keep.

34. Those elected to public office have to serve special
    interests (e.g., big business or labor) as well as the
    public's interest.

35. In getting a job promotion, some degree of "apple
    polishing" is required.

36. In getting a good paying job, it is necessary to
    exaggerate one's abilities (or personal merits).

37. In order to have a good income, a salesperson must use
    "high pressure salesmanship."

PART D.   (VARIABLE NAME: LOC)
For the following 29 questions, please fill in the letter of
the statement which most closely corresponds to your feelings
on the subject discussed.

38. A. Children get into trouble because their parents
       punish them too much.
    B. The trouble with most children nowadays is that
       their parents are too easy with them.

39. A. Many of the unhappy things in people's lives are
       partly due to bad luck.
    B. People's misfortunes result from the mistakes they
       make.

40. A. One of the major reasons why we have wars is because
       people don't take enough interest in politics.
    B. There will always be wars, no matter how hard people
       try to prevent them.

41. A. In the long run people get the respect they deserve in this world.
    B. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

42. A. The idea that teachers are unfair to students is nonsense.
    B. Most students don't realize the extent to which their grades are influenced by accidental happenings.

43. A. Without the right breaks one cannot be an effective leader.
    B. Capable people who fail to become leaders have not taken advantage of their opportunities.

44. A. No matter how hard you try some people just don't like you.
    B. People who can't get others to like them don't understand how to get along with others.

45. A. Heredity plays the major role in determining one's personality.
    B. It is one's experiences in life which determine what they're like.

46. A. I have often found that what is going to happen will happen.
    B. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

47. A In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
    B. Many times exam questions tend to be so unrelated to course work that studying is really useless.

48. A. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    B. Getting a good job depends mainly on being in the right place at the right time.

49. A. The average citizen can have an influence in government decisions.
    B. This world is run by the few people in power, and there is not much the little guy can do about it.

50. A. When I make plans, I am almost certain that I can make them work.
    B. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
51. A. There are certain people who are just no good.
    B. There is some good in everybody.

52. A. In my case getting what I want has little or nothing to do with luck.
    B. Many times we might just as well decide what to do by by flipping a coin.

53. A. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
    B. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

54. A. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
    B. By taking an active part in political and social affairs the people can control world events.

55. A. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    B. There really is no such thing as "luck."

56. A. One should always be willing to admit mistakes.
    B. It is usually best to cover up one's mistakes.

57. A. It is hard to know whether or not a person really likes you.
    B. How many friends you have depends on how nice a person you are.

58. A. In the long run, the bad things that happen to us are balanced by the good ones.
    B. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

59. A. With enough effort we can wipe out political corruption.
    B. It it is difficult for people to have much control over the things politicians do in office.

60. A. Sometimes I can't understand how teachers arrive at the grades they give.
    B. There is a direct connection between how hard I study and the grades I get.

61. A. A good leader expects people to decide for
       themselves what they should do.
    B. A good leader makes it clear to everybody what their
       jobs are.

62. A. Many times I feel that I have little influence over
       the things that happen to me.
    B. It is impossible for me to believe that chance or
       luck plays an important role in my life.

63. A. People are lonely because they don't try to be
       friendly.
    B. There's not much use in trying too hard to please
       people, if they like you, they like you.

64. A. There is too much emphasis on athletics in high
       school.
    B. Team sports are an excellent way to build character.

65. A. What happens to me is my own doing.
    B. Sometimes I feel that I don't have enough control
       over the direction my life is taking.

66. A. Most of the time I can't understand why politicians
       behave the way they do.
    B. In the long run the people are responsible for bad
       government on a national as well as on al local
       level.

PART E. (VARIABLE NAME: RIG)
For the following 24 questions, please fill in circle A if
the statement is true in your case, or circle B if the
statement is false in your case.

(A) 67. I usually don't like to talk much unless I am with
         people I know very well.

(B) 68. I like to talk before groups of people.

(A) 69. It is hard for me to start a conversation with
         strangers.

(B) 70. I would like to be an actor on the stage or in the
         movies.

(A) 71. It is hard for me to act natural when I am with new
         people.

(A) 72. I feel nervous if I have to meet a lot of people.

(A) 73. I usually feel nervous and ill at ease at a formal dance or party.

(B) 74. When I work on a committee I like to take charge of things.

(B) 75. I usually take an active part in the entertainment at parties.

(B) 76. I am a better talker than listener.

(B) 77. I try to remember good stories to pass them on to other people.

(A) 78. I am embarrassed with people I do not know well.

(A) 79. A strong person doesn't show their emotions and feelings.

(A) 80. I must admit that it makes me angry when other people interfere with my daily activity.

(A) 81. I find that a well-ordered mode of life with regular hours is congenial to my temperment.

(A) 82. It bothers me when something unexpected interrupts my daily routine.

(A) 83. I don't like to undertake any project unless I have a pretty good idea as to how it will turn out.

(A) 84. I find it hard to set aside a task that I have undertaken, even for a short time.

(A) 85. I don't like things to be uncertain and unpredictable.

(A) 86. I am very slow in making up my mind.

(B) 87. At times I feel that I can make up my mind with unusually great ideas.

(A) 88. I get very tense and anxious when I think other people are disapproving of me.

(A) 89. I am certainly lacking in self-confidence.

(A) 90. Criticism or scolding makes me very uncomfortable.

SECTION TWO

In this section, we wish to find out some information from you relating to computers.

PART F. (VARIABLE NAME: EXP)

91. Which one of the following statements most closely applies to you?

    A. I have no experience using a computer.

    B. I have used a computer printout produced by someone else.

    C. I have personally worked with a computer (played computer games, input information for processing, etc.)

    D. I have personally written a computer program.

    E. I am proficient in one or more computer languages.

    F. I earn (or supplement) my living with my knowledge of computer software or hardware.

PART G. (VARIABLE NAME: KNOW)

92. Which of the following statements would best describe your familiarity with word processing on a computer?

    A. I have never used a computer for word processing.

    B. I have used a word processor before, but do not have a working knowledge of one.

    C. I have used one or more word processors and am comfortable with them.

    D. I am conversant with one or more word processing programs.

    E. I use a word processor for most of my typing needs.

93. Which of the following statements would best describe your familiarity with the word processing program Wordstar?

   A. I have never used Wordstar.

   B. I have used Wordstar but do not have a working knowledge of it.

   C. I have used Wordstar and have some idea of how it works.

   D. I use Wordstar occasionally and am quite familiar with it.

   E. I currently use Wordstar for most of my typing needs.

PART H. (VARIABLE NAME: DAMBA)

For the following 20 statements, please use the following scale to express your feelings toward the topic discussed:

A	B	C	D	E
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

(+) 94. I think computers are fascinating.

(+) 95. If I used a computer, I could save time and work.

(-) 96. I feel very negative about computers in general.

(-) 97. Only computer specialists can use computers.

(-) 98. Computers control too much of our world today

(-) 99. Computers are having a bad effect on my work and my life.

(+) 100. A computer could make learning more fun for me.

(-) 101. Computers intimidate and threaten me.

(-) 102. Even though computers are valuable and necessary, I still have a fear of them.

(-) 103. All computer people talk in a strange and technical language.

(+) 104. Given a little time and training anybody could learn to use computers.

(-) 105. Government regulations should be established to control computers.

(-) 106. Computers make mistakes.

(+) 107. Using a computer could be enjoyable.

(+) 108. I look forward to computers taking over certain routine tasks of my home and job.

(+) 109. If I had the money I'd buy a home computer.

(+) 110. I would rather have a computer present my instruction than a teacher.

(-) 111. Computers are so complicated I would rather do my work manually.

(-) 112. Computers are being forced on us; we are having our decision process replaced by them, making us lose control of our lives.

(+) 113. Computers are superior to humans in processing information.

PART I. (VARIABLE NAME: MAUA)
For the following 26 statements, please use the following scale to express your feelings toward the topic discussed:

A	B	C	D	E	F
Strongly Agree	Agree	Mildly Agree	Mildly Disagree	Disagree	Strongly Disagree

(+) 114. Having a computer available to me would improve my productivity.

(+) 115. If I had to use a computer for some reason, it would probably save me some time and work.

(+) 116. If I had to use a computer, I would get a better picture of the facts and figures.

(+) 117. Having a computer available to me would improve my general satisfaction.

(-) 118. Having to use a computer would make my life less enjoyable.

(+) 119. Having a computer available to me could make things easier for me.

(-) 120. I feel very negative about computers in general.

(+) 121. Having a computer available to me could make things more fun for me.

(-) 122. If I had a computer at my disposal, I would try to get rid of it.

(+) 123. I look forward to a time when computer are more widely used.

(-) 124. I doubt if I would ever use computers very much.

(-) 125. I avoid using computers whenever I can.

(+) 126. I enjoy using computers.

(-) 127. I feel that there are too many computers around now.

(+) 128. Computers are probably going to be an important part of my life.

(+) 129. A computer could make learning fun.

(+) 130. If I were to use a computer, I could get a lot of satisfaction from it.

(-) 131. If I had to use a computer, it would probably be more trouble than it was worth.

(-) 132. I am usually uncomfortable when I have to use computers.

(-) 133. I sometimes get nervous just thinking about computers.

(-) 134. I will probably never learn to use a computer.

(-) 135. Computers are too complicated to be of much use to me.

(-) 136. If I had to use a computer all the time, I would probably be very unhappy.

(-) 137. I sometimes feel intimidated when I have to use a computer.

(-) 138. I sometimes feel that computers are smarter than I am.

(+) 139. I can think of many ways that I could use a computer.

PART J. (VARIABLE NAME: HOW)
For the following 10 questions, please fill in the circle corresponding to the correct answer. If you are unsure of the answer to the question, please fill in circle D for "Don't know."

140. CPU stands for

   A. Computer Processor Understanding.
   B. Computer Processing Unit.
   C. Central Processing Unit.
   D. Don't know.

141. Information is actually internally stored and manipulated by a computer in _____ form.

   A. decimal
   B. character
   C. binary
   D. Don't know.

142. Early computers used what type of processing?

   A. Batch
   B. Interactive
   C. Virtual
   D. Don't know.

143. An example of computer software is a

   A. computer printer.
   B. computer program.
   C. computer operator.
   D. Don't know.

144. Translation of high level languages into machine language is done by a(an)

A. compiler
B. assembler
C. encoder
D. Don't know.

145. Which of the following is not a programming language?

A. DIFT
B. ADA
C. LISP
D. Don't know.

146. Which of these is not a programming language?

A. COBOL
B. SIMPLEX
C. FORTRAN
D. Don't know.

147. Which of the following is considered a secondary storage device?

A. Core memory
B. Punched cards
C. Disk
D. Don't know.

148. A computer architecture that permits the real memory to act as if it is larger than it really is is called

A. phantom memory.
B. virtual memory.
C. variable memory.
D. Don't know.

149. A concept that revolutionized the practice of computer programming is

A. Optimal-Path Programming.
B. Structured Programming.
C. User-Centered Programming.
D. Don't know.

PART K.   (VARIABLE NAME: MATH)
For the following 12 statements, please use the following
scale to express your feelings:

A	B	C	D	E
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

(+)150. Math doesn't scare me at all.

(+)151. It wouldn't bother me at all to take more math
courses.

(+)152. I haven't usually worried about being able to solve
math problems.

(+)153. I almost never have gotten shook up during a math
test.

(+)154. I usually have been at ease during math tests.

(+)155. I usually have been at ease in math classes.

(-)156. Mathematics usually makes me feel uncomfortable and
nervous.

(-)157. Mathematics makes me feel uncomfortable, restless,
irritable, and impatient.

(-)158. I get a sinking feeling when I think of trying hard
math problems.

(-)159. My mind goes blank and I am unable to think clearly
when working mathematics.

(-)160. A math test would scare me.

(-)161. Mathematics makes me feel uneasy and confused.

PART L. (VARIABLE NAME: TRAIT)
A number of statements which people have used to describe themselves are given below. Read each statement and then use the following scale to indicate how you generally feel:

A	B	C	D
Almost Never	Sometimes	Often	Almost Always

(+) 162. I feel pleasant.
(-) 163. I feel nervous and restless.
(+) 164. I feel satisfied with myself.
(-) 165. I wish I could be as happy as others seem to be.
(-) 166. I feel like a failure.

(+) 167. I feel rested.
(+) 168. I am "calm, cool and collected."
(-) 169. I feel that difficulties are piling up so that I cannot overcome them.
(-) 170. I worry too much over something that doesn't really matter.
(+) 171. I am happy.

(-) 172. I have disturbing thoughts.
(-) 173. I lack self-confidence.
(+) 174. I feel secure.
(+) 175. I make decisions easily.
(-) 176. I feel inadequate.

(+) 177. I am content.
(-) 178. Some unimportant thought runs through my mind and bothers me.
(-) 179. I take disappointments so keenly that I can't put them out of my mind.
(+) 180. I am a steady person.
(-) 181. I get in a state of tension or turmoil as I think over my recent concerns and interests.

Post-test Phase Instrument Battery

PART A.   (VARIABLE NAME: STATE)
A number of statements which people have used to describe
themselves are given below. Read each statement and then use
the following scale to indicate how you feel RIGHT NOW, AT
THIS MOMENT:

A	B	C	D
Almost			Almost
Never	Sometimes	Often	Always

(+) 1. I feel calm.
(+) 2. I feel secure.
(-) 3. I am tense.
(-) 4. I feel strained.
(+) 5. I feel at ease.

(-) 6. I feel upset.
(-) 7. I am presently worrying over possible misfortunes.
(+) 8. I feel satisfied.
(-) 9. I feel frightened.
(+) 10. I feel comfortable.

(+) 11. I feel self-confident.
(-) 12. I feel nervous.
(-) 13. I am jittery.
(-) 14. I feel indecisive.
(+) 15. I am relaxed.

(+) 16. I feel content.
(-) 17. I am worried.
(-) 18. I feel confused.
(+) 19. I feel steady.
(+) 20. I feel pleasant.

PART B. (VARIABLE NAME: DAMBB)
For the following 20 statements, please use the following
scale to express your feelings toward the topic discussed:

A	B	C	D	E
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

(+) 21. I think computers are fascinating.

(+) 22. If I used a computer, I could save time and work.

(-) 23. I feel very negative about computers in general.

(-) 24. Only computer specialists can use computers.

(-) 25. Computers control too much of our world today

(-) 26. Computers are having a bad effect on my work and my
        life.

(+) 27. A computer could make learning more fun for me.

(-) 28. Computers intimidate and threaten me.

(-) 29. Even though computers are valuable and necessary, I
        still have a fear of them.

(-) 30. All computer people talk in a strange and technical
        language.

(+) 31. Given a little time and training anybody could learn
        to use computers.

(-) 32. Government regulations should be established to
        control computers.

(-) 33. Computers make mistakes.

(+) 34. Using a computer could be enjoyable.

(+) 35. I look forward to computers taking over certain
        routine tasks of my home and job.

(+) 36. If I had the money I'd buy a home computer.

(+) 37. I would rather have a computer present my instruction
        than a teacher.

(-) 38. Computers are so complicated I would rather do my work manually.

(-) 39. Computers are being forced on us; we are having our decision process replaced by them, making us lose control of our lives.

(+) 40. Computers are superior to humans in processing information.

PART C. (VARIABLE NAME: MAUB)
For the following 26 statements, please use the following scale to express your feelings toward the topic discussed:

A	B	C	D	E	F
Strongly Agree	Agree	Mildly Agree	Mildly Disagree	Disagree	Strongly Disagree

(+) 41. Having a computer available to me would improve my productivity.

(+) 42. If I had to use a computer for some reason, it would probably save me some time and work.

(+) 43. If I had to use a computer, I would get a better picture of the facts and figures.

(+) 44. Having a computer available to me would improve my general satisfaction.

(-) 45. Having to use a computer would make my life less enjoyable.

(+) 46. Having a computer available to me could make things easier for me.

(-) 47. I feel very negative about computers in general.

(+) 48. Having a computer available to me could make things more fun for me.

(-) 49. If I had a computer at my disposal, I would try to get rid of it.

(+) 50. I look forward to a time when computer are more widely used.

(-) 51. I doubt if I would ever use computers very much.

(-) 52. I avoid using computers whenever I can.

(+) 53. I enjoy using computers.

(-) 54. I feel that there are too many computers around now.

(+) 55. Computers are probably going to be an important part of my life.

(+) 56 A computer could make learning fun.

(+) 57. If I were to use a computer, I could get a lot of satisfaction from it.

(-) 58. If I had to use a computer, it would probably be more trouble than it was worth.

(-) 59. I am usually uncomfortable when I have to use computers.

(-) 60. I sometimes get nervous just thinking about computers.

(-) 61. I will probably never learn to use a computer.

(-) 62. Computers are too complicated to be of much use to me.

(-) 63. If I had to use a computer all the time, I would probably be very unhappy.

(-) 64. I sometimes feel intimidated when I have to use a computer.

(-) 65. I sometimes feel that computers are smarter than I am.

(+) 66. I can think of many ways that I could use a computer.

PART D. (VARIABLE NAME: NON-USAGE)

67. Which of the following statements would most closely describe the possibility that you will use the word processing software you have learned about?

   A. I am planning to use it in the future.
   B. I will use it if an opportunity to do so came up.
   C. I have no plans to ever use the software again.
   D. I will definitely never use it again.

APPENDIX C.

ASSIGNED TASK AND INSTRUCTIONS

FORM NO._____   ID NUMBER _____

                                                              ·

Now that you have participated in a training session and have
learned the basics of Wordstar, we would like to take this
opportunity to evaluate your skill at using this software.
This task we are asking you to do could take you anywhere from
30 minutes to 2 hours.

You are not asked to provide your name, so your identity will
remain anonymous. However, please fill in the blank marked ID
NUMBER above. Use the last four digits of your social security
number as your I.D. number. This information will allow us to
distinguish your answers from those of the other participants
in this study. We will also use this information in order to
match your responses in this phase with Phase Two of this study
on effectiveness of computer training methods. This
information will not be used for any other purpose. Your
complete anonymity is guaranteed. Your participation in this
study is completely voluntary. If for any reason you do not
wish to continue, simply return this packet to the monitor.

If you have any questions or concerns regarding this study,
please feel free to contact me:

                    Kerm Harrington
                    323 Carver Hall
                    294-9401

Thank you for your time and help.

In this packet, you will find 65 lines of text for you to enter
into a Wordstar document. You are free to name this document
anything you like. Please note that the numbers in
parentheses, for example, (01), are not to be entered into the
document. They are shown here for reference only. Please
enter this text exactly as it is displayed, noting that
paragraphs are to begin at lines (01), (19), (35), (43), (45),
(46), and (63). There are three things for you to note.
First, do not be concerned if the margins in your version of
the document do not exactly correspond to the margins shown
here. This is to be expected. Second, make certain that your
version of the document is right justified. Third, double
space the entire document.

After you are done entering in this document, go to the printer
and get a hard copy print-out of it. Then, return to your
computer and make the changes in your version of the document
as described below.

I. Spelling and Grammar

    The author of this piece is British, and as such, there are
    several references to British words, places, and things.
    The first set of changes for you to make in your document
    involves Americanizing this piece.

    Changes:

    A - In line (01), change the spelling of "clangour" to
        "clangor".
    B - In line (13), change the word "Lancaster" to "B-17".
    C - In line (19), change the words "Wing Commander" to
        "Lieutenant Colonel".
    D - In line (21), change the words "Whitstable Bay" to
        "Cape Cod".
    E - Throughout the entire piece, change the word "Siberian"
        to "Alaskan".

II. Paragraph format

    Changes:

    A - For the paragraph beginning at line (01), change the
        left margin to 15 and the right margin to 55.
    B - Single space the paragraph beginning at line (19).
    C - Turn off the right justification on the paragraphs
        beginning at lines (35), (43), and (63).
    D - Center the text on line (40).
    E - Force a page break between lines (47) and (48).
    F - Remove the page numbers from the entire document.

After you have made these changes, save the document, go to the printer and obtain a hard copy of this version. When you have finished, please turn in both print-outs and this packet to the monitor. Once again, thank you for your time and help. It is greatly appreciated.

(01)   The vibrating clangour from the four great piston

(02)   engines set teeth on edge and made an intolerable assault

(03)   on cringing eardrums. The decibel-level, Smith

(04)   calculated, must have been about that found in a boiler

(05)   factory, and one, moreover, that was working on overtime

(06)   rates, while the shaking cold in that cramped,

(07)   instrument-crowded flight deck was positively Siberian.

(08)   On balance, he reflected, he would have gone for the

(09)   Siberian boiler factory any time because, whatever its

(10)   drawbacks, it wasn't liable to fall out of the sky or

(11)   crash into a mountainside which, in his present

(12)   circumstances, seemed a likely enough, if not imminent,

(13)   contingency for all that the pilot of their Lancaster

(14)   bomber appeared to care to the contrary. Smith looked

(15)   away from the darkly opaque world beyond the windscreens

(16)   where the wipers fought a useless battle with the driving

(17)   snow and looked again at the man in the left-hand

(18)   captain's seat.

(19)   Wing Commander Cecil Carpenter was as completely at

(20)   home in his environment as the most contented oyster in

(21)   his shell in Whitstable Bay. Any comparison with a

(22)   Siberian boiler factory he would have regarded as the

(23) ravings of an unhinged mind. Quite clearly, he found the

(24) shuddering vibrations as soothing as the ministrations of

(25) the gentlest of masseurs, the roar of the engines

(26) positively soporific and the ambient temperature just

(27) right for a man of his leisured literary tastes. Before

(28) him, at a comfortable reading distance, a book rested on

(29) a hinged contraption which he had swung out from the

(30) cabin's side. From what little Smith could occasionally

(31) see of the lurid cover, depicting a bloodstained knife

(32) plunged into the back of a girl who didn't seem to have

(33) any clothes on, the wing commander held the more serious

(34) contemporary novelist in a fine contempt. He turned a

(35) page.

(36) "Magnificent," he said admiringly. He puffed deeply on

(37) an ancient briar that smelt like a fumigating plant. "By

(38) heavens, this feller can write. Banned, of course,

(39) young Tremayne" -   this to the fresh-faced youngster in

(40) the co-pilot's seat - "so I can't let you have it until

(41) you grow up." He broke off, fanned the smoke-laden air

(42) to improve the visibility, and peered accusingly at his

(43) co-pilot.

(44) "Flying Officer Tremayne, you have that look of pained

(45) apprehension on your face again."

(46) "Yes sir. That's to say, no, sir."

(47) "Part of the malaise of our time," Carpenter said

(48) sorrowfully. "The young lack so many things, like

(49) appreciation of a fine pipe tobacco or faith in their

(50) commanding officers." He sighed heavily, carefully

(51) marked the place in his book, folded the rest away and

(52) straightened in his seat. "You'd think a man would be

(53) entitled to some piece and quiet on his own flight deck."

(54) He slid open his side screen. An icy gust of snow-laden

(55) wind blew into the flight deck, carrying with it the

(56) suddenly deepened roar from the engines. Carpenter

(57) grimaced and thrust his head outside, shielding his eyes

(58) with a gauntleted right hand. Five seconds later he

(59) shook his head dispiritedly, screwed his eyes shut as he

(60) winced in what appeared to be considerable pain, withdrew

(61) his head, closed the screen, brushed the snow away from

(62) his flaming red hair and magnificent handlebar moustache,

(63) and twisted round to look at Smith.

(64)   "It is no small thing, Major, to be lost in a blizzard

(65) in the night skies over war-torn Europe."

Note: The text reproduced here comes from the book:

MacLean, Alistar.   (1967). Where eagles dare. New York: Doubleday

APPENDIX D.

MODIFIED WORDSTAR TUTORIAL

HELLO AND WELCOME TO WORDSTAR!!!!!!

If you've gotten this far, you've obviously figured out
how to open a document file. Now let's begin this tutorial by
talking about cursor control. The cursor is the flashing
underline which you now see to the far left of the word
"HELLO".

At the top of the screen you will find the main menu; on
the left side of this menu is a selection of cursor control
commands. The caret (^) in front of the letters indicates that
you should press the CTRL key like a shift key as you press the
letter. You will find the CTRL key on the lower left hand side
of the keyboard. Look for it now and try using ^X to move the
cursor until you can see the next paragraph.

There are also commands for scrolling; that means to move
the "window" that you're looking at the text through up and
down. Try pressing ^C right now.

Congratulations! You've figured out how to read the rest
of this tutorial! Hopefully you have jumped down in the text
by one screen. If you press ^R, you'll jump back upward one
screen. Try pressing ^R, then press ^C to get back here. From
here on, use the cursor controls to read more of this document.

The cursor can be moved in the document using keys laid
out in the famous "Star diamond" (called that because Wordstar,
CalcStar, and all the other Micropro software uses it):

```
                              ^E
                              ^
                              |
      ^A              ^S <-- --> ^D                    ^F
  Word left                 |                      Word right
                            v
                           ^X
```
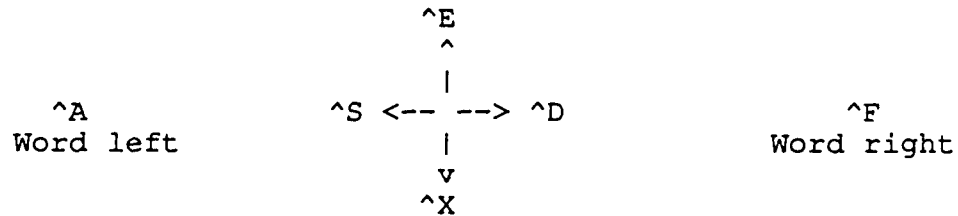
^A moves the cursor to the beginning of the word to the
left of the cursor; ^F moves the cursor to the beginning of the
word to the right of the cursor. Try using the diamond keys to
move the cursor now.

Above the numeric keypad to the right of the typewriter
keys are four arrow keys; they can also be used to move the
cursor a character or line at a time. The advantage of the
CTRL keys is that you don't have to move one hand off the
keyboard. If you press SHIFT while using the arrow keys,
you'll jump further than one character or line:

```
        SHIFT <-  -- jump to beginning of line
        SHIFT ->  -- jump to end of line
        SHIFT UP  -- jump to top of screen
        SHIFT DOWN -- jump to bottom of screen
```

Hmm. . .what's this dotted line across the screen? The
dotted line indicates where Wordstar will break for a new page
when it prints. If you don't like having the paragraph broken
up like that (or if it's in the middle of a table) you can add
extra carriage returns before the page break to shove the
paragraph into the next page or type ".PA" at the beginning of
a line to force a page break anywhere. The ".PA" is what is

known as a "Dot Command" in Wordstar. We will talk more about Dot Commands later.

ENTERING TEXT

When we first enter the editing mode with Wordstar it is in INSERT MODE. That means that any text typed in will be inserted wherever the cursor is, and any text after that will be pushed out of the way and not overwritten.

If this is annoying to you, you can turn it off by typing ^V. Then any text typed in will write over the text at the cursor position. If you need to insert text somewhere then you can do that by pressing ^V again; that turns insert mode back on.

Let's try inserting some text in the following paragraph:

Now is the time for all good men to come to the aid of the party. I still think that this is a really stupid sentence for people to typing for umpty-ump years.

The grammar in that last sentence is kind of shaky, isn't it? Look up at the top line of the main menu and see if there's a little box that says "INSERT ON". If there isn't, press ^V until there is. Now move the cursor to the beginning of the word "typing" in the last paragraph and type in "have been". Now it makes more sense.

DELETING TEXT

There are four keys that will delete characters on the screen; ^G, DEL, ^T and ^Y. ^G deletes the character under the cursor. Try that in the next sentence, correcting the misspelled word "Americca" to "America":

We are in the United States of Americca.

Position the cursor on the first "c" in "Americca" and press ^G. It should disappear, leaving an umblemished America.

The DEL key deletes the character to the left of the cursor. It is the one to use if you type the wrong letter in and realize it before typing the next letter; just press DEL and the bad letter vanishes. (Unfortunately, the BACK SPACE key, which is easier to hit, simply backs over the bad character. If insert mode is on, you will tend to accumulate characters to the right of the cursor that you'll push along as you type.)

You can wipe out entire words with the ^T key. Position the cursor at the beginning of the word you want to eradicate and press ^T and it will be erased. If you position the cursor in the middle of the word, the part of the word under and to the right of the cursor will be deleted. Try this by removing the word "ugly" in the following sentence:

My ugly sister wears orange Army boots.

Put the cursor on the first letter in the word "ugly",
press ^T and notice how the "ugly" disappears. Hmm. . .that
sentence is still pretty offensive. This looks like a job for
^Y, which erases entire lines. Place the cursor anywhere on
that ridiculous line and press ^Y. Notice that the line
disappears, which in this case is a giant leap for mankind.

REFORMATTING PARAGRAPHS

In the course of inserting and deleting text, you can
thoroughly destroy any semblence of margins and formatting in a
paragraph. For example, the following paragraph has been
altered by adding the words "definitely" and "and decent" to
the first line and deleting a batch of text from the third
line.

Now is definitely the time for all good and decent men to
come to the aid of the party. (I am sure that you are hoping
that I am quite through beating this sentence into the ground.)

Notice that the first line hangs over the right margin (you
can use the cursor control keys to scroll over to the end of
the line if you want) and the third line is too short.
Remember that Wordstar is a what-you-see-is-what-you-get word
processor. It will try to print that paragraph that way (with
disastrous results). What we need to do is reformat it.

Move the cursor to the beginning of the paragraph and press
^B. Notice that the words jump around to conform to the

margins. Occasionally, Wordstar will ask you where you would like to hyphenate a large word during the reformatting process. If it does, use the ^S and ^D keys to move the cursor around in the word, then press the hyphen key OR simply press ^B to tell Wordstar not to hyphenate at all.

If you want to change the margins, you'll have to reformat every paragraph individually. There is a shortcut that may help; the command ^QQ will prompt you to enter a command. Wordstar will then repeat the command until you press any key.

CHANGING MARGINS AND TABS

When you first begin to edit a new document, Wordstar automatically sets up the margins and tab stops for you. The left margin is automatically set at and the right margin is set at 64. There are many times which you may want to set-up custom margins and/or tab stops. Look now at the line right below the main menu. This is your margin line. The "L" on the left and the "R" on the right signify the left and right margins, respectively. Every five spaces you see an exclamation point (!). These denote tab stops.

Let's now change the margins. Type ^O (not the number zero). On the left hand side of the menu, you will now see a sub-title "Margins & Tabs". Type an "L". Now type "10" and hit the RETURN key. Notice how the "L" on the margin line has moved in to column 10. We can change the right margin in much

the same way. Type ^OR, then type 55 and the RETURN key. The

"R" has now moved in to column 55.

Notice how this paragraph is still set up to the old

margins of 0 and 64. Move the cursor to the beginning of this

paragraph and type ^B in order for it to reformat itself to the

new margins.

CENTERING AND JUSTIFYING TEXT

Wordstar allows you to center text on a line by simply

placing the cursor anywhere on that line and typing ^OC. This

will center the text according to the margins set at the time.

Wordstar allows you to right justify the text in your document

(in other words, make the text flush with the right margin).

In fact, this is the way Wordstar will normally enter text. In

order to do this, Wordstar fills in extra spaces in lines when

necessary. If this is annoying to you, you can turn off this

feature by typing ^OJ. You can turn the feature back on by

typing ^OJ again. To see if the feature is on or off, type ^O

and look at the right hand side of the menu under "More

Toggles". If the setting is the way you want it, simply hit

the SPACE BAR, if it isn't, type "J". Remember to reformat

your paragraphs after you change this setting.

LINE SPACING

There may be times when you wish to change the line spacing

of a document. For instance, this tutorial is single spaced,

while most papers and other documents are double spaced. To
change the line spacing, type ^OS, and then a number from 1 to
9 (1 is single spacing, 2 is double spacing, etc.)

DOT COMMANDS

You saw that typing ".PA" at the beginning of a line forced
Wordstar to start a new page. There are many other Dot
Commands which tell Wordstar to do different things. Here are
just two:

.OP - Tells Wordstar not to number pages when it prints a
     document. (Without this command, Wordstar will print
     page numbers at the center of the bottom of each
     page.)
.PNn - Tells Wordstar to begin numbering pages on a print
     out any time after you have typed ".OP". (By typing
     ".PN75, for example, Wordstar will begin numbering
     pages on the printout at 75.)

One thing you must remember about using Dot Commands, the
"." must be in the first column of a line in order for Wordstar
to recognize the command.

OTHER COMMANDS IN OTHER MENUS

Take a look at the right side of the Main Menu. In that
space are control commands that will get you at other menus

full of commands. One very important command might be ^J, which gets you at the help menu. Press ^J right now to see what is available. The most important command in the Help Menu might be I, which tells you what kind of commands are in which menu. Otherwise, just keep following the directions until you are returned to edit mode.

SAVING TEXT AND LEAVING EDIT MODE

The other very important menu for your first session with Wordstar is the Block Menu. The Block menu contains all of the commands for saving your text and leaving Wordstar.

To reach this menu, press ^K. If you are finished editing you have several choices:

D -- save the file and return to the No-File Menu;

X -- save the file, leave Wordstar and return to DOS.

Q -- discard all changes you have made and return to the No-File menu.

Normally you will use ^KD or ^KX when you finish editing a document. When you finish reading this tutorial, I ask that you carefully press ^KQ so that all of the errors you have carefully corrected may be preserved for the next person to use this tutorial file.

There is one more option; pressing S saves the file and returns to the edit mode. Why would you want to do this? If

the computer "goes down" right now, all of the changes you have made (or the three chapters of the thesis you've typed) will be lost. This can happen when the power fails or when you make a stupid mistake and delete all of your text (or a large piece of it). If you have periodically saved your text as it is entered, you won't have as many changes to lose as you might have had.

THAT'S ALL THERE IS TO IT!! This is the end of this Wordstar tutorial. Please leave Wordstar by typing ^KX.

Note: The original version of this Wordstar tutorial was written by Jeff Balvanz of the Iowa State University Computation Center.

APPENDIX E.

SUBJECT DEBRIEFING

Thank you very much for your participation in this study. We are hoping that its finding will result in material suitable for publication in the academic literature, and without your cooperation, it would not have been possible.

Prior to Phase One of this study, you were told that its purpose was to investigate computer training methods. This, however, was not its entire purpose. In order to maintain the integrity of the data to be obtained, it was necessary to withhold the entire purpose from you. Now, in accordance with the guidelines set up by the Human Subjects Committee here at Iowa State, we wish to divulge the complete purpose of this study.

This study was designed to look into the phenomenon known as computer anxiety and is part of a master's thesis entitled "Computer anxiety: an examination of its correlates and a test of two possible treatment strategies". The study investigates whether computer anxiety is an identifiable construct by relating it to several known concepts. In Phase One, measures were taken from you on the following variables: Self-esteem, Powerlessness, Trait Anxiety, Personality Rigidity, Locus of Control, Math Anxiety, Computer Knowledge and Computer Anxiety. This was in order to see if computer anxiety was consistently related to any of these other variables in individuals.

In Phase Two, you were instructed in the use of Wordstar by one of two methods: Classroom lecture/demo and interactive tutorial. This was done in order to ascertain which method would be the most effective in training computer anxious individuals in the use of the computer. This part of the study was completed when you were asked to enter a text into a Wordstar document file. Your performance in this activity was measured and then related to your scores in Phase One.

Finally, in Phase Three, the phase you just completed, your level of computer anxiety was re-measured in order to see if your training on Wordstar had any effect on you. Those of you who did not participate in Phases Two and Three were part of a control group in this study to account for any variables external to the study.

As noted previously, it is hoped that this study will be published in the academic literature. If it is, reprints of the article will be available from Dr. McElroy.

Thank you again for your participation.

Kerm Harrington

APPENDIX F.

SPSS^X PROGRAMS AND DATASETS

```
Command> USE PHASEONE

Command> L

    1.      //PHASEONE JOB I4855,HARRINGTON
    2.      //STEP1 EXEC SPSSX
    3.      //INPUT DD DSN=M.I4855.KERMDAT1,DISP=SHR
    4.      //OUTPUT DD DSN=M.I4855.PHASE1,DISP=(OLD,KEEP)
    5.      //SYSIN DD *
    6.      DATA LIST FILE = INPUT RECORDS = 4
    7.       /1 CARD 2-5 ID 26-34 SEX 52
    8.       /2 DEM1 TO DEM3 6-8 EST1 TO EST27 9-35 POW1 TO POW7 36-42
    9.          LOC1 TO LOC29 43-71 RIG1 TO RIG9 72-80
   10.       /3 RIG10 TO RIG24 6-20 EXP 21 KNOW1 TO KNOW2 22-23
   11.          DAMB1 TO DAMB20 24-43 MAU1 TO MAU26 44-69 HOW1 TO HOW10 70-79
   12.          MATH1 80
   13.       /4 MATH2 TO MATH12 6-16 TRAIT1 TO TRAIT20 17-36
   14.
   15.      SET BLANKS = 6
   16.
   17.      COMMENT RECODES FOR THE DAMBROT ET AL. INSTRUMENT
   18.      RECODE DAMB3 TO DAMB6 (1=5) (2=4) (4=2) (5=1)
   19.             /DAMB8 TO DAMB10 (1=5) (2=4) (4=2) (5=1)
   20.             /DAMB12 TO DAMB13 (1=5) (2=4) (4=2) (5=1)
   21.             /DAMB18 TO DAMB19 (1=5) (2=4) (4=2) (5=1)
   22.
   23.      COMMENT RECODES FOR THE MAURER INSTRUMENT
   24.      RECODE MAU5 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
   25.             /MAU7 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
   26.             /MAU9 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
   27.             /MAU11 TO MAU12 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
   28.             /MAU14 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
   29.             /MAU18 TO MAU25 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
   30.
   31.      COMMENT RECODES FOR NEAL & SEEMAN INSTRUMENT
   32.      RECODE POW1 TO POW7 (1=0) (2=1)
   33.
   34.      COMMENT RECODES FOR THE COOPERSMITH INSTRUMENT
   35.      RECODE EST1 TO EST3 (1=0) (2=1)
   36.             /EST4 TO EST5 (2=0)
   37.             /EST6 TO EST7 (1=0) (2=1)
   38.             /EST8 (2=0)
   39.             /EST9 (1=0) (2=1)
   40.             /EST10 (2=0)
   41.             /EST11 TO EST13 (1=0) (2=1)
   42.             /EST14 (2=0)
   43.             /EST15 TO EST18 (1=0) (2=1)
   44.             /EST19 TO EST20 (2=0)
   45.             /EST21 TO EST23 (1=0) (2=1)
   46.             /EST24 TO EST26 (2=0)
   47.             /EST27 (1=0) (2=1)
   48.
   49.      COMMENT RECODES FOR ROTTER INSTRUMENT
   50.      RECODE LOC2 (2=0)
   51.             /LOC3 TO LOC5 (1=0) (2=1)
   52.             /LOC6 TO LOC7 (2=0)
   53.             /LOC9 (2=0)
   54.             /LOC10 TO LOC13 (1=0) (2=1)
   55.             /LOC15 (1=0) (2=1)
   56.             /LOC16 TO LOC18 (2=0)
   57.             /LOC20 TO LOC21 (2=0)
```

```
 58.            /LOC22 (1=0) (2=1)
 59.            /LOC23 (2=0)
 60.            /LOC25 (2=0)
 61.            /LOC26 (1=0) (2=1)
 62.            /LOC28 (1=0) (2=1)
 63.            /LOC29 (2=0)
 64.            /LOC1 (1=9) (2=9)
 65.            /LOC8 (1=9) (2=9)
 66.            /LOC14 (1=9) (2=9)
 67.            /LOC19 (1=9) (2=9)
 68.            /LOC24 (1=9) (2=9)
 69.            /LOC27 (1=9) (2=9)
 70.
 71.     COMMENT RECODES FOR REHFISCH INSTRUMENT
 72.     RECODE RIG1 (2=0)
 73.            /RIG2 (1=0) (2=1)
 74.            /RIG3 (2=0)
 75.            /RIG4 (1=0) (2=1)
 76.            /RIG5 TO RIG7 (2=0)
 77.            /RIG8 TO RIG11 (1=0) (2=1)
 78.            /RIG12 TO RIG20 (2=0)
 79.            /RIG21 (1=0) (2=1)
 80.            /RIG22 TO RIG24 (2=0)
 81.
 82.     COMMENT RECODES FOR THE FENNEMA & SHERMAN INSTRUMENT
 83.     RECODE MATH7 TO MATH12 (1=5) (2=4) (4=2) (5=1)
 84.
 85.     COMMENT RECODES FOR THE SPIELBERGER ET AL INSTRUMENT
 86.     RECODE TRAIT1 (1=4) (2=3) (3=2) (4=1)
 87.            /TRAIT3 (1=4) (2=3) (3=2) (4=1)
 88.            /TRAIT6 TO TRAIT7 (1=4) (2=3) (3=2) (4=1)
 89.            /TRAIT10 (1=4) (2=3) (3=2) (4=1)
 90.            /TRAIT13 TO TRAIT14 (1=4) (2=3) (3=2) (4=1)
 91.            /TRAIT16 (1=4) (2=3) (3=2) (4=1)
 92.            /TRAIT19 (1=4) (2=3) (3=2) (4=1)
 93.
 94.     COMMENT SCORE ON THE HOWARD INSTRUMENT
 95.     COMPUTE HOW = 0
 96.     IF (HOW1 EQ 3) HOW = HOW + 1
 97.     IF (HOW2 EQ 3) HOW = HOW + 1
 98.     IF (HOW3 EQ 1) HOW = HOW + 1
 99.     IF (HOW4 EQ 2) HOW = HOW + 1
100.     IF (HOW5 EQ 1) HOW = HOW + 1
101.     IF (HOW6 EQ 1) HOW = HOW + 1
102.     IF (HOW7 EQ 2) HOW = HOW + 1
103.     IF (HOW8 EQ 3) HOW = HOW + 1
104.     IF (HOW9 EQ 2) HOW = HOW + 1
105.     IF (HOW10 EQ 2) HOW = HOW + 1
106.
107.     COMMENT SCORE ON DAMBROT INSTRUMENT
108.     COUNT NMISS = DAMB1 TO DAMB20 (6)
109.     COMPUTE DAMB = SUM(DAMB1 TO DAMB20)
110.     COMPUTE DAMB = DAMB - 5 * NMISS
111.     IF (NMISS GT 5) DAMB = 0
112.     IF (NMISS LE 5) DAMB = DAMB/(20-NMISS)
113.     MISSING VALUES DAMB (-999)
114.     COMPUTE DCA = 0
115.     IF (DAMB GT 2.200) DCA = 2
116.     IF (DAMB LE 2.200 AND DAMB GT 0) DCA = 1
117.
118.     COMMENT SCORE ON MAURER INSTRUMENT
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```
119.    COUNT NMISS = MAU1 TO MAU26 (6)
120.    COMPUTE MAU = SUM(MAU1 TO MAU26)
121.    COMPUTE TRAIT = TRAIT - 12 * NMISS
122.    IF (NMISS GT 12) MAU = 0
123.    IF (NMISS LE 12) MAU = MAU/26
124.    MISSING VALUES MAU (-999)
125.    COMPUTE MCA = 0
126.    IF (MAU GT 2.538) MCA = 2
127.    IF (MAU LE 2.538 AND MAU GT 0) MCA = 1
128.
129.    COMMENT SCORE ON SPIELBERGER INSTRUMENT
130.    COUNT NMISS = TRAIT1 TO TRAIT20 (6)
131.    COMPUTE TRAIT = SUM (TRAIT1 TO TRAIT20)
132.    COMPUTE TRAIT = TRAIT - 5 * NMISS
133.    IF (NMISS GT 5) TRAIT = 0
134.    IF (NMISS LE 5) TRAIT = TRAIT/(20-NMISS)
135.    MISSING VALUES TRAIT (-999)
136.
137.    COMMENT SCORE ON NEAL & SEEMAN INSTRUMENT
138.    COUNT NMISS = POW1 TO POW7 (6)
139.    COMPUTE POW = SUM (POW1 TO POW7)
140.    COMPUTE POW = POW - 1 * NMISS
141.    IF (NMISS GT 1) POW = 0
142.    IF (NMISS LE 1) POW = POW/(7-NMISS)
143.    MISSING VALUES POW (-999)
144.
145.    COMMENT SCORE FOR COOPERSMITH INSTRUMENT
146.    COUNT NMISS = EST1 TO EST27 (6)
147.    COMPUTE EST = SUM(EST1 TO EST27)
148.    COMPUTE EST = EST - 7 * NMISS
149.    IF (NMISS GT 7) EST = 0
150.    IF (NMISS LE 7) EST = EST/(27-NMISS)
151.    MISSING VALUES EST (-999)
152.
153.    COMMENT SCORE FOR ROTTER INSTRUMENT
154.    COMPUTE LOC = 0
155.    COMPUTE VALID = 0
156.    DO REPEAT L = LOC1 TO LOC29
157.    DO IF (L NE 6)
158.    IF (L NE 9) LOC = LOC + L
159.    COMPUTE VALID = VALID + 1
160.    END IF
161.    END REPEAT
162.    DO IF (VALID GE 15 AND VALID LT 23)
163.    COMPUTE LOC = LOC/VALID
164.    ELSE
165.    COMPUTE LOC = LOC/23
166.    END IF
167.    IF (VALID LT 21) LOC = -999
168.
169.    COMMENT SCORE ON REFISCH SCALE
170.    COUNT NMISS = RIG1 TO RIG24 (6)
171.    COMPUTE RIG = SUM (RIG1 TO RIG24)
172.    COMPUTE RIG = RIG - 6 * NMISS
173.    IF (NMISS GT 6) RIG = 0
174.    IF (NMISS LE 5) RIG = RIG/(24-NMISS)
175.    MISSING VALUES RIG (-999)
176.
177.    COMMENT SCORE ON FENNEMA & SHERMAN SCALE
178.    COUNT NMISS = MATH1 TO MATH12 (6)
179.    COMPUTE MATH = SUM (MATH1 TO MATH12)
```

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180.    COMPUTE MATH = MATH - 3 * NMISS
181.    IF (NMISS GT 3) MATH = 0
182.    IF (NMISS LE 3) MATH = MATH/(12-NMISS)
183.    MISSING VALUES MATH (-999)
184.
185.
186.    COMMENT SCALE RELIABILITIES
187.
188.    COMMENT COOPERSMITH INSTRUMENT
189.
190.    RELIABILIY VARIABLES = EST1 TO EST27/
191.     SCALE (ESTEEM) = EST1 TO EST27/
192.    STATISTICS 1 2 3 4 5 6 7 8 9 10
193.
194.    COMMENT NEAL & SEEMAN INSTRUMENT
195.
196.    RELIABILITY VARIABLES = POW1 TO POW7/
197.     SCALE (POWER) = POW1 TO POW7/
198.    STATISTICS 1 2 3 4 5 6 7 8 9 10
199.
200.    COMMENT ROTTER INSTRUMENT
201.
202.    RELIABILITY VARIABLES = LOC1 TO LOC29/
203.     SCALE (CONTROL) = LOC2 TO LOC7 LOC9 TO LOC13 LOC15 TO LOC18
204.                       LOC20 TO LOC23 LOC25 TO LOC26 LOC28 TO LOC29/
205.    STATISTICS 1 2 3 4 5 6 7 8 9 10
206.
207.    COMMENT REHFISCH INSTRUMENT
208.
209.    RELIABILITY VARIABLES = RIG1 TO RIG24/
210.     SCALE (RIGIDITY) RIG1 TO RIG24/
211.    STATISTICS 1 2 3 4 5 6 7 8 9 10
212.
213.    COMMENT DAMBROT ET AL. INSTRUMENT
214.
215.    RELIABILITY VARIABLES = DAMB1 TO DAMB20/
216.     SCALE (ATTITUDES) = DAMB1 TO DAMB20/
217.    STATISTICS 1 2 3 4 5 6 7 8 9 10
218.
219.    COMMENT MAURER INSTRUMENT
220.
221.    RELIABILITY VARIABLES = MAU1 TO MAU26/
222.     SCALE (CANXIETY) = MAU1 TO MAU26/
223.    STATISTICS 1 2 3 4 5 6 7 8 9 10
224.
225.    COMMENT FENNEMA & SHERMAN INSTRUMENT
226.
227.    RELIABILITY VARIABLES = MATH1 TO MATH12/
228.     SCALE (MANXIETY) = MATH1 TO MATH12/
229.    STATISTICS 1 2 3 4 5 6 7 8 9 10
230.
231.    COMMENT SPIELBERGER ET AL. INSTRUMENT
232.
233.    RELIABILITY VARIABLES = TRAIT1 TO TRAIT20/
234.     SCALE (TANXITEY) = TRAIT1 TO TRAIT20/
235.    STATISTICS 1 2 3 4 5 6 7 8 9 10
236.
237.    COMMENT HOWARD INSTRUMENT
238.
239.    RELIABILITY VARIABLES = HOW1 TO HOW10/
240.     SCALE (KNOWLEDGE) = HOW1 TO HOW10
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241.      STATISTICS 1 2 3 4 5 6 7 8 9 10
242.
243.      COMMENT SAVE DATASET TO FILE PHASE1
244.
245.      SORT CASES BY ID
246.      FILE HANDLE PHASE1
247.      FILE LABEL THESIS PHASE ONE DATA
248.      DOCUMENT  THIS IS THE DATA FROM PHASE ONE OF K. V. HARRINGTON'S
249.                THESIS RESEARCH.  THE FILE CONTAINS INFORMATION OBTAINED
250.                FROM STUDENTS IN A MASS LECTURE OF AN INTRODUCTORY
251.                MANAGEMENT CLASS AT IOWA STATE UNIVERSITY.
252.      SAVE OUTFILE = OUTPUT/RENAME (DAMB=DAMBA) (MAU=MAUA)/
253.       KEEP = CARD, SEX, ID, EST, POW, LOC, RIG, DAMBA, MAUA,
254.             HOW, MATH, TRAIT, EXP, DEM3, KNOW1, KNOW2, MCA,
255.             DCA, DEM1, DEM2/MAP
256.      FINISH
257.      /*
Command> USE PHASETWO CLE

Command> L

  1.      //PHASETWO JOB I4855,HARRINGTON
  2.      //STEP1 EXEC SPSSX
  3.      //INPUT DD DSN=M.I4855.KERMDAT2,DISP=SHR
  4.      //OUTPUT DD DSN=M.I4855.PHASE2,DISP=(OLD,KEEP)
  5.      //SYSIN DD *
  6.      DATA LIST FILE = INPUT RECORDS = 2 /* PHASE TWO DATA (KERMDAT2)
  7.       /1 CARD 2-5 ID 26-35 GROUP 36 QUEST 37-38 RATER1 39-40
  8.          SEX 52 RATER2 53-54
  9.       /2 STATE1 TO STATE20 6-25 DAMB1 TO DAMB20 26-45 MAU1 TO MAU26 46-71
 10.          USAGE 72
 11.
 12.
 13.      SELECT IF (CARD NE 63)
 14.      SET BLANKS = 6 /* RESET INVALID RESPONSES */
 15.
 16.      COMMENT RECODES FOR  RATERS
 17.      RECODE RATER2 (66=0)
 18.
 19.      COMMENT RECODES FOR USAGE
 20.      RECODE USAGE (1=4) (2=3) (3=2) (4=1)
 21.
 22.      COMMENT RECODES FOR THE SPIELBERGER ET AL. INSTRUMENT
 23.      RECODE STATE1 (1=4) (2=3) (3=2) (4=1)
 24.             /STATE2 (1=4) (2=3) (3=2) (4=1)
 25.             /STATE5 (1=4) (2=3) (3=2) (4=1)
 26.             /STATE8 (1=4) (2=3) (3=2) (4=1)
 27.             /STATE10 (1=4) (2=3) (3=2) (4=1)
 28.             /STATE11 (1=4) (2=3) (3=2) (4=1)
 29.             /STATE15 (1=4) (2=3) (3=2) (4=1)
 30.             /STATE16 (1=4) (2=3) (3=2) (4=1)
 31.             /STATE19 (1=4) (2=3) (3=2) (4=1)
 32.             /STATE20 (1=4) (2=3) (3=2) (4=1)
 33.
 34.      COMMENT RECODES FOR THE DAMBROT ET AL. INSTRUMENT
 35.      RECODE DAMB3 TO DAMB6 (1=5) (2=4) (4=2) (5=1)
 36.             /DAMB8 TO DAMB10 (1=5) (2=4) (4=2) (5=1)
 37.             /DAMB12 TO DAMB13 (1=5) (2=4) (4=2) (5=1)
 38.             /DAMB18 TO DAMB19 (1=5) (2=4) (4=2) (5=1)
 39.
 40.      COMMENT RECODES FOR THE MAURER INSTRUMENT
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41.     RECODE MAU5 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
42.            /MAU7 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
43.            /MAU9 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
44.             /MAU11 TO MAU12 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
45.             /MAU14 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
46.             /MAU18 TO MAU25 (1=6) (2=5) (3=4) (4=3) (5=2) (6=1)
47.
48.     COMMENT SCORE ON DAMBROT INSTRUMENT
49.     COUNT NMISS = DAMB1 TO DAMB20 (6)
50.     COMPUTE DAMB = SUM (DAMB1 TO DAMB20)
51.     COMPUTE DAMB = DAMB - 5 * NMISS
52.     IF (NMISS GT 5) DAMB = -999
53.     IF (NMISS LE 5) DAMB = DAMB/(20-NMISS)
54.     MISSING VALUES DAMB (-999)
55.     COMPUTE DCA = 0
56.     IF (DAMB GT 2.250) DCA = 2
57.     IF (DAMB LE 2.250 AND DAMB GT -999) DCA = 1
58.
59.     COMMENT SCORE ON MAURER INSTRUMENT
60.     COUNT NMISS = MAU1 TO MAU26 (6)
61.     COMPUTE MAU = SUM (MAU1 TO MAU26)
62.     IF (NMISS GT 12) MAU = -999
63.     IF (NMISS LE 12) MAU = MAU/26
64.     MISSING VALUES MAU (-999)
65.     COMPUTE MCA = 0
66.     IF (MAU GT 2.462) MCA = 2
67.     IF (MAU LE 2.462 AND MAU GT -999) MCA = 1
68.
69.     COMMENT SCORE ON SPIELBERGER INSTRUMENT
70.     COUNT NMISS = STATE1 TO STATE20 (6)
71.     COMPUTE STATE = SUM (STATE1 TO STATE20)
72.     COMPUTE STATE = STATE - 5 * NMISS
73.     IF (NMISS GT 5) STATE = -999
74.     IF (NMISS LE 5) STATE = STATE/(20-NMISS)
75.     MISSING VALUES STATE (-999)
76.
77.     COMMENT ERROR CALCULATION
78.     COMPUTE ERRORS = (RATER1 + RATER2)/2
79.
80.     COMMENT SCALE RELIABILITIES
81.
82.     RELIABILITY VARIABLES = DAMB1 TO DAMB20/
83.      SCALE (ATTITUDES) = DAMB1 TO DAMB20/
84.     STATISTICS 1 2 3 4 5 6 7 8 9 10
85.
86.     RELIABILITY VARIABLES = MAU1 TO MAU26/
87.      SCALE (CANXIETY) = MAU1 TO MAU26/
88.     STATISTICS 1 2 3 4 5 6 7 8 9 10
89.
90.     RELIABILITY VARIABLES = STATE1 TO STATE20/
91.      SCALE (SANXIETY) = STATE1 TO STATE20/
92.     STATISTICS 1 2 3 4 5 6 7 8 9 10
93.
94.     SORT CASES BY ID
95.     FILE HANDLE OUTPUT
96.     FILE LABEL THESIS PHASE TWO DATA
97.     DOCUMENT  THIS IS THE DATA FROM PHASE TWO OF K. V. HARRINGTON'S
98.               THESIS RESEARCH.  THE FILE INCLUDES DATA OBTAINED FROM
99.               THREE SURVEY SUB-GROUPS FROM PHASE ONE:
100.              GROUP = 1: INDIVIDUALS EXPOSED TO A CLASSROOM DEMO IN
101.                         LEARNING WORDSTAR
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102.                   GROUP = 2: INDIVIDUALS EXPOSED TO AN INTERACTIVE TUTORIAL
103.                   GROUP = 3: CONTROL GROUP
104.        SAVE OUTFILE = OUTPUT/RENAME (DAMB=DAMBB) (MAU=MAUB)/
105.         KEEP = CARD, SEX, ID, DAMBB, MAUB, STATE, RATER1, RATER2, QUEST,
106.               GROUP, USAGE, MCA, DCA, ERRORS/MAP
107.        FINISH
108.        /*
Command> USE STATS CLE

Command> L

    1.        //STATS JOB I4855,HARRINGTON
    2.        //STEP1 EXEC SPSSX
    3.        //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
    4.        //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
    5.        //SYSIN DD *
    6.        MATCH FILES FILE=ONE/FILE=TWO/BY=ID
    7.        MISSING VALUES ALL (-999)
    8.        SORT CASES BY ID
    9.        FREQUENCIES VARIABLES = EST LOC RIG MATH STATE TRAIT
   10.                   DAMBA DAMBB MAUA MAUB HOW EXP POW/STATISTICS = ALL
   11.        FINISH
   12.        /*
Command> USE PEARSONS CLE

Command> L

    1.        //PEARSONS JOB I4855,HARRINGTON
    2.        //STEP1 EXEC SPSSX
    3.        //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
    4.        //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
    5.        //SYSIN DD *
    6.        MATCH FILES FILE=ONE/FILE=TWO/BY=ID
    7.        MISSING VALUES ALL (-999)
    8.        SORT CASES BY ID
    9.        PEARSON CORR DAMBA DAMBB MAUA MAUB TRAIT STATE EST LOC RIG HOW MATH
   10.                   EXP QUEST RATER1 RATER2 ERRORS USAGE
   11.        PEARSON CORR DAMBA DAMBB MAUA MAUB TRAIT STATE EST LOC RIG HOW MATH
   12.                   EXP QUEST RATER1 RATER2 ERRORS USAGE
   13.        OPTIONS 5
   14.        FINISH
   15.        /*
Command> USE ANOVA CLE

Command> L

    1.        //ANOVA JOB I4855,HARRINGTON
    2.        //STEP1 EXEC SPSSX
    3.        //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
    4.        //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
    5.        //SYSIN DD *
    6.        MATCH FILES FILE=ONE/FILE=TWO/RENAME=(MCA=MCA2) (DCA=DCA2)/BY=ID
    7.        MISSING VALUES ALL (-999)
    8.        COMPUTE MATCH = 2
    9.        IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
   10.        IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
   11.        VARIABLE LABELS DCA2 'DAMBROT COMPUTER ATTITUDES (PHASE TWO)'
   12.                    MCA2 'MAURER COMPUTER ANXIETY (PHASE TWO)'
   13.                    DEM3 'PREFERRED MODE OF LEARNING'
   14.        VALUE LABELS GROUP 1 'DISCUSSION' 2 'TUTORIAL' 3 'CONTROL'/
   15.                    DCA2 1 'LOW CA' 2 'HIGH CA'/
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16.                    MCA2 1 'LOW CA' 2 'HIGH CA'/
17.                    DEM3 1 'DISCUSSION' 2 'TUTORIAL'/
18.                    MATCH 1 'MATCH' 2 'NON-MATCH'
19.    CROSSTABS VARIABLES = DCA2 (1,2) GROUP (1,3)/
20.             TABLES = GROUP BY DCA2
21.    CROSSTABS VARIABLES = MCA2 (1,2) GROUP (1,3)/
22.             TABLES = GROUP BY MCA2
23.    ANOVA ERRORS BY DCA (1,2) GROUP (1,2) MATCH (1,2)
24.         /QUEST BY DCA (1,2) GROUP (1,2) MATCH (1,2)
25.         /DAMBB BY DCA (1,2) GROUP (1,2) MATCH (1,2)
26.         /MAUB BY DCA (1,2) GROUP (1,2) MATCH (1,2)
27.         /USAGE BY DCA (1,2) GROUP (1,2) MATCH (1,2)
28.    STATISTICS 3
29.    ANOVA ERRORS BY MCA (1,2) GROUP (1,2) MATCH (1,2)
30.         /QUEST BY MCA (1,2) GROUP (1,2) MATCH (1,2)
31.         /DAMBB BY MCA (1,2) GROUP (1,2) MATCH (1,2)
32.         /MAUB BY MCA (1,2) GROUP (1,2) MATCH (1,2)
33.         /USAGE BY MCA (1,2) GROUP (1,2) MATCH (1,2)
34.    STATISTICS 3
35.    FINISH
36.    /*
Command> USE ANOVAROY CLE

Command> L

1.     //ANOVA2 JOB I4855,HARRINGTON
2.     //STEP1 EXEC SPSSX
3.     //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.     //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.     //SYSIN DD *
6.     MATCH FILES FILE=ONE/FILE=TWO/RENAME=(MCA=MCA2) (DCA=DCA2)/BY=ID
7.     MISSING VALUES ALL (-999)
8.     COMPUTE CHOICE = 5
9.     IF (DEM3 EQ 1 AND GROUP EQ 1) CHOICE = 1
10.    IF (DEM3 EQ 2 AND GROUP EQ 1) CHOICE = 2
11.    IF (DEM3 EQ 1 AND GROUP EQ 2) CHOICE = 2
12.    IF (DEM3 EQ 2 AND GROUP EQ 2) CHOICE = 3
13.    VARIABLE LABELS DCA2 'DAMBROT COMPUTER ATTITUDES (PHASE TWO)'
14.                    MCA2 'MAURER COMPUTER ANXIETY (PHASE TWO)'
15.                    DEM3 'PREFERRED MODE OF LEARNING'
16.    VALUE LABELS GROUP 1 'DISCUSSION' 2 'TUTORIAL' 3 'CONTROL'/
17.                 DCA2 1 'LOW CA' 2 'HIGH CA'/
18.                 MCA2 1 'LOW CA' 2 'HIGH CA'/
19.                 DEM3 1 'DISCUSSION' 2 'TUTORIAL'/
20.                 CHOICE 1 'MATCH DISS' 2 'NON-MATCH'
21.                        3 'MATCH TUT'
22.    CROSSTABS VARIABLES = DCA2 (1,2) GROUP (1,2)/
23.             TABLES = GROUP BY DCA2
24.    CROSSTABS VARIABLES = MCA2 (1,2) GROUP (1,2)/
25.             TABLES = GROUP BY MCA2
26.    CROSSTABS VARIABLES = MCA2 (1,2) CHOICE (1,3)/
27.             TABLES = CHOICE BY MCA2
28.    ANOVA ERRORS BY DCA (1,2) GROUP (1,2) CHOICE (1,3)
29.         /QUEST BY DCA (1,2) GROUP (1,2) CHOICE (1,3)
30.         /DAMBB BY DCA (1,2) GROUP (1,2) CHOICE (1,3)
31.         /MAUB BY DCA (1,2) GROUP (1,2) CHOICE (1,3)
32.         /USAGE BY DCA (1,2) GROUP (1,2) CHOICE (1,3)
33.    STATISTICS 3
34.    ANOVA ERRORS BY MCA (1,2) GROUP (1,2) CHOICE (1,3)
35.         /QUEST BY MCA (1,2) GROUP (1,2) CHOICE (1,3)
36.         /DAMBB BY MCA (1,2) GROUP (1,2) CHOICE (1,3)
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37.         /MAUB BY MCA (1,2) GROUP (1,2) CHOICE (1,3)
38.         /USAGE BY MCA (1,2) GROUP (1,2) CHOICE (1,3)
39.    STATISTICS 3
40.    FINISH
41.    /*
Command> USE ANOETA CLE

Command> L

1.     //ANOVA3 JOB I4855,HARRINGTON
2.     //STEP1 EXEC SPSSX
3.     //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.     //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.     //SYSIN DD *
6.     MATCH FILES FILE=ONE/FILE=TWO/RENAME=(MCA=MCA2) (DCA=DCA2)/BY=ID
7.     MISSING VALUES ALL (-999)
8.     COMPUTE MATCH = 2
9.     IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
10.    IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
11.    VARIABLE LABELS DCA2 'DAMBROT COMPUTER ATTITUDES (PHASE TWO)'
12.                    MCA2 'MAURER COMPUTER ANXIETY (PHASE TWO)'
13.                    DEM3 'PREFERRED MODE OF LEARNING'
14.    VALUE LABELS GROUP 1 'DISCUSSION' 2 'TUTORIAL' 3 'CONTROL'/
15.                 DCA2 1 'LOW CA' 2 'HIGH CA'/
16.                 MCA2 1 'LOW CA' 2 'HIGH CA'/
17.                 DEM3 1 'DISCUSSION' 2 'TUTORIAL'/
18.                 MATCH 1 'MATCH' 2 'NON-MATCH'
19.    CROSSTABS VARIABLES = DCA2 (1,2) GROUP (1,3)/
20.              TABLES = GROUP BY DCA2
21.    CROSSTABS VARIABLES = MCA2 (1,2) GROUP (1,3)/
22.              TABLES = GROUP BY MCA2
23.    ANOVA ERRORS BY DCA (1,2) GROUP (1,2) MATCH (1,2)
24.         /QUEST BY DCA (1,2) GROUP (1,2) MATCH (1,2)
25.         /DAMBB BY DCA (1,2) GROUP (1,2) MATCH (1,2)
26.         /MAUB BY DCA (1,2) GROUP (1,2) MATCH (1,2)
27.         /USAGE BY DCA (1,2) GROUP (1,2) MATCH (1,2)
28.    STATISTICS 1
29.    ANOVA ERRORS BY MCA (1,2) GROUP (1,2) MATCH (1,2)
30.         /QUEST BY MCA (1,2) GROUP (1,2) MATCH (1,2)
31.         /DAMBB BY MCA (1,2) GROUP (1,2) MATCH (1,2)
32.         /MAUB BY MCA (1,2) GROUP (1,2) MATCH (1,2)
33.         /USAGE BY MCA (1,2) GROUP (1,2) MATCH (1,2)
34.    STATISTICS 1
35.    FINISH
36.    /*
Command> USE ONEWAY CLE

Command> L

1.     //ONEWAY JOB I4855,HARRINGTON
2.     //STEP1 EXEC SPSSX
3.     //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.     //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.     //SYSIN DD *
6.     GET FILE = ONE/
7.          RENAME = (MCA=MCA1) (DCA=DCA1)
8.     GET FILE = TWO/
9.          RENAME = (MCA=MCA2) (DCA=DCA2)
10.    MATCH FILES FILE=ONE/FILE=*/BY=ID
11.    MISSING VALUES ALL (-999)
12.    VARIABLE LABELS DCA2 'DAMBROT COMPUTER ATTITUDES (2)'
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13.                      MCA2 'MAURER COMPUTER ANXIETY (2)'
14.     VALUE LABELS GROUP 1 'DISCUSSION' 2 'TUTORIAL'/
15.                 MCA2 1 'LOW CA' 2 'HIGH CA'/
16.                 DCA2 1 'LOW CA' 2 'HIGH CA'
17.     CROSSTABS VARIABLES = MCA2 (1,2) GROUP (1,2)/
18.              TABLES = GROUP BY MCA2
19.     CROSSTABS VARIABLES = DCA2 (1,2) GROUP (1,2)/
20.              TABLES = GROUP BY DCA2
21.     ONEWAY RATER1 BY GROUP (1,2)/
22.     STATISTICS ALL
23.     ONEWAY RATER2 BY GROUP (1,2)/
24.     STATISTICS ALL
25.     ONEWAY QUEST BY GROUP (1,2)/
26.     STATISTICS ALL
27.     ONEWAY STATE BY GROUP (1,2)/
28.     STATISTICS ALL
29.     ONEWAY TRAIT BY GROUP (1,2)/
30.     STATISTICS ALL
31.     ONEWAY DAMBB BY GROUP (1,2)/
32.     STATISTICS ALL
33.     ONEWAY MAUB BY GROUP (1,2)/
34.     STATISTICS ALL
35.     FINISH
36.     /*
Command> USE MANOVA CLE

Command> L

1.      //MANOVA JOB I4855,HARRINGTON
2.      //STEP1 EXEC SPSSX
3.      //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.      //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.      //SYSIN DD *
6.      MATCH FILES FILE=ONE/FILE=TWO/RENAME=(MCA=MCA2) (DCA=DCA2)/BY=ID
7.      COMPUTE MATCH = 2
8.      IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
9.      IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
10.     MANOVA ERRORS, QUEST, DAMBB, MAUB, USAGE BY DCA (1,2) GROUP (1,2) MATCH (1,2)
11.     MANOVA ERRORS, QUEST, DAMBB, MAUB, USAGE BY MCA (1,2) GROUP (1,2) MATCH (1,2)
12.     FINISH
13.     /*
Command> USE REGRES6

Command> L

1.      //REGRES6 JOB I4855,HARRINGTON
2.      //STEP1 EXEC SPSSX
3.      //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.      //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.      //SYSIN DD *
6.      MATCH FILES FILE=ONE/FILE=TWO/BY=ID
7.      MISSING VALUES ALL (-999)
8.      COMPUTE MATCH = 2
9.      IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
10.     IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
11.     REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT DAMBB
12.                            HOW EXP SEX GROUP
13.                            MATCH/
14.              DEPENDENT = DAMBB/STEPWISE/FORWARD
15.     REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT MAUB
16.                            HOW EXP SEX GROUP
```

```
17.                              MATCH/
18.               DEPENDENT = MAUB/STEPWISE/FORWARD
19.    REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT QUEST
20.                              HOW EXP SEX GROUP
21.                              MATCH/
22.               DEPENDENT = QUEST/STEPWISE/FORWARD
23.    REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT USAGE
24.                              HOW EXP SEX GROUP
25.                              MATCH/
26.               DEPENDENT = USAGE/STEPWISE/FORWARD
27.    FINISH
28.    /*
Command> USE REGRES7 CLE


Command> L


1.    //REGRES7 JOB I4855,HARRINGTON
2.    //STEP1 EXEC SPSSX
3.    //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.    //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.    //SYSIN DD *
6.    MATCH FILES FILE=ONE/FILE=TWO/BY=ID
7.    MISSING VALUES ALL (-999)
8.    COMPUTE MATCH = 2
9.    IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
10.   IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
11.   REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT DAMBA DAMBB
12.                              HOW EXP SEX GROUP
13.                              MATCH/
14.               DEPENDENT = DAMBB/STEPWISE/FORWARD
15.   REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT MAUA MAUB
16.                              HOW EXP SEX GROUP
17.                              MATCH/
18.               DEPENDENT = MAUB/STEPWISE/FORWARD
19.   REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT QUEST DAMBA MAUA
20.                              HOW EXP SEX GROUP
21.                              MATCH/
22.               DEPENDENT = QUEST/STEPWISE/FORWARD
23.   REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT USAGE DAMBA MAUA
24.                              HOW EXP SEX GROUP
25.                              MATCH/
26.               DEPENDENT = USAGE/STEPWISE/FORWARD
27.   FINISH
28.   /*
Command> USE REGRES8 CLE


Command> L


1.    //REGRES8 JOB I4855,HARRINGTON
2.    //STEP1 EXEC SPSSX
3.    //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.    //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.    //SYSIN DD *
6.    MATCH FILES FILE=ONE/FILE=TWO/BY=ID
7.    MISSING VALUES ALL (-999)
8.    COMPUTE MATCH = 2
9.    IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
10.   IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
11.   REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT MAUA DAMBB
12.                              HOW EXP SEX GROUP
13.                              MATCH/
```

```
14.                    DEPENDENT = DAMBB/STEPWISE/FORWARD
15.    REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT DAMBA MAUB
16.                        HOW EXP SEX GROUP
17.          .            MATCH/
18.                    DEPENDENT = MAUB/STEPWISE/FORWARD
19.    REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT DAMBA MAUA DAMBB
20.                        HOW EXP SEX GROUP
21.                        MATCH/
22.                    DEPENDENT = DAMBB/STEPWISE/FORWARD
23.    REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT DAMBA MAUA MAUB
24.                        HOW EXP SEX GROUP
25.                        MATCH/
26.                    DEPENDENT = MAUB/STEPWISE/FORWARD
27.    FINISH
28.    /*
Command> USE CRUM CLE

Command> L

1.     //REGCRUM JOB I4855,HARRINGTON
2.     //STEP1 EXEC SPSSX
3.     //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.     //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.     //SYSIN DD *
6.     MATCH FILES FILE=ONE/FILE=TWO/BY=ID
7.     MISSING VALUES ALL (-999)
8.     REGRESSION VARIABLES = MATH STATE MAUA MAUB/
9.                  STATISTICS=ALL/
10.                  DEPENDENT = MAUB/
11.                  ENTER STATE MATH/ENTER MAUA/
12.                  DEPENDENT = MAUB/
13.                  ENTER MAUA/ENTER STATE MATH/
14.                  DEPENDENT = MAUB/
15.                  ENTER MAUA/ENTER STATE/
16.    REGRESSION VARIABLES = MATH STATE DAMBA DAMBB/
17.                  STATISTICS = ALL/
18.                  DEPENDENT = DAMBB/
19.                  ENTER STATE MATH/ENTER DAMBA/
20.                  DEPENDENT = DAMBB/
21.                  ENTER DAMBA/ENTER STATE MATH/
22.                  DEPENDENT = DAMBB/
23.                  ENTER DAMBA/ENTER STATE/
24.    FINISH
25.    /*
Command> USE TTEST CLE

Command> L

1.     //TTEST JOB I4855,HARRINGTON
2.     //STEP1 EXEC SPSSX
3.     //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
4.     //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
5.     //SYSIN DD *
6.     GET FILE = ONE
7.     GET FILE = TWO
8.     MATCH FILES FILE=ONE/FILE=*/BY=ID
9.     MISSING VALUES ALL (-999)
10.    SORT CASES BY ID
11.    T-TEST GROUPS = SEX/VARIABLES = MATH STATE TRAIT DAMBA MAUA DAMBB MAUB
12.    T-TEST GROUPS = GROUP (3)/ VARIABLES = DAMBB MAUB TRAIT
13.    T-TEST PAIRS = DAMBA DAMBB
```

```
    14.      T-TEST PAIRS = MAUA MAUB
    15.      SELECT IF (GROUP EQ 3)
    16.      T-TEST PAIRS = DAMBA DAMBB
    17.      T-TEST PAIRS = MAUA MAUB
    18.      FINISH
    19.      /*
Command> USE NEWTST CLE

Command> L

     1.      //TTEST2 JOB I4855,HARRINGTON
     2.      //STEP1 EXEC SPSSX
     3.      //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
     4.      //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
     5.      MATCH FILES FILE=ONE/FILE=TWO/BY=ID
     6.      MISSING VALUES ALL (-999)
     7.      SELECT IF (DEM3 EQ 1 AND GROUP EQ 1)
     8.      TTEST GROUPS = MCA/VARIABLES = USAGE
     9.      TTEST PAIRS = MAUA MAUB
    10.      FINISH
    11.      /*
Command> USE QTEST

Command> L

     1.      //TTEST3 JOB I4855,HARRINGTON
     2.      //STEP1 EXEC SPSSX
     3.      //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
     4.      //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
     5.      MATCH FILES FILE=ONE/FILE=TWO/BY=ID
     6.      MISSING VALUES ALL (-999)
     7.      TTEST GROUPS=SEX/VARIABLES=QUEST
     8.      FINISH
     9.      /*
Command> USE CORR1 CLE

Command> L

     1.      //CORR1 JOB I4855,HARRINGTON
     2.      //STEP1 EXEC SPSSX
     3.      //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
     4.      //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
     5.      //SYSIN DD *
     6.      MATCH FILES FILE=ONE/FILE=TWO/BY=ID
     7.      MISSING VALUES ALL (-999)
     8.      SORT CASES BY ID
     9.      PEARSON CORR DAMBA DAMBB MAUA MAUB TRAIT STATE EST LOC RIG HOW MATH
    10.                  EXP QUEST RATER1 RATER2 ERRORS WITH USAGE
    11.      PEARSON CORR DAMBA DAMBB MAUA MAUB TRAIT STATE EST LOC RIG HOW MATH
    12.                  EXP QUEST RATER1 RATER2 ERRORS USAGE
    13.      OPTIONS 5
    14.      FINISH
    15.      /*
Command> USE INDEX CLE

Command> L

     1.      //INDEX JOB I4855,HARRINGTON
     2.      //STEP1 EXEC SPSSX
     3.      //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
     4.      //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
```

```
    5.     //SYSIN DD *
    6.     MATCH FILES FILE=ONE/FILE=TWO/BY=ID
    7.     MISSING VALUES ALL (-999)
    8.     COMPUTE MATCH = 2
    9.     IF (DEM3 EQ 1 AND GROUP EQ 1) MATCH = 1
   10.     IF (DEM3 EQ 2 AND GROUP EQ 2) MATCH = 1
   11.     COMPUTE INDEX = QUEST + ERRORS
   12.
   13.     REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT MAUA DAMBA
   14.                           HOW EXP SEX GROUP
   15.                           MATCH INDEX/
   16.                           CRITERIA=PIN(.06)/
   17.              DEPENDENT = INDEX/STEPWISE/FORWARD
   18.
   19.     ANOVA INDEX BY DCA (1,2) GROUP (1,2) MATCH (1,2)
   20.     STATISTICS 3
   21.
   22.     ANOVA INDEX BY MCA (1,2) GROUP (1,2) MATCH (1,2)
   23.     STATISTICS 3
   24.     FINISH
   25.     /*
Command> USE DEMO CLE

Command> L

    1.     //DEMO JOB I4855,HARRINGTON
    2.     //STEP1 EXEC SPSSX
    3.     //ONE DD DSN=M.I4855.PHASE1,DISP=SHR
    4.     //TWO DD DSN=M.I4855.PHASE2,DISP=SHR
    5.     MATCH FILES FILE=ONE/FILE=TWO/BY=ID
    6.     MISSING VALUES ALL (6)
    7.     FREQUENCIES VARIABLES = DEM1 DEM2 DEM3
    8.     PEARSON CORR DEM1 WITH DAMBA MAUA DAMBB MAUB
    9.     PEARSON CORR DEM2 WITH DAMBA MAUA DAMBB MAUB
   10.     REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT
   11.                           HOW EXP SEX GROUP DEM1 DEM2
   12.                           DAMBB/
   13.              DEPENDENT = DAMBB/STEPWISE
   14.     REGRESSION VARIABLES = EST LOC RIG MATH STATE TRAIT
   15.                           HOW EXP SEX GROUP DEM1 DEM2
   16.                           MAUB/
   17.              DEPENDENT = MAUB/STEPWISE
   18.     FINISH
   19.     /*
Command> USE KERMDAT1 CLE

Command> L UNN

1   1                   020801              0514591
2  145111112221211221221211122221222221222222111122122121221122222212212121211122
3  122222212121111131112444414442221224444322525352552422455555355132424443443
4  1344433334342222222222232322332
1   2                   900556              1
2  234121111222121212122121122211122222122221212121111112122211112222212122221211
3  212222121122212225122255442555255242554522225252525552533222555545233121422234
4  23444422443222212232221132232222
1   3                   907720              0605652
2  345222122122211222111111121222211111122 222 212221212121211122222 1121211112
3  321121111111111113551255452553134142444222225252525552422255555255223421423433
4  3244423422442222122232322323324
1   4                   906484              1022632
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2    43512121122121121121222122221212221111212  111222111221222122122222221111211212
3    4221111212121111223331254444242442421144422121415141441421144445542221413424442
4    424242444454432421212142232232231
1    5                 849204            092364115
2    52311111112112221211211122111211121122122221211221221221111112221222212211111122
3    52212121211121111132121443432412222433231245342334334222333454223221212211344
4    5424432323233223322223223322322222
1    6                 62251             0610651
2    63512111112121221221221222212122121222222221212112222111112222222211121221122
3    6222212221112121222321214544244534424355323224425353453522345555544233424423431
4    6213425555555212221311322232211232
1    7                 846151            0624651
2    75412121121122122222211122211121221121222121222111211121112211212222121211212
3    72112112122211213111224423322323224444343343535 2  4443333343445233223413423343
4    7343223444433243123224224324314224 2
1    8                 020764            1
2    84422111122111222121222112211212112212212211112212211211122222121222222 11
3    8212221212122112244112134343334243221444322324424234343222232544222421144224 41
4    812211554445313213322311332323 31
1    9                 067617            1
2    9 122212221212121222111222121212122111211111212221211211211212121222212212122212
3    91121121222121122425115514245325121134521111515151552411244455445233421425555
4    9545422222222313423322322342222 32
1    10                271674            1
2    10551211122221211221121121111222211112112221222222112221211112222112121212122 22
3    10222211112211112152322444243544222321355422224243524424232445543332331211232 22
4    1032222444444422223132222223222222 2
1    11                920077            1106581
2    11421222112222121212222121122211121111222212122212212112212221111212221212222 1212
3    11212221211211122411215555534444252132545222335253523525233455515422342142444 2
4    1142424444434423213321421431411 41
1    12                985336            1226642
2    122 1111222221222121111212111211121122122222222212221122222221111111212112112112 1121
3    12211212222211111241122442422242312444444432124333424324222334241424233111422 442
4    1222442444444221332322 3
1    13                587634            1021641
2    13222111212212122221221222221222121211122222222212211121112111111122221212121 1221
3    132122222222211111132312454442443232232344233  23 2525255253125455 4544334214244 42
4    1322442444233432222323122331232323
1    14                745505            0316662
2    145 12212122121221121121122122121211211121222122212212212111111221122121212212 112
3    14112212122121112232232454423234542424334323453435455342334  23 2312133424444 41
4    14144524445553232222223223323233 2
1    15                709324            0324651
2    153312121122  21222212222211212212112112112222  222222212112111222221 111222212 21
3    1521222122122122215112255534344513522254323244425353443523345515245223421424 444
4    1523443444434323112222322332212 22
1    16                847665            1014641
2    16332111211212121111112222212221211111122122122221212121211121211122211212111 22
3    161112111111221113341155451554154111355211211   1  1    1111   5     133121423442
4    1622422444444333223324333322 33134
1    17                662623            1219621
2    175 12222112121212122221122221112112122211221  22221121212121  22112  21221212212 2222
3    1721222122221122253311555553435125131544312424152525515122255554251232214234 41
4    17124115455543241124124214214124 2
1    18                064918            1130652
2    184 1211112111122222222112222212  22121222212122212212212111111222112211222222 122
3    181111222212221122311234434244323322142333322424343342433344443444443444424 442
4    1822344444444432222232322332222 232
1    19                962370            0216652
2    195 12222112212122221222211212211212211222222221122211111212211111212112122211 121212
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3 19222221222222222334215554144514411145541141512 1   2 221 35   522133421423432
4 195243244454432441341231144141142
1 20                      022161                        1
2 2053222111122   1112 111    122 222112222221122122222212111112 212212211222211
3 2012221222112211232122442454444555554452254I 252452455        433222422142
4 20545442222222212112123312212
1 21                      062528                    1116641
2 2135122111221211221222211222121211211222221212221111212221211222221211212212
3 21112111211121221554115555515541551115551111151515255151115555555133222123221
4 21111115555555151113125115424242
1 22                      642513                    0617652
2 2235122121112121222112121111212212221112122121212121222122112221121112221222211
3 22122121212111112342115445154224211544211215151525515222455555511234244421442
4 22324215555453133123243123213433
1 23                      869876                    1120631
2 23431221212112121122212112112222222112122212222221222122111212211222212222221
3 23212212212222111122112543423223232435325322453535454343334124333323441423124
4 23355433432432322233332212323323
1 24                      594168                    0503631
2 243 12111112121122122222211121111211212122222211121111111212221221221112221112121 22
3 24222211111121121211115525243423422332422122525252442222444242223244444424441
4 24222224444444342333343224323232232
1 25                      042950                    1013652
2 255512221 122212221121211222212111112 1211112221121212221111221212121212122212 22
3 2521221221212222251122442445523425554234255335454545522254555553 5233131121442
4 25244424444242221122123 233122231
1 26                      923586                    0310641
2 2645221211212211221222121222211122111111222111212211211222211112222211222212212
3 26212211221222122333214534255413412354442123 1 2535525222555  55323312342414
4 26222224555544242144124124314114
1 27                      786425                    0422651
2 275 12222122121211222221222221121212112122212122121112121111222122221121221222221 22211
3 27212222211211121333234414343432221343242233425352233323244445222333423123244
4 2754333232433242123243
1 28                      808755                    0801612
2 28221212212122122122212212212212121121111211112221211221212111111211122212212221
3 28112222222112111221324544322225233452443344334344235443511555412344444423444
4 2815554212221222222232224212221223
1 29                      866524                    0610652
2 2954222211221211221222221122211121121122222112121111121211121222221112222221222
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4 2944442332444324213322322442414131
1 30                      462092                    0826651
2 304512111122111122221222221112222111112221222222212122121112222212222121221211
3 302122222121222214214234243323453535421224443335444433434355513333344414244442
4 3022442444344432212231231232131131
1 31                      660393                    0703651
2 31341221212212112222212122122212121121122221 22221  2 2 211111 221122 122212222
3 312222111121221214212244442444243242444232 353535455243 35345545234312242344 2
4 3122422443444222232233232233232232
1 32                      784428                    0228652
2 32352212112212122221222121222112211211222211111121111112122112112221212122111222
3 32212122212121111311224434244423222244542244442424243242224444443424242444414442
4 3222222444444323223322323333231332
1 33                      946562                    0414631
2 33452212112212222212122222221112222122222211122221222121221121212222121112122212 12
3 332122222211212223221155555145323413145412243535213551532254545245241423421142
4 3322222444444432311331131133131131
1 34                      724496                    0114642
2 34   21212222212222112222122221112211111221121211212211112122112112222212121221112
3 342222111111222124213234342323222315442334242333 34 24223435 5435333121423444
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4  343344344443432222222332233232132
1  35              705739           1209651
2  3554112111221222111212212212121111111112222222111221211212111112111121111211121211221
3  3521222121111121214332345542445334242543333435352555534154345555554331214233422
4  3542522442444223323232322133221232
1  36              804448           0123651
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3  3621222122221211111311224424422224223253323233434353542423344454234333221424442
4  3622222444444323213313312232221243
1  37              084169           12    2
2  374322221 22 21 22 1 2211222 112212112222112222 122121222212222222221112222221
3  3721222222 22 22243321452535542152214551111451535445243334555515413312  2 243
4  374443244444444231123114
1  38              627878           071249215
2  38221211112212122221212111212212222111222122222121211212211112222222211122211122
3  3821222111211121113221155551555135113515531225252525551512155555553233414424445
4  38455531111112322232342242232323223
1  39              860874           0321631
2  393 222111221211122221212221221212111222222121211112112121121222122222222222211
3  392122212111211215214235134555112234544 322 4243  4543 4235   1  133122422221
4  3911411555555522222221222143232222
1  40              800082           0428631
2  404 221211221211221221211221221221212221222221212221121211111221222122221221121
3  4022222222211212122211323424344424242434233223442334332332243224433434344424424442
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1  41              921063           0209641
2  41442211212122221212122212112121221121121222212222221212222221111212122122211121221222
3  4121221111121211114112344342443242223344333223535353552522255555454233421423321
4  4122442424334322322223223222222322
1  42              681727           0814622
2  425 222221122121222122221122221111212212222121122121212122211112222222111112222222
3  42222221212121121214113255452444144223444332224253434435333355555253333423424441
4  42222225555553232133123124313131242
1  43              968726           1121642
2  4345221121221212221222211122122122222122211111212222111212212211111221221222211
3  4322222121211222141121555514541321425554412252525255241215555523222414444443
4  4322424244444432321322232232141231
1  44              863631           1126642
2  4433111111221211211111111222221211112112112221222211222221212111222121211211111112
3  4421222221222211114211155342444323423144423333535325524122555555555233122123434
4  4453543342232222432232322322222223
1  45              763450           0624662
2  454 222211222121222122221122121122121112 212 21212221211121 1212 2111111122221
3  4521222221212222251122452242251322424342332433434443342332444424423112442444442
4  4522222444444323212312322321322322
1  46              822636           0312652
2  463422221122121222122221122222121121122 222 11212212212111211122112  212122211
3  4621222222112122233122443424443322324443333342535255232235455442324134131431433
4  46444333323333242123223223213223232 32
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