NEGOTIATOR PERFORMANCE USING
COMPUTERIZED NEGOTIATION
SUPPORT SYSTEMS

Thesis

Submitted to

The College of Arts and Sciences of the

UNIVERSITY OF DAYTON

In Partial Fulfillment of the Requirements for

The Degree

Master of Arts in Psychology

by

Julie L. Garloch

UNIVERSITY OF DAYTON

Dayton, Ohio

May 1997

APPROVED BY:

Kenneth A. Graetz, PhD

Faculty Advisor

William F. Moroney, PhD

Faculty Reader

Donald J. Polzella, PhD

Faculty Reader

Concurrence:

F. Thomas Eggemeier, PhD

Chairperson, Department of Psychology

ABSTRACT

NEGOTIATOR PERFORMANCE USING COMPUTERIZED NEGOTIATION SUPPORT SYSTEMS

Name: Garloch, Julie L.

University of Dayton, 1997

Advisor: Dr. K. A. Graetz

The purpose of the present study was to explore the effects of 3 forms of negotiation support. The effects of the mental workload imposed by the 3 interfaces on the negotiator and the formation of integrative solutions were evaluated. Heart rate, eyeblink rate, and NASA-TLX scores served as multiple measures of mental workload. The outcomes of both negotiators on a negotiation task were also assessed. It was found that, contrary to expectations, a graphical presentation of the task did not result in lower cognitive workload as measured by heart rate and NASA-TLX scores. However, when examining the effects of the presentation style for male and female negotiators separately, it was found that the graphical presentation increased eyeblink rates for female negotiators, perhaps indicating a decrease in workload as compared to more traditional negotiation presentations. The absence of other hypothesized effects is in all likelihood the result of methodological limitations.

ACKNOWLEDGEMENTS

I would like to thank my committee members, Dr. Donald Polzella and Dr. William Moroney, for their suggestions throughout the course of this project. Their time and patience was greatly appreciated. I would also like to express sincere appreciation to Dr. William Moroney for providing the necessary physiological measurement equipment.

Thanks also go to Dr. Kenneth Graetz, my thesis advisor, for his guidance and support throughout the planning, implementation, and analysis of this research.

Finally, I could not have completed this project without the love and support of my family. Their patience and encouragement is especially appreciated.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

Overview

Throughout the course of a lifetime, you will be involved in thousands of negotiations. Some are more memorable than others, such as negotiating the salary for your first real job. Perhaps the majority involve simple tasks like choosing a movie or a vacation destination. Generally defined, negotiations are situations in which two or more people with different preferences and priorities confer in order to come to an agreement (Carnavale & Lawler, 1986; Carrol, Bazerman, & Maury, 1988).

Because negotiations are so pervasive, the area is rich in opportunities for research. The primary goal of the proposed research is to investigate ways to improve the ability of parties to negotiate effectively. This could be done by finding methods of dealing with some common perceptual problems exhibited by negotiators, fixed sum error and incompatibility error (Bazerman & Neale, 1983; Thompson & Hastie, 1990). Computer based negotiation support systems (NSSs) may facilitate negotiations eliminating these cognitive biases.

Past studies (e.g., Graetz, Macbeth, Seifert, Sacher, & Kozar, in press) have explored the potential benefits of these new systems, focusing on their ability to reduce the mental workload imposed on the negotiator. To date, all research in this area has relied on subjective, self-report measures of workload. Such measures are prone to memory errors because they are often collected after the task is over (Wilson, 1991). In addition, if a researcher is interested in changes in workload over the course of a task, it is intrusive to stop the task periodically to administer a subjective workload scale. Physiological measures are less intrusive and less prone to bias, allowing for a more detailed record of changes in workload throughout the course of the task. The proposed study will use two physiological measures and a subjective measure as multiple indicators of the mental workload imposed by three different levels of NSS support.

The first NSS interface will present the negotiator with issues and options in a strictly alphanumeric format. The second interface will provide low-level mathematical functionality to assist the negotiators in evaluating possible solutions. The third interface will present the issues and options graphically, allowing the negotiator to evaluate the possible solutions visually. Generally, it is expected that negotiators will benefit from a more graphical presentation of the negotiation problem. Such a will presumably lower the negotiator's mental workload.

Negotiation: Distributive and Integrative Agreements

What constitutes a negotiation? A negotiation may involve two or more people, although the most common type studied is the dyadic negotiation. This occurs when the negotiation involves two parties who are attempting to come to an agreement on one or more issues (Carnavale & Lawler, 1986; Carnavale, Pruitt, & Britton, 1979; Carnavale, Pruitt, & Seilheimer, 1981; Deutsch & Krauss, 1960; Fry, 1985; Hottes & Kahn, 1974; Tripp & Sondak, 1992). Although studies concerning multiple parties have been conducted (Bazerman, Magliozzi, & Neale, 1985), it has been argued that the majority of real-world negotiations occur between two parties who perhaps are representatives of larger constituencies (Bazerman & Neale, 1992). In addition, multiparty negotiations are far more complex than those between two negotiators, making research in a laboratory setting more difficult (Bazerman & Neale, 1992). Furthermore, when it comes to determining the forces at work in a negotiation, multiparty negotiations are also much harder to interpret (Lewicki & Litterer, 1985). Therefore, dyadic negotiations simplify the interpretation of results and are used more widely in laboratory studies.

Because a negotiation involves an agreement to allocate a limited amount of resources (Thompson & Hastie, 1990), a certain amount of skill is necessary to achieve an agreement that is acceptable to the negotiator or the constituency. Unfortunately, negotiators frequently arrive at suboptimal agreements when more favorable solutions exist for both parties. The failure to reach more mutually beneficial outcomes can often be attributed to a common phenomenon known as fixed pie perception (Bazerman, Magliozzi, & Neale, 1985; Thompson & Hastie). This bias causes negotiators to view their interests as diametrically opposed to that of the other party, thereby framing the interaction as a win-lose situation (Bazerman, Magliozzi, & Neale; Thompson & Hastie). A win-lose situation is one in which what one side gains, the other side loses. Some researchers have called this phenomenon the incompatibility error because negotiators tend to think that their preferences on each issue are incompatible with the other negotiator's preferences when, in fact, some degree of compatibility may exist.

Consider two children dividing up 10 pieces of candy. Both children want all the candy, yet there is no way to resolve the issue so that each child has all 10 pieces. In order for the second child to get any candy, the first child must share. The result of such a win-lose situation is often a distributive solution, whereby opponents split the resources equally. Instead of a win-lose orientation, many negotiation situations provide the opportunity for win-win solutions in which both parties increase their earnings over the strictly distributive solution. Walton and McKersie (1965) have referred to these solutions as integrative. Whereas a distributive solution is one in which there is a clear "winner" and a clear "loser", an integrative solution allows divergent interests to be reconciled and the joint benefit to both participants to be increased (Pruitt & Rubin, 1986). A distributive solution often relies on a decision made by participants to split the issues right down the middle, only partially satisfying either negotiator (Carnavale & Lawler, 1986). An integrative solution occurs when there are many possible ways to arrive at an agreement, some of which may allow greater joint benefit than a strictly distributive solution (Carnavale & Lawler).

The ability to find an existing integrative solution is highly desirable. Pruitt (1991) has described several methods for discovering an integrative agreement. They include: (a) compensation, (b) cost-cutting, (c) bridging, and (d) logrolling. Compensation occurs when one participant is allowed to "win" what they want and then they give something to the other participant in return. An example of this would be children who are given lollipops in return for picking up and putting away their toys. The theory behind cost-cutting is that the participant may incur a cost and this creates the conflict. If the cost to one participant is reduced, the other participant is allowed to get what he or she wants without causing undue hardship for the first participant. Bridging, however, may occur when a shortage of resources is responsible for the conflict, requiring the addition of resources. The last method for achieving an integrative agreement, and the focus of this study, is the ability to logroll issues when several issues are being considered. This method involves concessions by both parties on their low priority issues.

An example of a negotiation that illustrates these orientations might occur when buying a house. The sellers want $90,000 for the house and the buyers want to pay $76,000. However, the buyers have just been transferred to the area and must move in immediately. The buyers want to take possession of the house in 30 days but the sellers say they need 90 days to move out. The distributive agreement to this problem would lead to a price of $83,000 and possession in 60 days. Although this is a compromise by both parties on both issues, neither side gets exactly what they want. The integrative solution would be a selling price of $90,000 and possession in 30 days. In this manner, both the buyers and the sellers get what is most important to them. They give up something on one of the issues in order to get everything on the issue that is of most importance to them.

This example illustrates yet another type of error known as <u>fixed sum error</u>. In a multi-issue negotiation, negotiators can erroneously assume that the issues have the same relative importance to the other party (Bazerman & Neale, 1983; Thompson & Hastie, 1990). In the real estate example, the sellers may assume that because price is their most important issue, it is the more important issue for the buyers also. In the given example, this was clearly not the case. Because integrative agreements are accomplished due to mutually beneficial trades, this error leads to the removal of any possibility for an integrative agreement. Past research has focused primarily on situational variables such as whether the negotiator is competitive or cooperative (Carnavale & Lawler, 1986; Dahl & Kienast, 1990; Deutsch & Krauss, 1960), the visibility of the opposing negotiator (Carnavale, Pruitt & Britton, 1979; Carnavale, Pruitt, & Seilheimer, 1981; Fry, 1985), the gender of the parties involved (Gerhart & Rynes, 1991; Hottes & Kahn, 1974), and the time pressure placed on the negotiator (Carnavale & Lawler). These variables may affect negotiated solutions via the activation of cognitive biases.

Negotiator orientation. The research regarding individualistic or cooperative negotiator orientation has led to mixed conclusions regarding its effects. Dahl and Kienast (1990) found that those dyads with a competitive orientation arrived at solutions with more joint value than those with a cooperative orientation. Deutsch and Krauss (1960) took a different approach and came to a different conclusion. They assumed that a competitive orientation would lead to an increase in perceived threat. They found that perceived threat by at least one party decreased the dyad's ability to reach an agreement. It has been suggested that persons in a competitive situation tend to make simplifying assumptions regarding the decision patterns of their opponents in order to make the task cognitively manageable (Carroll, Bazerman, & Maury 1988). This supports Deutsch and Krauss' findings.

Negotiator visibility. Visibility of negotiators, either to the other party or to their constituencies, has been another area of interest. Carnavale, Pruitt, and Britton (1979) found that surveillance by the constituents inhibits the dyad's logrolling and the development of integrative agreements. They attributed this to the desire of the negotiator to appear strong to his or her constituency by not taking large "losses" on a single issue. In a related study (Carnavale, Pruitt, & Seilheimer, 1981), visual access to the other negotiator resulted in decreased information exchange and increased pressure tactics when accompanied by high accountability to a constituency. Based on these and other studies (see Druckman, 1994), negotiators with an audience seem to view the concessions needed to reach an integrative solution as indications of weakness and may miss the opportunity to reach the maximal joint benefit.

Negotiator gender. Gerhart and Rynes (1991) found a difference between males and females regarding relative gains made through negotiation. They found that males gained more than females from the act of negotiating. In addition, Hottes and Kahn (1974) found that males were more cooperative than females in reaching a win-win solution. They concluded that males are more inclined towards maximizing earnings than females. Conversely, the behavior of females was viewed as more determined by the gender and physical attributes of their partner. Another explanation for these differences is that females are more likely to view the negotiation as a test of their intelligence and therefore behave defensively, leading to the impression of increased competition (Coleman, 1982; Hottes & Kahn).

Another body of literature exists which may also contribute to differential gender effects in negotiations. Particularly, a number of personality characteristics may be involved. Specifically, females may be more oriented towards preserving harmony and less self-assured than male negotiators (Ragins & Sandstrom, 1989).

Time pressure. A fourth variable of interest is time pressure and its effects on negotiators' ability to achieve integrative solutions. Time pressure, as experienced by negotiators, can stem from the presence of a deadline set by the constituency or perhaps the presence of increasing costs as the negotiation continues. One might expect that as time pressure increases, the possibility of an integrative resolution would decrease. This has been observed when participants were in a competitive orientation (Carnavale & Lawler, 1986).

Negotiation Support Systems

Of interest to many investigators are techniques for overcoming these barriers that limit integrative bargaining. It has been suggested that computer based Negotiation Support Systems (NSSs) could be developed to facilitate the discovery of integrative solutions by enhancing information retention, retrieval, and processing (Seibold, Heller, & Contractor, 1994). Today, computers are already used in the negotiation arena (Wheeler, 1995). For example, they have been used to examine alternative distributions of business resources via spreadsheets or to communicate via e-mail with collaborators in different geographical areas. It would be just another step forward to develop support systems specifically for negotiations. Already, specific NSSs are being developed and tested (e.g., Jarke, Jelassi, & Shakun, 1987; Samuelson, 1995; Warbelow & Hoffman, 1987), most of which use alphanumeric displays to organize and display the issues clearly. While some recent studies have demonstrated beneficial effects of NSSs (Jelassi & Jones, 1988; Kersten, 1985), others have shown only a moderate effects (e.g., Graetz et al., in press). This interest in the development of NSSs seems to be an outgrowth of the more general research in the development of group decision support systems to aid in multi-party coordination of resources (see Siebold, Heller, & Contractor for a review).

The typical display format for a negotiation simulation is alphanumeric. Examples of some common alphanumeric displays include road signs, telephone books, and newspapers. Tullis (1981) has proposed that while a graphical display of information may improve performance over alphanumerical displays, the effects are quite dependent on the task involved. Nielson (1993) agreed with this, saying that, although specialists in interface design often praise the usability of graphical interfaces, most studies are done regarding specific applications (i.e., economic models or sales oriented programs). Graphical interfaces may be useful in one situation (e.g., sales), but may not be useful in another situation (e.g., salary negotiations). Recent research has indicated that representing the negotiation graphically increases the benefit to both participants (Graetz et al., in press). In addition, in a non-negotiation task, response speed was found to be higher when data were displayed graphically than when data were displayed (Tullis).

Mental Workload

We might think of multi-issue negotiations in terms of the mental workload involved in considering alternative solutions, dealing with the social perceptions involved, and the complexity of the issues on the table (Graetz et al., in press). The assumption that makes mental workload applicable to this situation is that humans have a limited amount of resources to devote to processing information in the time available (Adams, 1989). If workload is increased and exceeds the negotiator's capacity, performance on the task decreases and errors occur (Adams; Wickens, 1992). Thus, anything that decreases mental workload should increase the probability of both participants attaining a high value in the negotiation.

Two ways to measure relative workload are subjective measures, (e.g., questionnaires) and physiological measures. Previous research utilizing physiological measures has mainly focused on military applications such as aviation. It is believed that measures of mental workload have an even wider range of applicability, including the study of negotiation processes. There may, however, be a problem with the sensitivity of physiological measures in general due to a ceiling effect (Wilson, 1991). There is a question as to the degree to which these measures are able to detect changes in workload amount. They may work at a gross level, discriminating between low and high levels of workload, but may fail in discriminating between finer levels, such as between medium and high levels. Further research needs to be conducted in order to assess the true sensitivity of each individual physiological measure, such as eyeblink rate, interblink interval, heart rate, etc. Physiological measures do, however, have at least one advantage over subjective measures in that they are less intrusive (Wickens), making them well suited for the investigation of negotiation behavior. In the current study, two main physiological measures, heart rate and eyeblink rate will be used. What follows is a selective review of the research regarding these measures.

Heart Rate Measures

The use of heart rate measures in workload assessment has been widely studied (see Wilson, Purvis, et al., 1987; Kakimoto et al., 1988; Wilson, 1991, 1993). However, there are many possible ways to measure heart functioning and a large number of experimental situations in which they might be used. Few studies explore the same experimental task and even fewer utilize the same measures.

Perhaps the most widely used heart activity measure is heart rate, also known as the interbeat interval. This is measured as the number of heart beats per minute or the amount of time which occurs between successive R waves (Gawron, Schflett, & Miller, 1989). Another measure which shows great promise is heart rate variability. This is a measure of how stable the heart rate is.

Heart activity is usually measured via an electrocardiogram (ECG), which records heart activity. As the heart beats, electrical forces, strong enough to be detected by electrodes placed on the surface of the skin, are generated (Marvin, 1960). A line is generated on the ECG display that reflects the electrical activity of the heart. When the heart is between contractions, this line is horizontal and smooth. Each heart beat is accompanied by electrical activity which can be recorded by the ECG as a series of waves (see Figure 1). These waves are referred to as P,Q, R, S, and T waves (Marvin). After the T wave, the line is again horizontal and smooth for a short time while the heart rests. Then the heart beats again, producing another PQRST wave group. This is a very identifiable waveform and easily monitored. Typically, the R portion of the wave, the highest and most clearly defined peak, is used in the measurement of heart rate and heart rate variability.

The heart beat is very strong and easily detectable via cutaneous electrodes. In addition, heart rate is considered to be a non-intrusive measure in that the electrodes are easily attached and worn. One problem that might be encountered is that any physical activity may cause an increase in heart rate regardless of workload. Thus, it is important to limit the movement of the person or to document any physical movements and so they can be considered when analyzing and interpreting the results.

This measure has been utilized in several studies using various methodologies, most of which focuses on aircraft and flight. The major underlying theme is that periods of increased workload should be indicated by an increased heart rate (Wilson, Purvis, et al., 1987; Kakimoto et al., 1988; Wilson, 1991, 1993). McCloskey, Morrow, and Perez (1988) found that heart rate was higher during the landing segment of simulator flight (arguably the hardest segment) than in any other segment. One exception to this seems to occur with air traffic controllers who, with more airplanes to handle, show no increase in heart rate (Costa, 1993). In addition, it appears that heart rate decreases with task

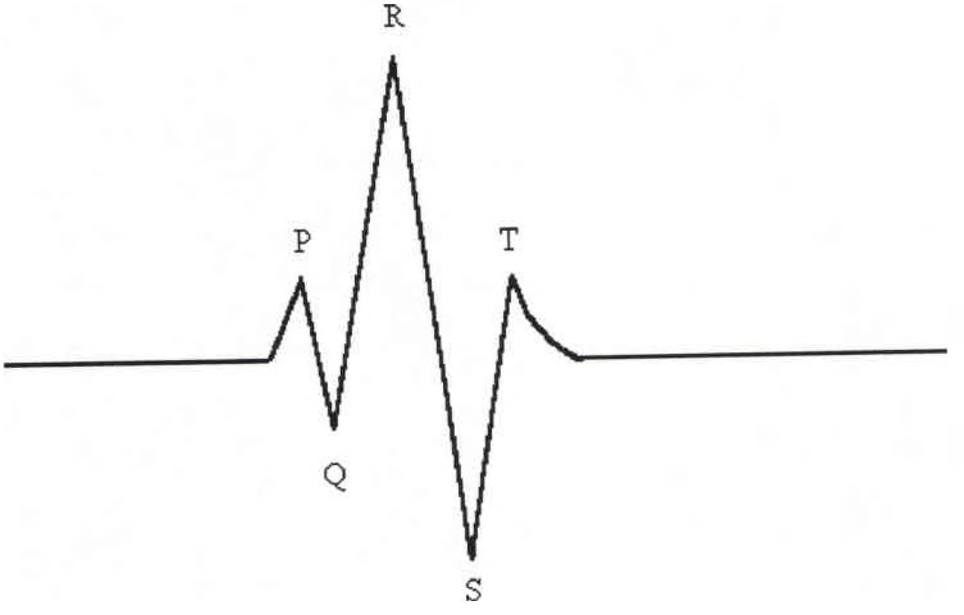

Figure 1. Normal heart beat.

duration, especially during vigilance tasks (Andreassi & Juszczak, 1984; McCloskey, 1987).

Another aspect of the aviation and heart rate connection is the varying difficulty levels of the different flight segments. This may relate back to the increased workload idea if we accept that increased difficulty yields increased workload. In any case, it seems that increased difficulty leads to increased heart rate. Wilson (1991) found that heart rate increased up to the bombing portion of a flight, a segment requiring great skill and precision. Alberry (1988) and Jorna (1993) found similar results, with heart rate increasing along with difficulty. Casper and Kantowitz (1987) found a similar response, noting an increased heart rate from baseline while performing a divided attention task in both the auditory and visual modalities.

A slight variation on this theme was carried out by Gellatly and Meyer (1992). In a non-aviation related task, they gave participants different goals to work towards. They varied the goal difficulty and found that there was a greater change in heart rate for more difficult goals. Not only does heart rate increase with goal difficulty, but heart rate variability decreases (Jorna, 1993). This might indicate that the increased difficulty leads to increased concentration and the activation of the body's natural reaction to pressure. This natural reaction is, in many cases, to conserve resources. In this example, this may lead to decreased variability in the heart rate. However, the type of task may make a difference. Jorna's study dealt with flight related tasks. McCloskey (1987), however, used a spatial task and found no effect on heart rate variability for differing difficulty levels of the task.

Another question that might arise concerns the difference between measurements taken during a simulation versus measurements taken during an actual task. The research addressing this question was done to compare simulated flight versus actual flight. The literature shows that there is a clear difference between the two types of flight. Heart rate showed greater changes in actual flight than in a simulator (Wilson, Purvis, et al., 1987; Wilson, 1991). Specifically, real flight can show 40% to 50% increases in heart rate while simulated flight shows increases of only about 10% (Wilson, 1991). Thus, when conducting laboratory simulations, we might expect to obtain a smaller fluctuation in heart rate with increases in workload than might actually occur in the real world.

Many other aspects of flight have been studied using heart activity measures, but few have been replicated. Research seems to cover a large number of different topics relating to different tasks, and is not easily condensed. As can be seen from the literature cited in this review, there seems to be a need for research focusing on the use of heart measures in areas other than aviation.

Eyeblink Measures

There are two different types of eyeblinks: elicited and spontaneous (Stern, 1987). Elicited eyeblinks are responses to a stimulation of the eye itself or the surrounding area. Spontaneous eyeblinks, however, are traditionally thought of as a way to periodically cleanse the eye and to maintain a protective layer of fluid to moisten the eyeball. However, it is well established that newborn infants blink only once or twice every three minutes as compared to the normal adult rate of fifteen to thirty blinks per minute. This rate is reached at the time of adolescence. Even allowing for a gradual increase in the need for moistening of the eye with age, it is quite unlikely that the difference between the two blink rates is due to a difference in lubrication needs alone. This difference has been attributed to cognitive and affective variables (Stern).

Although there are multiple measures of eyeblinks, three that are commonly used are blink rate, blink closure duration, and blink latency. Blink rate refers to the number of blinks per minute. Blink closure duration, as depicted in Figure 2, generally refers to the "time between the point where a blink achieves half of it's total amplitude, and the point, in the reopening phase, at which it recrosses that same...level" (Stern, Goldstein, & Dunham, 1988, p. 35). The third measure, blink latency, is the time from the end of a stimulus presentation to the point where the next blink occurs (see Figure 3; Stern, Walrath, & Goldstein, 1984).

Eyeblink measures can be recorded using several techniques of varying levels of sophistication. Among the least sophisticated methods is the use of a video camera to record the eye movements or attaching a string to the eyelid and using a potentiometer to measure closure and opening (Stern, Walrath, et al., 1984). One of the more frequently used methods is electrooculography (EOG). The EOG is based on the normal potential difference that exists between the cornea and the retina of the eye (Andreassi, 1989). Electrodes are affixed above and below the eye. When the eye is open, a positive baseline state exists, which is the result of a combination of the positively charged cornea and the negatively charged retina. Movement of the eyelid causes a change in the potential difference. As the eyelid moves downward over the cornea, an increase in the positivity occurs (Stern, Walrath, et al.). Correspondingly, as the eyelid moves back upward, an increase in negativity occurs.

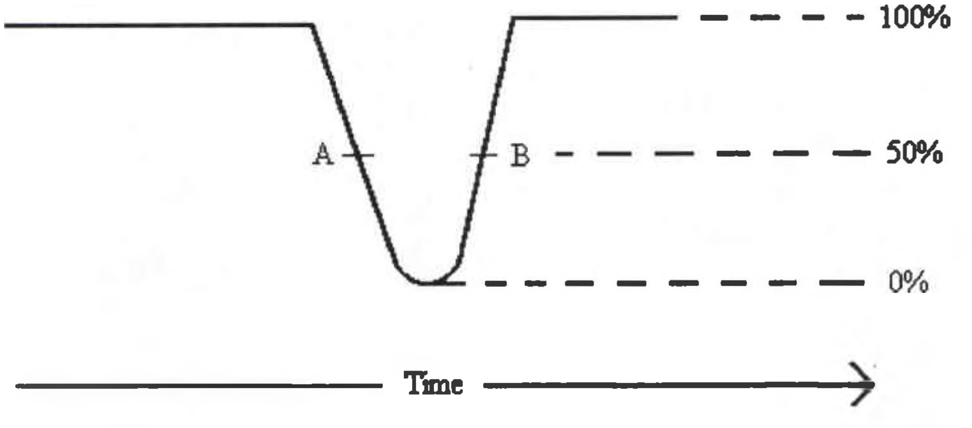

Figure 2. Blink closure duration. The time between the point where a blink reaches half it's amplitude (Pt. A) to the point in the reopening phase where it recrosses the same level (Pt. B).

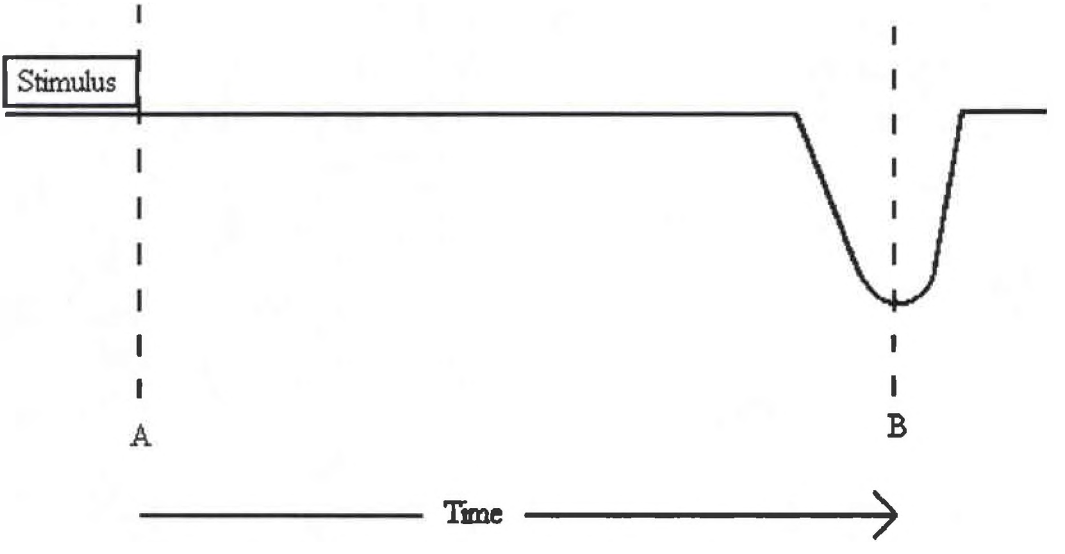

Figure 3. Blink latency. The time from stimulus offset (Pt. A) to the point where the next blink occurs (Pt. B).

These changes are all recorded by the EOG. Although the use of EOG as a measurement device seems quite straight forward, there are a few problems which could complicate interpretation of the data. These problems, including slow drift and the existence of skin potentials in the same frequency as the EOG signal, can be controlled by careful and consistent laboratory techniques and careful skin preparation before application of the electrodes (Andreassi, 1989). Researchers also believe that the use of electrodes with the EOG is tolerable in a laboratory study but may be impossible when attempting to monitor attention in a real-world situation (Stern, 1992). This is because the use of electrodes restricts movement to a great extent. By restricting movement, participants may actually alter the way they would have performed the task in order to accommodate the limited range of motion.

Another problem with the interpretation of the EOG signals is that people sometimes shift their gaze up or down without blinking. Vertical eye movements look very similar to blinks on an EOG recording (see Figure 4). The way they can be discriminated is by the form of the final voltage deflection (Stern, Goldstein, et al., 1988). A vertical saccade has a more gradual slope on the deflection, while an eyeblink has a sharper slope.

Much research has linked various aspects of eyeblink data to input modality, task difficulty, expectancy, nature of the task, and perceptual or cognitive burden placed on the operator (Stern, 1987). There are, however, a few other possible explanations for differential blink measurements. These include anxiety and fatigue (Stern, 1992). Anxiety can be caused by a number of factors, including situational elements regarding the experimental setting. Research has been sparse, and so far inconclusive, regarding the effect of anxiety on eyeblinks. However, if it were true that high anxiety produced higher

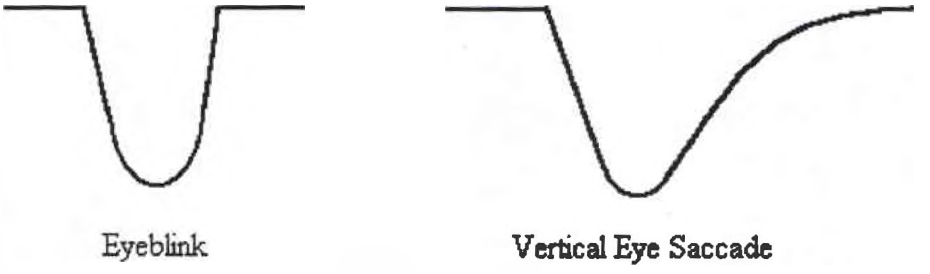

Figure 4. The difference between an EOG representation of an eyeblink versus a vertical eye saccade. A saccade is an eye movement without eyelid closure.

blink rates, then a laboratory situation in which a participant is attached to electrodes may not be a valid way to measure the load imposed on the operator by the experimental manipulation. Several studies (see Bauer, Strock, Goldstein, Stern, & Walrath, 1985; Goldstein, Walrath, Stern, & Strock, 1985; McCloskey et al., 1988; & Stern, Boyer, & Schroeder, 1994), however, have attempted to deal with this potential problem by taking baseline measurements before the task begins and comparing these to the measures obtained during the task.

Fatigue can also act to influence blink measurements. Numerous studies have linked fatigue to various types of measures. One general conclusion is that blink rate and blink duration increase with time on task (Bauer, Strock, Goldstein, Stern, & Walrath, 1985; Goldstein, Walrath, Stern, & Strock, 1985; McCloskey et al., 1988; Stern, Boyer, & Schroeder, 1994; Stern, Goldstein, & Dobkin, 1992; Stern, Walrath, et al., 1984).

Each of the three common measures has in some way been linked to cognitive variables. The consensus among researchers is that blinks occur at points during the course of processing information where people are not required to take in or process any information (Bauer et al., 1985; Goldstein et al., 1985; Stern, 1987, 1992; Stern, Goldstein, et al., 1992; Stern, Walrath, et al., 1984). This means that blinks should occur at times when attentional demands are at their lowest. This has been seen in studies which show that the duration of a blink decreases as a stimulus approaches (Stern, 1992). Typically, when a response is needed to a stimulus, blinks tend to be deferred after presentation of the stimulus as long as possible. If possible, blinks are held off until after the response action is initiated (Stern, Goldstein, et al., 1992). Another study which illustrates this point found that average blink durations were shorter when pilots were engaged in threat avoidance and attacking situations, typically times when attentional demands are high (Stern, 1992).

Using a Sternberg memory task, Stern (1987) found that there was a decreased level of blinking as the participant approached the time of the presentation of a to-be remembered memory set; and the larger the anticipated memory set, the longer the blink latency. This can be interpreted as an indication that blink latency is most affected by information processing. Such processing would take longer for more complex tasks.

This information regarding blink latency combined with the information from another experiment by Stern, Goldstein, and Dobkin (1992) leads to an interpretation of the meaning of blink latency measures. Blink latency is usually measured after the presentation of the stimulus, but before a response is required (see Figure 2). The nature of the stimulus, however, appears to affect the latency. As long as the stimulus is of a perceptual nature, which doesn't require any elaborate internal processing, the blink latency won't be affected by the difficulty of the task. However, if the stimulus is of a cognitive nature such as would be the case during a negotiation, and requires the retention and/or manipulation of information, then latency would be affected by the difficulty of the negotiation.

McCloskey et al. (1988) conducted numerous studies regarding physiological measures of workload, including eyeblink measures. In evaluating blink rate in relation to various flight segments, they found that blinks decreased during banking maneuvers more than any other part of the flight. This lends more credence to the fact that blink rate decreases as the difficulty of the task increases, as banking is typically more demanding than straight and level flight.

In summary, numerous studies have shown that, as demands on the participant's attention increase, the blink rate and duration decrease (Bauer et al., 1985; Stern, 1987; Stern, Walrath, et al., 1984). It has also been determined that, as time on task (fatigue) increases, blink rate and duration increase while latency decreases (Bauer et al.; Goldstein et al., 1985; McCloskey et al., 1988; Stern, Boyer, et al., 1994; Stern, Goldstein, et al., 1992; Stern, Walrath, et al.). The general conclusion made by many of the researchers is that eye blinks usually occur at times when attention is not strictly required, such as when not taking in new information, when processing has ended, or a response selected (Bauer et al.; Goldstein et al.; Stern, 1987, 1992; Stern, Goldstein, et al.; Stern, Walrath, et al.).

By combining the effects of the three different eyeblink measures, it may be possible to compile an even more reliable way to measure and predict mental workload. In the end, an even more reliable workload measure may result from combining not just eyeblink measures, but other physiological measures, performance measures, and subjective measures.

<u>The Current Study</u>

The current focuses on the interface style of the negotiation support system (alphanumeric, mathematical help, graphical), the gender of the negotiator, and the effects of these two variables on physiological and subjective measures of mental workload (eyeblink rate, heart rate, NASA-TLX). It is expected that the use of a graphical interface style will decrease mental workload experienced by the negotiator and that this will be indicated by decreased heart rate, increased eyeblink rate, and decreased overall workload rating on the NASA-TLX. In addition, it is expected that the graphical interface will increase the joint benefit achieved relative to the alphanumeric interface or the mathematical help interface. The mathematical help interface incorporates a computer based calculator so that participants will not have to add point values mentally. Due to the added help that this interface affords, it is expected that, relative to the alphanumeric display, the mathematical help interface will decrease the mental workload of the negotiator (as shown by decreased heart rate, increased eyeblink rate, and decreased overall workload ratings on the NASA-TLX) and increase the joint benefit score.

It is also anticipated that there will be an interaction between gender and in terms of total point value. Specifically, female negotiators are expected to benefit more from the graphical display than the male negotiators. This is based on previous research that found differential effects for male and female participants (Gerhart & Rynes, 1991; Graetz et al., in press) in a simulated negotiation task. The same interaction is expected for mental workload. Specifically, females will experience a greater decrease in workload (using the previously mentioned measures) than males when using the graphical interface style. This is based on previous research that indicated that males and females negotiate differently (Coleman, 1982; Hottes & Kahn, 1974; Gerhart & Rynes, 1991).

In addition, it is expected that cognitive biases (as measured by developer ratings of the interests of the other party and the degree to which they disagree on the issues) will differ for each of the interface styles. It is expected that those participants in the graphical interface condition will have the fewest cognitive biases and those in the alphanumeric condition will have the most cognitive biases.

It is also predicted that there will be a negative relationship between workload scores and the total point total achieved by both negotiators. A positive correlation is predicted between the presence of cognitive biases (issue importance and issue conflict) and workload measures, so that increased workload is associated with a higher presence of cognitive biases.

CHAPTER II

METHOD

Participants

A total of 60 people participated in partial fulfillment of an introductory psychology course requirement and each received $10.00 for his or her participation. A 2 x 3 between-subjects factorial design manipulated negotiator gender and interface style (alphanumeric, mathematical help, or graphical; see Table 1). The 30 male and 30 female participants were randomly assigned in equal numbers to one of the three interface styles.

Negotiation Task

The task was a slight variation on one previously utilized in integrative bargaining studies (see Bazerman, Magliozzi, & Neale, 1985; Pruitt, 1981; Thompson, 1990). Participants played the role of a theme park developer. They were told that they were negotiating with a land manager for the state regarding the construction of a new theme park. Participants were told to negotiate on four issues: park acreage, earliest opening date for the park, the percentage of the park's gross profit to go to the state, and the number of in-state employees to be hired by the park. As shown in Table 2, each issue had five alternative offer levels. Each offer was followed by the point values (in parentheses) to the negotiator if the agreement included that offer level (except in the graphical interface condition). This set of issues included one compatible issue (earliest opening date), for which the point values were equal for both players. One issue was a zero-sum issue (percent gross profit), in which the point values for the two players were equal and diametrically opposed. The remaining two issues (percent in-state employees and

Table 1a

Experimental Design

	Interface Style		
Gender	**Alphanumeric**	**Mathematical Help**	**Graphical**
Male	10	10	10
Female	10	10	10

Note. The numbers in the cells are the number of participants.

Table 1b

Experimental Design Following Subject Loss Due to Failure to Reach an Agreement

	Interface Style		
Gender	**Alphanumeric**	**Mathematical Help**	**Graphical**
Male	07	08	10
Female	06	10	07

Note. The numbers in the cells are the number of participants.

Table 2

Payoff Schedules for the Negotiation Task

Park Developer

Acres	Earliest opening day	% of gross profit	% of in-state employees
110 acres (4000)	1 year (2400)	2% (2400)	10% (1600)
100 acres (3000)	2 years (1800)	4% (1800)	20% (1200)
90 acres (2000)	3 years (1200)	6% (1200)	30% (800)
80 acres (1000)	4 years (600)	8% (600)	40% (400)
70 acres (0)	5 years (0)	10% (0)	50% (0)

Land Manager

Acres	Earliest opening day	% of gross profit	% of in-state employees
70 acres (1600)	1 year (2400)	10% (2400)	50% (4000)
80 acres (1200)	2 years (1800)	8% (1800)	40% (3000)
90 acres (800)	3 years (1200) .	6% (1200)	30% (2000)
100 acres (400)	4 years (600)	4% (600)	20% (1000)
110 acres (0)	5 years (0)	2% (0)	10% (0)

Note. Points for each offer level are listed in parentheses.

acres) were the issues with integrative potential. The acres issue was valued more by the park developer and percent of gross was the issue of greatest importance to the land manager. The distributive solution to the negotiation included 90 acres of land, an opening date of 3 years, 6% of gross profit to go to the state, and 30% of the employees to be in-state. The integrative solution included 110 acres of land, an opening date of 1 year, 6% of gross profit to go to the state, and 50% of employees to be in-state. The solutions are depicted in Figure 5.

Independent Variables

Interface style. During the negotiation session, all participants were presented with a computerized version of the payoff schedule. Three interfaces were used. Each of the interfaces was designed using Visual Basic 3.0 for Windows.

The negotiators in the alphanumeric condition viewed the payoff schedule of offers via a series of pull-down menus. Each issue menu pulled-down to show the five possible offer levels followed by the point values associated with them in parentheses. Figure 6 shows a stylized representation of the alphanumeric interface. Another menu (final offer) allowed the negotiator to make a final offer. The display also included a manager's reply box, windows presenting counter offers from the land manager, a "send" button for the developer, and buttons corresponding to possible replies to the counter offers.

The negotiators in the mathematical help condition viewed the interface used in the alphanumeric condition. In addition, two "total-points" boxes appeared on the display. As the participant clicked the left mouse button (LMB) on an offer, the total points summed over all four issues were displayed in one of these boxes. The total points for each counter offer was displayed in the other box. A stylized representation of this interface can be seen in Figure 7. The third interface was a graphical representation of the offers. This NSS, called the SCAN interface (Supporting Conflict Analysis and Negotiation), can be seen in Figure 8. Once again, the payoff schedule was presented via a series of pull-down menus,

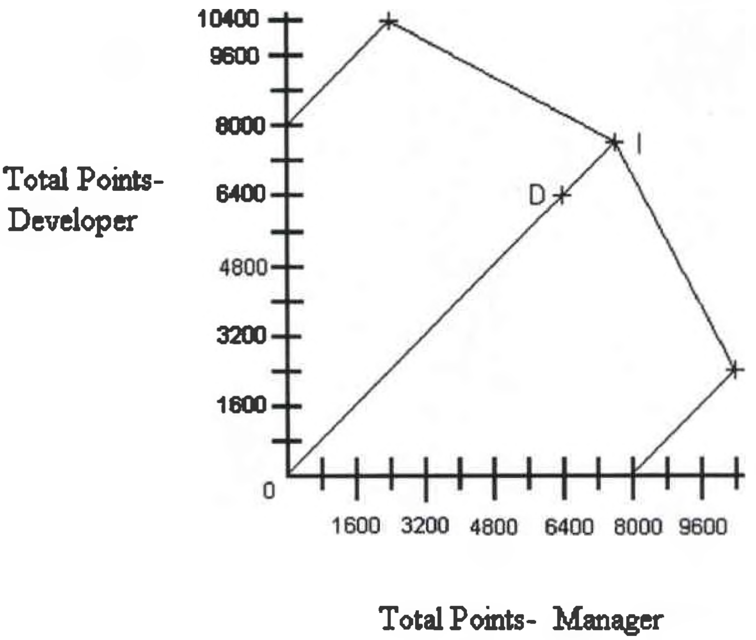

Figure 5. Pareto frontier for the negotiation task. The distributive solution is represented by the "D" and the integrative solution is represented by the "I".

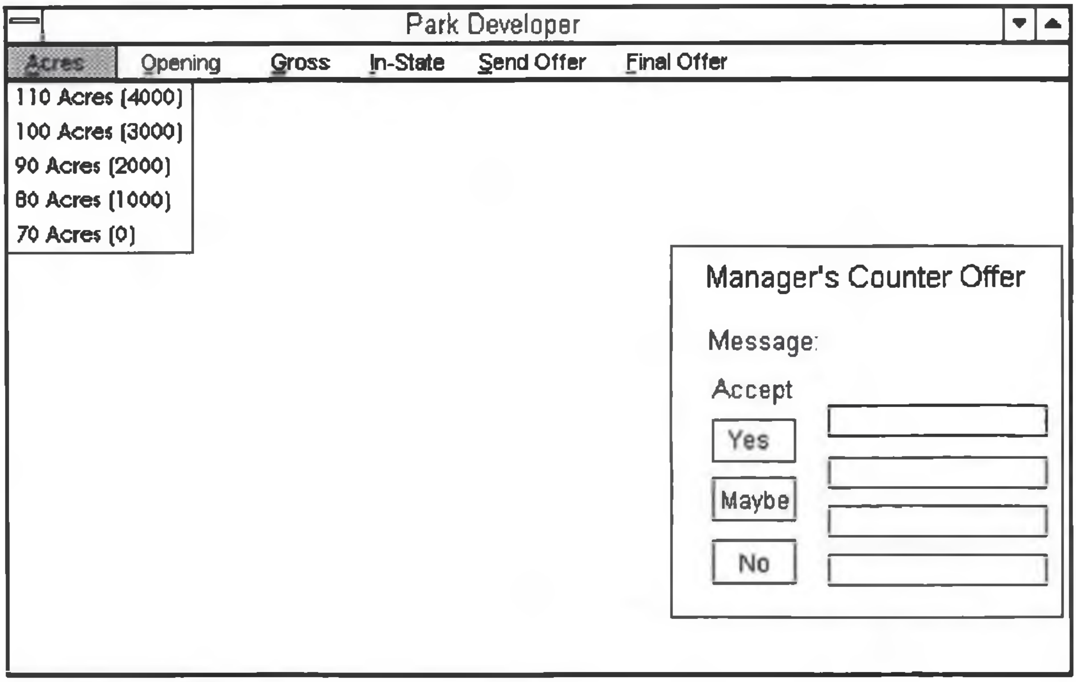

Figure 6. The alphanumeric interface. The Acres menu is shown as it would appear when selected by the park developer. The five levels of the issue are shown followed by the points for that issue level in parentheses.

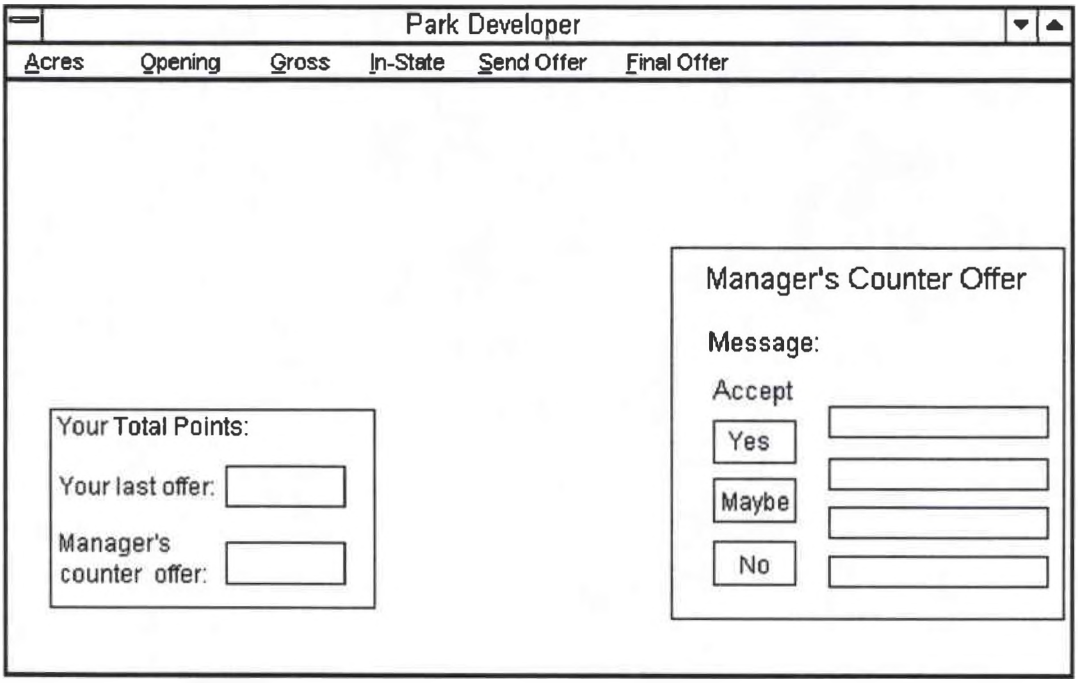

Figure 7. The mathematical help interface. The menus along the top pull down to show the five levels for each issue followed in parentheses by the points for that issue level.

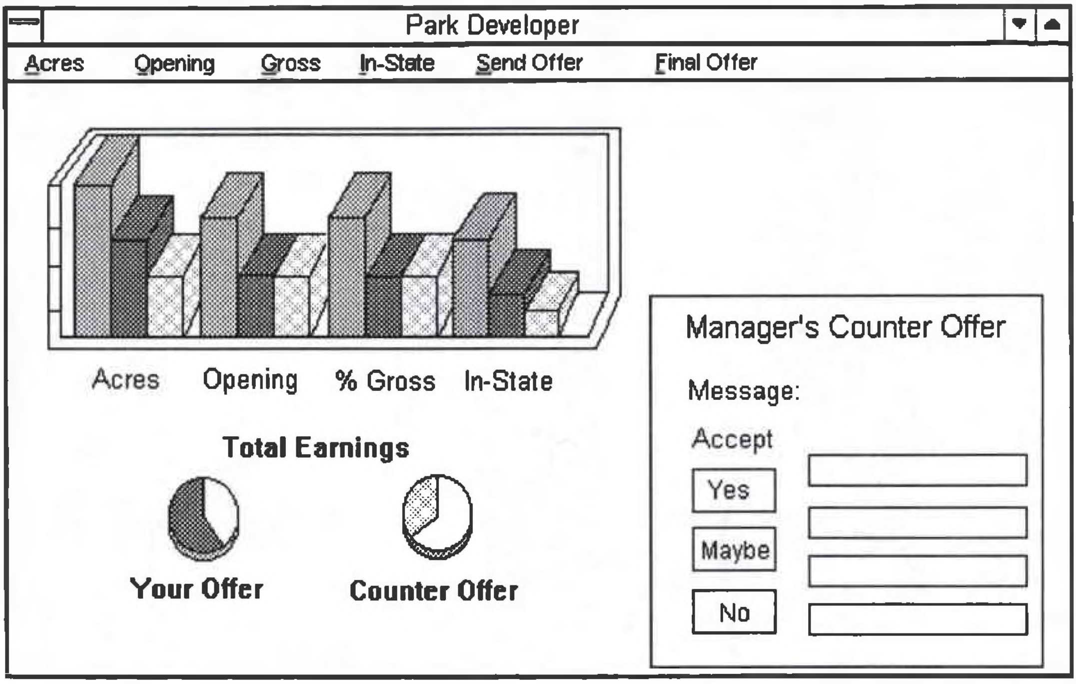

Figure 8. The SCAN interface style. The menus along the top pull down to show the five levels for each issue without the point totals.

although the point values for each offer level were not available in parentheses. Another menu allowed the negotiator to make a final offer. The display included the same controls that the other interfaces did, but it also included a vertical bar chart and a pie graph.

During the process of negotiation, the participant chose an offer level for each issue by clicking the LMB on the issue and dragging the pointer to the chosen level. As a level was chosen, a check mark appeared next to it on the menu. On the bar chart, each issue was represented by three colored bars. A gray bar represented the maximum number of points which could be earned for the particular issue. These gray bars served as a reference point for the negotiator and did not change throughout the task. A blue bar indicated the points awarded for the offer made by the park developer. In addition, as counter offers were generated, they were represented by green bars on the graph.

A pie graph was also updated with every offer level that was chosen. As new offers were evaluated, the pie graph showed the relationship between the total points summed across all four issues for the offer under consideration and the maximum number of points that were possible (the whole pie). As the participant clicked the LMB on a different offer level for an issue, the bar chart and the pie graph were updated to show the points for the offer. A second pie graph showed the proportion of points based on the manager's counter offer.

Gender. An equal number of males and females participated. This was so potential gender effects could be studied.

Procedure

Each participant was brought into the negotiation room. They were asked to read and sign a form indicating their consent to participate (see Appendix A). Once this was completed, they were asked to complete a general questionnaire (see Appendix B). This asked questions regarding computer skills, tobacco use, alcohol use, and caffeine consumption. These last questions were included because the use of any of these items may affect heart rate. A general description of the task and procedure for monitoring physiological responses was read by the researcher (see Appendix C), along with a description of the payment method. Individuals were told they would earn $10.00 for their participation in the study plus a chance to win a $100.00 bonus prize. The participants were informed that the person who earned the most points totaled across all four issues would receive the prize and that the winner would be determined once the entire study was completed. Participants were told that it was likely that more than one person would receive the same high point total and that if this were the case, the winner would be chosen randomly from among the top point earners. Participants in the graphical interface condition were told that they should maximize the proportion of the total pie that they received and that awards would be made based on this amount.

Next, the skin was thoroughly cleansed in the areas necessary using isopropyl alcohol. Electrodes were then placed as follows: on the superorbital notch and the infraorbital notch of the left eye, on the sphenoid bone, and on the left and right inner arm about one inch below the elbow.

Participants were then given a briefing sheet that informed them as to what each of the issues represented and what their goal should be with regard to each issue (see Appendix D). In addition, the briefing sheet informed the participants that they should try to come up with the best, overall solution possible. Once this briefing sheet was read, instructions as to how to manipulate the interfaces were read to the participants, allowing them the opportunity to ask questions regarding their use.

Next, the participants completed a pre-experimental exercise and questionnaire. The exercise was designed to test their understanding of the task (see Appendix E). They were asked to list the offer levels for all four issues that would result in the highest and the lowest point totals for themselves. They were also asked to evaluate two random offers to determine which was the best in terms of total points to themselves. The researcher then checked to ensure that all the questions on this exercise were correctly answered. If they were not, then further instruction was given, explaining which answer was the correct answer.

Participants were told that they had 10 minutes to arrive at an agreement and that if they did not agree on all four issues in that time, they would be assigned a score of zero. They were also told that five minutes into the negotiation the researcher would reenter the room, administer a questionnaire, and reset some of the equipment.

After the negotiation had been under way for five minutes, the researcher entered the room and asked the participant to temporarily stop working. The participant was then asked to complete another questionnaire (see Appendix F). This questionnaire included a NASA-TLX workload rating (Task Load Index; Hart & Staveland, 1988) and was designed to assess mental workload perceived by the participant as well as the level of cognitive biases present. Once this was completed, the participants were told that they would have five more minutes to complete the negotiation. The negotiation then proceeded.

Participants were given a warning when one minute remained in the negotiation. After the negotiation was complete (or the time limit was been reached), participants completed a post-experimental questionnaire (Appendix G). This included another NASA-TLX workload rating procedure. The questionnaire also asked them to evaluate their performance on a series of scales. Once this was completed, the experimenter paid and verbally debriefed the participants (see Appendix H).

<u>The Negotiation Task</u>

Each participant was aware that they were negotiating with a computer generated opponent. Therefore, some rules were established for how the negotiation would proceed. The negotiation proceeded as a series of offers and counter offers, with each side making offers to each other until an agreement was found which was agreeable to both and which each side determined to be the best possible solution they could reach.

The negotiation began when the park developer (the actual opponent) made the first offer. To make this first offer, the participant clicked the LMB on an offer level for each issue and then clicked the LMB on the "Send" button. At this point, the computer evaluated the offer in relation to a predefined set of rules to determine whether it should be accepted. The first rule was that the computer would unconditionally accept the offer if it resulted in a point total (across all four issues) that equaled or exceeded the point total for the integrative agreement (7,600). If the point total of the offer was less than the integrative solution but greater than or equal to the point total for the distributive solution (5,200), then the computer gave a conditional reply of "Maybe" in the reply box. The final rule applied to offers that resulted in point totals that were less than the distributive total. In these cases, the reply box returned a "No" response.

Once the computer opponent made a determination as to whether to accept or reject an offer, it then made a counter offer. The first offer made by the computer was always one which maximized the total points that the computer opponent (the land manager) could receive over all the issues (10,400). This set a high aspiration level for the computer opponent.

After the first counter offer, the computer used different rules to make counter offers. The simulation was programmed to emulate rational negotiators. To this end, the computer opponent never made counter offers that resulted in point totals below the distributive solution point total. If the real opponent (the park developer) offered a solution that was accepted or was conditionally accepted by the computer opponent with a "Yes" or a "Maybe" in the reply box, then the computer randomly selected a counter offer that resulted in a point total that was greater than the point total that resulted from the real opponent's last offer. If the real opponent made an offer that, in terms of total points to the computer opponent, could only be beaten by one other offer, the computer opponent made the counter offer that resulted in the maximum point total to the computer across all four issues. If the real opponent made an offer that maximized the computer's total points, then the computer opponent simply countered with that same maximal offer.

Once a counter offer was made, the park developer had to respond to it. This was be done by clicking the LMB on one of the three possible response buttons. The possible responses were: (a) Yes, I'll definitely accept this offer, (b) Yes, but I might prefer another, or (c) No.

Once an acceptable solution was found, participants were instructed to send a final offer. If it was also acceptable to the computer opponent, the negotiation ended. If not, the computer would have simply continued to make counter offers.

Dependent Variables

NASA-TLX. As a measure of perceived mental workload imposed during the course of the negotiation, the NASA-TLX (Task Load Index; Hart & Staveland, 1988) was administered once five minutes into the negotiation and again at the end of the negotiation. This instrument consisted of six component subscales. The subscales were: perceived mental demand, physical demand, temporal demand, performance, effort, and frustration level. Twenty-step bipolar scales were used to obtain ratings for each subscale. A potential score from 0 to 100 was possible for each subscale, as each division of the scale represented an increment of 5 units.

The NASA-TLX originally called for a weighting procedure to be performed to determine the relative contribution of each subscale (as perceived by the participant) to the overall mental workload. Recent studies have suggested that this is not a necessary procedure and may actually severely restrict the psychometric properties of the TLX (Nygren, 1991). Through research, it has been shown that a simple, equally weighted average of the six dimensions is just as effective, if not more so, as the old weighting procedure (Hendy, Hamilton, & Landry, 1993; Nygren, 1991). Thus, the scores from the six subscales were averaged together to obtain an overall workload score which was used as a total workload score in the present study.

Heart rate. The participant's heart rate was recorded throughout the negotiation task using the Neuropsychological Workload Test Battery (NWTB). This is a computerized test system developed by the Armstrong Aeromedical Research Laboratory (AAMRL) for the U.S. Air Force. An overall average heart rate was computed. In addition, the 10 minute session was divided into five minute increments and the average heart rate per increment was calculated.

Eyeblink rate. The participant's eyeblink rate was recorded throughout the negotiation using the Neuropsychological Workload Test Battery. An overall average eyeblink rate was computed.

Joint benefit scores. When an agreement was reached, the actual participant (the park developer) had earned a certain number of points over all four issues. Correspondingly, the computer (the land manager) had also earned a certain number of points over all four issues. These two values were added to yield a joint benefit score. The maximal joint benefit score attainable was 15,200 points.

Logrolling scores. In addition to a point total over all four issues, a score was computed using only the two issues with integrative potential. The point values achieved by the park developer on the two issues with integrative potential (number of acres and percent in-state employees) were summed to arrive at a logrolling score. This served as an additional measure of whether the negotiators were able to reach an integrative agreement.

Cognitive biases. On the mid-negotiation and post negotiation questionnaires, participants were asked to rate both the level of disagreement between negotiators on each of the four issues (issue conflict) and the importance of each issue to the other negotiator (issue importance). These two questions were presented to participants in a counterbalanced manner.

For the issue conflict scores, participants used a 7-point scale ranging from 1 (very much agreed) to 7 (very much disagreed). Although there is no direct method of measuring the amount of fixed-pie perception, the conflict ratings of the two issues with integrative potential allowed the presence of fixed-pie perception to be detected. The conflict ratings assigned to these two issues were averaged to arrive at a fixed-pie perception score that ranged from one to seven. It was expected that those negotiators with high amounts of fixed-pie perception would rate these issues as being on the upper end of the scale whereas those negotiators with little fixed-pie perception would indicate that there was little disagreement on these issues.

Another question on the mid- and post-negotiation questionnaires required the participants to consider the four issues as the opponent viewed them and to rank the issues in descending order of importance to the opponent. It was expected that if the negotiators had low levels of fixed-sum error they would rank the Acres issue as "4" (least important to the other party) and the percent of in-state employees issue as "1" (most important to the other party). An index of issue importance perceptions was computed by first taking the absolute value of the difference between the expected rankings and the actual rankings for these two issues, adding them together, and finding the average score. This resulted in a fixed-sum error score for the developer than ranged between 0 (no fixed-sum error) and 3.0 (maximum fixed-sum error).

CHAPTER III

RESULTS

Missing Data

While all 60 participants completed the task, 12 failed to reach an agreement within the allotted time. Of these 12, seven were using the alphanumeric interface, two were using the mathematical help interface, and three were using the SCAN interface. In addition, of these 12, five were males and seven were females. All subsequent analyses excluded these 12 participants.

Due to technical difficulties, the number of offers made during the task was not captured for three participants. Therefore, all subsequent analysis regarding number of offers or offer rate excluded these three participants.

Effects on Mental Workload

Table 3 displays the means and standard deviations for heart rate, eyeblink rate, and final NASA-TLX scores obtained across interface style and participant gender.

The NASA-TLX scale was administered to each participant twice, once midway through the task and again at the end of the task. A repeated measures analysis of variance was conducted in order to see if the workload scores differed across administrations. No significant difference was obtained [F (1,37) = 2.78, p = .104]. In addition, no interactive effects involving the repeated measures were significant. Additionally, several of the participants completed the negotiation within five minutes and so only had one workload measure. Thus, the NASA-TLX measure obtained at the end of the task was used in subsequent analyses.

Table 3

Means and Standard Deviations for Workload Measures Across Interface Style and Participant Gender

	Males			Females		
Dependent measures	Alphanumeric Display	Mathematical Help Display	SCAN Display	Alphanumeric Display	Mathematical Help Display	SCAN Display
Heart rate	80.53 (08.83)	78.56 (10.11)	74.33 (06.69)	83.65 (11.59)	78.53 (12.84)	82.68 (05.84)
Eyeblink rate	11.04 (06.86)	11.70 (07.98)	08.49 (04.60)	14.04 (11.75)	13.89 (06.95)	21.59 (07.93)
Final NASA-TLX	50.33 (21.66)	42.83 (12.45)	44.92 (14.99)	58.67 (16.20)	45.09 (16.24)	54.29 (19.83)

Note. FPP = Fixed Pie Perception, FSE = Fixed Sum Error. Numbers in parentheses are the standard deviations (SDs).

It was hypothesized that the graphical, SCAN interface would decrease the mental workload experienced by the participants as compared to both the alphanumeric and mathematical help interfaces. A multivariate analysis of variance (MANOVA) using interface style and gender as independent measures and heart rate, eyeblink rate, and final NASA-TLX score as dependent measures was conducted. There were no significant main effects for interface style on heart rate, eyeblink rate, or NASA-TLX score ($F < 1.00$). The interaction between interface and gender was only marginally significant [$F(6,76) = 1.99$, $p = .077$]. However, the main effect of gender was significant [$F(3,39) = 6.75$, $p = .001$]. Univariate ANOVAs revealed a gender effect for eyeblink rate [$F(1,41) = 12.20$, $p = .001$], with females blinking more than males ($M = 17.54$ and $M = 10.81$). In addition, the interaction between interface style and gender on eyeblink rate was significant [$F(2, 42) = 3.31$, $p = .046$]. Specifically, for females the mathematical help interface decreased eyeblink rate compared to the other interfaces while for males it increased the eyeblink rate compared to the other two interfaces (Figure 9).

An analysis of planned comparisons between the mathematical help interface and the SCAN interface indicated that there was no difference between the two interfaces with respect to eyeblink rate ($F < 1.00$). When the interaction of these two interfaces and the participant gender was analyzed, there was a significant difference [$F(1, 42) = 5.86$, $p = .020$]. Further simple comparisons were done to determine the locus of this effect. It was found that females had a significantly higher eyeblink rate with the SCAN interface than with the mathematical help interface [$F(1, 42) = 4.11$, $p = .049$; $M = 20.58$ and $M = 13.31$, respectively]. This did not hold true for males ($M = 8.49$ and $M = 13.27$).

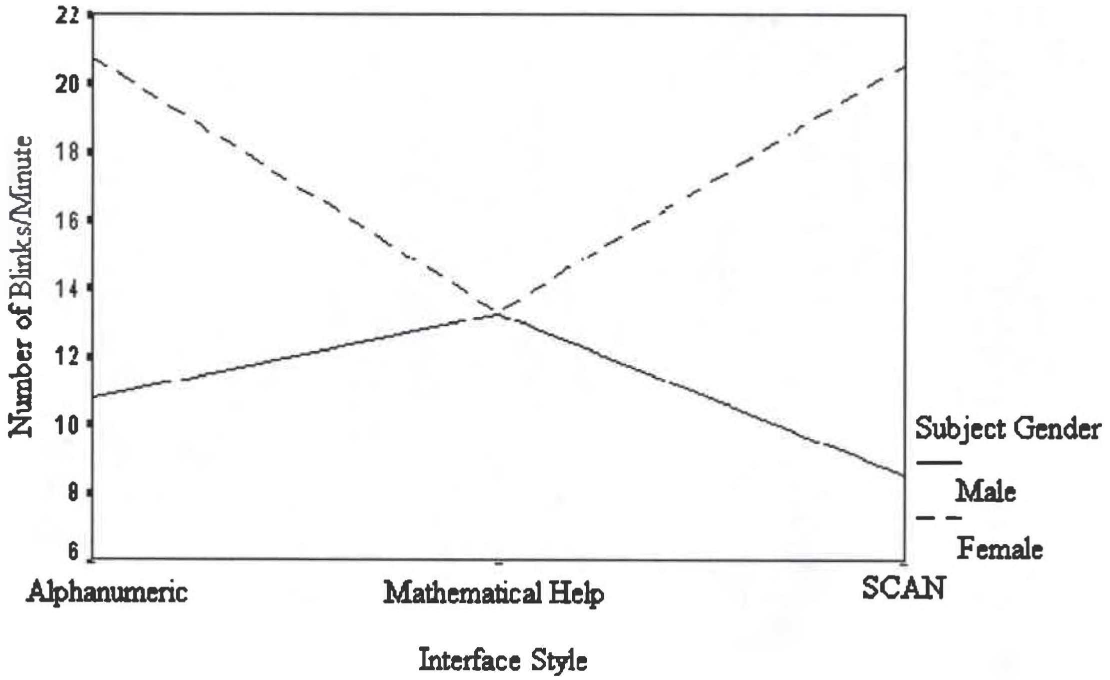

Figure 9. The interaction of gender and interface style on average blinkrate.

Joint Benefit and Logrolling Scores

The means and standard deviations for the total joint benefit and logrolling scores are displayed in Table 4. Another ANOVA was conducted, including the total joint benefit score as the dependent measure and the interface style and gender as independent measures. It was expected that there would be a significant main effect for the interface style and a significant interaction between the measures. Neither of these hypotheses was supported [$F < 1.00$ and $F < 1.00$ respectively].

An ANOVA was conducted including logrolling score as the dependent measure and gender and interface style as the independent measures. It was expected that there would be a significant main effect for the interface style and a significant interaction between the independent measures. It was found that there was a marginally significant effect of interface style on logrolling scores [$F(2,42) = 2.80$, $p = .072$]. However, there was not a significant interaction between interface style and gender ($F < 1.00$).

An analysis of planned comparisons was then conducted. It was found that there was a significant difference between the alphanumeric and SCAN interfaces [$F\ (1,42) = 4.68$, $p = .036$] but no significant interaction between interface and gender ($F < 1.00$). Specifically, participants who used the SCAN interface had lower logrolling scores (M = 2870.59) than those who used the alphanumeric interface (M = 3369.23) There was also a marginally significant difference between the mathematical help and SCAN interfaces [$F\ (1,42) = 3.51$, $p = .068$], but no significant interaction between interface and gender ($F < 1.00$). Specifically, the trend was for those who used the SCAN interface to achieve lower logrolling scores (M = 2870.59) than those who used the mathematical help interface (M = 3277.78). Finally, there was also a significant difference between the combination of

Table 4

Means and Standard Deviations for Performance Measures Across Interface Style and Participant Gender

	Males			Females		
Dependent measures	Alphanumeric Display	Mathematical Help Display	SCAN Display	Alphanumeric Display	Mathematical Help Display	SCAN Display
Joint benefit	8600.00 (5997.78)	10120.00 (5508.94)	11900.00 (1208.31)	7780.00 (6752.42)	12577.78 (1361.78)	8920.00 (6238.38)
Logrolling score	3124.86 (607.88)	3350.00 (602.38)	2820.00 (415.80)	3633.33 (871.01)	3220.00 (780.03)	2942.86 (427.62)

Note. Numbers in parentheses are the standard deviations (SDs).

alphanumeric and mathematical help interfaces and the SCAN interface [F (1,42) = 5.54, p = .023]. Specifically, the combination of the alphanumeric and mathematical help interfaces resulted in higher logrolling scores (M = 3426.65) than did the SCAN interface (M = 2870.59).

Cognitive Biases

The means and standard deviations of the fixed pie perception and fixed sum error levels are displayed in Table 5. The effects of interface style and gender were then explored in relation to the level of fixed pie perception and fixed sum error indicated by the participants in the middle of the task and at the completion of the task. Each participant's bias level was measured in the middle of the task and again at the completion of the task. Thus, the fixed sum error (FSE) and fixed pie perception (FPP) were compared using a repeated measures analysis of variance to see if the measures varied across administrations. It was found that neither the FSE nor the FPP differed across administrations [F (1,52) = 3.31, p = .074 and F < 1.00, respectively]. Thus, the measure obtained at the end of the task was used in subsequent analyses.

Both of these final measures served as dependent measures in a MANOVA with the interface style and gender as independent variables. It was found that, at the end of the task, neither the main effect of interface style or the interaction with gender was significant for these measures [F (4,84) = 2.21, p = .075 and F < 1.00, respectively].

Workload, Outcome, and Cognitive Biases

The relationships among the various measures of workload, the joint benefit score, the logrolling score, and the cognitive biases were assessed using bivariate correlations. It was expected that the workload measures would be negatively correlated with the joint

Table 5

Means and Standard Deviations for Bias Measures Across Interface Style and Participant Gender

	Males			Females		
Dependent measures	Alphanumeric Display	Mathematical Help Display	SCAN Display	Alphanumeric Display	Mathematical Help Display	SCAN Display
Fixed Pie Perception	02.29 (01.19)	02.25 (01.46)	02.25 (00.86)	01.08 (00.38)	02.15 (01.31)	01.71 (00.86)
Fixed Sum Error	00.64 (00.38)	01.06 (00.98)	01.25 (00.89)	01.50 (01.00)	00.75 (00.35)	01.57 (01.10)

Note. Numbers in parentheses are the standard deviations (SDs).

benefit scores. This was not supported for the heart rate measure [$r(48) = +.201$, $p = .172$], the eyeblink measure [$r(48) = +.176$, $p = .232$], the middle NASA-TLX score [$r(39) = +.063$, $p = .703$], or the final NASA-TLX score [$r(48) = -.030$, $p = .844$].

Correlational analyses were also conducted to investigate the relationship between the cognitive biases (fixed pie perception and fixed sum error) and the various workload measures. First, the cognitive biases, as assessed in the midst of the task, were analyzed. Fixed pie perception scores from the middle of the task were not significantly related to heart rate [$r(41) = +.048$, $p = .768$], eyeblink rate [$r(48) = -.239$, $p = .102$], the middle NASA-TLX score [$r(39) = +.004$, $p = .983$], or the final NASA-TLX score [$r(47) = .050$, $p = .737$]. Fixed sum error scores from the middle of the task were not significantly related to heart rate [$r(41) = +.025$, $p = .877$] or the eyeblink rate [$r(48) = +.067$, $p = .678$]. However, FSE was significantly related to the middle NASA-TLX score [$r(39) = +.427$, $p = .007$], and the final NASA-TLX score [$r(40) = +.463$, $p = .003$], so that those participants who indicated a large amount of fixed sum error in the midst of the task rated the task as having a higher workload.

Second, the cognitive biases as assessed at the end of the task were analyzed. Fixed pie perception scores from the end of the task were not significantly related to heart rate [$r(48) = -.013$, $p = .930$], eyeblink rate [$r(48) = -.239$, $p = .102$], the middle NASA-TLX score [$r(39) = +.226$, $p = .167$], or the final NASA-TLX score [$r(47) = -.050$, $p = .737$]. Fixed sum error scores from the end of the task were not significantly related to the heart rate [$r(48) = +.075$, $p = .614$], eyeblink rate [$r(48) = +.117$, $p = .428$], the middle NASA-TLX score [$r(39) = +.261$, $p = .108$], or the final NASA-TLX score [$r(47) = +.255$, $p = .083$].

Additional Analyses

Further analyses were also performed. These analyses explored possible relationships which were not previously hypothesized.

As an overall check of the validity of assuming that an increase in heart rate and a decrease in eyeblink rate are associated with higher workloads, we would expect to find a significant, negative bivariate correlation between these two measures. This was not the case [$r(48) = -.174$, $p = .238$], although the relationship appears to be in the expected direction.

A reliability analysis was conducted in order to ensure that the six items on the mid- and post- experimental NASA-TLX rating sheet were reliably correlated with each other. It was found that on the mid-experimental NASA-TLX questionnaire, the Cronbach's alpha value is 0.716. If the fourth item on the scale were deleted (regarding participants' ratings of their own performance), the alpha value increases to .789. On the post-experimental questionnaire, it was found that Cronbach's alpha value is .796. If the fourth item were deleted from this scale, the alpha value would increase to .849. Additionally, when the repeated measures ANOVA was conducted for workload scores, there was no difference between the two scores based on the time of administration [$F(1,49) = 2.93$, $p = .093$]. However, if the fourth item from the scale were deleted, it was found that there was a significant difference between the scores collected midway through the task and those collected after the task was completed [$F(1,38) = 9.70$, $p = .004$]. Specifically, workload scores without item four were lower midway through the task ($M = 44.41$) than after the task was completed ($M = 50.74$).

CHAPTER IV

DISCUSSION

This study used a computer-simulated, dyadic integrative bargaining task to investigate the effects of presentation style and participant gender on negotiation outcomes and the presence of cognitive biases. Presentation style was altered by having negotiators use one of three different computer interfaces.

Effects of Interface Style on Mental Workload

In the current study, three different measures were used in an attempt to measure the mental workload experienced by negotiators. These measures were of two types: physiological and self-report. The physiological measures included heart rate (beats per minute) and eyeblink rate (blinks per minute). In addition, there were two administrations of the NASA-TLX, one collected 5 minutes into the 10 minute negotiation task and one collected at the end of the task. Several effects of interface style were hypothesized. First, it was predicted that the use of the graphical, SCAN interface would decrease the mental workload experienced by the negotiators and that this would be indicated by a decrease in heart rate, an increase in eyeblink rate, and a lower overall NASA-TLX workload rating compared with the other two interfaces. For two of the three workload measures (heart rate and NASA-TLX scores), this hypothesis was not supported by the data. Thus, attempts to demonstrate that a graphical interface would reduce the mental workload of negotiators were largely unsuccessful.

In explaining the absence of interface effects on mental workload, perhaps a distinction should be made between the physiological and self-report measures.

Participants may have been biasing their responses on the NASA-TLX in an attempt to downplay the difficulty of the task, reluctant to portray themselves as inept negotiators who couldn't handle the pressure of the negotiation. This may have led to the homogeneously low NASA-TLX ratings across the three interface styles. On the other hand, the physiological measures were less subject to response bias and may have been more valid indicators of actual workload levels.

Of the two physiological indicators, only eyeblink varied significantly across interface styles. In hindsight, heart rate may not have been an effective measure of the mental workload experienced during the current negotiation task. Although a number of studies have found a significant relationship between mental workload and heart rate (Lindholm & Cheatham, 1983; Wierwille & Conner, 1983), other studies have failed to find any systematic relationship (Casali & Weirwille, 1983; Hicks & Weirwille, 1979). One explanation offered for these inconsistent findings is that the relationship between mental workload and heart rate varies across tasks (Lacey & Lacey, 1978), with a negative association exhibited for tasks involving the intake of environmental information (e.g., visual detection, scanning) and a positive relationship exhibited for tasks involving the rejection of environmental information (e.g., mental arithmetic, memory retrieval). The negotiation procedure used in the current study actually involved multiple tasks. Participants scanned the computer screen and encoded offer information while presumably engaging in mental computation and offer comparison. The excitatory influence on heart rate of the mental computation may have been canceled out by the inhibitory effects of the visual scanning. Thus, participants' heart rates did not typically depart from baseline, remaining fairly constant throughout the task.

As predicted however, eyeblink rates did vary significantly across the interfaces for female participants. In the current study, it was found that females using the SCAN interface blinked more than females who used the mathematical help interface. Assuming that eyeblinks occur more frequently when attentional demands are at their lowest (Bauer et al., 1985; Goldstein et al., 1985; Stern, 1987, 1992; Stern, Goldstein, et al., 1992; Stern, Walrath, et al., 1984), the current data suggest that the SCAN interface reduced the workload of female negotiators relative to the other two interfaces. Two unexpected findings were (a) that this pattern of results did not appear for males and (b) that there was no apparent mental workload differences (for males and females both) between the alphanumeric and mathematical help interfaces.

The eyeblink rates for male negotiators, although not significantly different across the interfaces, were in the hypothesized direction. Furthermore, males' eyeblink rate tended to be lower overall than females' eyeblink rate, indicating that males may have been experiencing relatively high levels of mental workload across all three interface styles. On the surface, this would seem to contradict previous research suggesting that females experience greater difficulty during laboratory negotiation tasks than males. It has been suggested that women tend to view such negotiation tasks as evaluations of their intelligence or mathematical ability. To the extent that women are more anxious than men about this evaluation, they will tend to behave more competitively in an attempt to gain a positive evaluation (Coleman, 1982; Hottes & Kahn, 1974). Thus, it was expected that their greater anxiety would lead them to rely on cognitive heuristics and biases as a way of reducing their heavier workload.

Previous studies on gender differences, however, have focused on discrepancies between male and female negotiators' outcomes following the negotiation and not on their level of mental workload during the negotiation. What the current study suggests is that females do not necessarily perceive the negotiation task itself as more cognitively demanding than males. Instead, low motivation and involvement on the part of females could have accounted for the pattern of results obtained in this and previous studies. A negotiator who is not motivated to engage in the task should demonstrate less mental workload and lower outcomes than a negotiator who is motivated to excel. To the extent that they view laboratory negotiation tasks as irrelevant or unrealistic, female negotiators would be expected to experience less mental workload and obtain lower outcomes than male negotiators. Although motivation levels may have been lower for female negotiators, leading to a higher overall blink rate than males, it is not suggested that the female negotiators did not try to perform well on the negotiation task. They may have still been trying to perform well, but just took the task less seriously than males.

It was also hypothesized that the mathematical help interface would decrease mental workload to a greater extent than the alphanumeric interface. This hypothesis was not supported by the data. One possible explanation is that there was little difference between these two interfaces in terms of workload imposed on the negotiators. Contrary to expectations, the addition of mathematical help did not lead to a large reduction in negotiators' workload. This could be because there were many other things for the negotiator to consider during the negotiation (e.g., prior offers made by both parties). The negotiators in the mathematical help condition may have still been doing extensive mental arithmetic, in spite of the addition of the total points display. This mental arithmetic may have been in the form of comparing the points achieved for one offer with previous offers which were made. This may have also contributed to the finding that there was not a significant relationship between eyeblink rates and joint benefit or logrolling scores. Although the workload due to mental arithmetic was partially alleviated by the mathematical help interface, it may not have been enough to significantly reduce workload ratings.

Joint Benefit and Logrolling Scores

Differences in joint benefit scores and logrolling scores (scores on the issues with integrative potential) across the three interfaces were also predicted. In addition, it was hypothesized that there would be a difference between male and female negotiators for the joint benefit and logrolling scores. These hypotheses were not supported by the data. There was also no support for the prediction that, with respect to bargaining outcomes, females would benefit more from the SCAN interface than males. Unexpectedly, logrolling scores were marginally different across the three interfaces, with those using the SCAN interface receiving somewhat lower logrolling scores.

When considering the effects of the SCAN interface on workload and outcome measures, it should be noted that the nature of the assistance provided by the SCAN interface was quite different from the other two, with negotiators having to compare graphical items (e.g., portions of a pie chart, bars on a bar graph) rather than numerical items. Thus, the SCAN interface may have presented negotiators with new sources of cognitive load, not present in the other two interfaces. There is some evidence that the visual nature of the SCAN interface required the negotiators to think about each offer and counteroffer more, slowing down the negotiation process. Although nonsignificant, the offer rate was slightly slower for negotiators using the SCAN interface (M = 1.94 offers per minute) relative to those using the mathematical help and alphanumeric interfaces (Ms = 2.29 and 2.01 offers per minute, respectively). So those negotiators using the SCAN interface may have been feeling greater temporal demand than those using the other two interfaces. This is supported by the finding that, when using the SCAN interface, 53% of the negotiators who reached an agreement did so in the last 30 seconds of the task. This compares with 38.5% and 39.1% in the alphanumeric and mathematical help interfaces, respectively. Therefore, the offer that was finalized might not have been a result of careful consideration, but might have been the result of the time pressure imposed on the participants. This added temporal demand in the SCAN condition may have negated any possible workload benefits of the SCAN interface which would have appeared if the negotiators were given more time to complete the task. This would account for the finding that the overall workload measures were as high for the SCAN interface as for the other two interfaces and that logrolling scores actually decreased when using the SCAN interface. Consequently, if negotiators had been given more time, the temporal demand would have decreased and the negotiators using the SCAN interface might have experienced less mental workload. Future studies should address these issues.

In addition to the time pressure imposed on the negotiators, a second explanation exists for the finding that the alphanumeric and mathematical help interfaces resulted in higher logrolling scores than the SCAN interface. Specifically, participants in the current study had relatively little experience with the interfaces. Although each participant was given detailed instructions as to how the interface worked and completed a short exercise to ensure that they understood the task, the negotiators' ability to use and understand the interface during the interaction was not assessed. Even though negotiators appeared to understand the interface and the bargaining task prior to the negotiation, they had little experience actually using the computer tools to negotiate. Because of this lack of experience, negotiators may have relied on their existing mental model of negotiation. The alphanumeric and mathematical help displays are very similar to what we traditionally expect in negotiations (e.g., percentages, dollar values, points). The SCAN interface, however, is a departure from this traditional model. It requires the negotiator to evaluate offers visually, using bar graphs and pie charts. Thus, negotiators in the SCAN interface may have been placed at an initial disadvantage, and therefore obtained lower outcomes than negotiators using the other two interfaces. Future studies should include a training period wherein participants actually use the interface to negotiate.

Cognitive Biases

It was also hypothesized that fixed pie perception and fixed sum error levels would differ for each of the three interface styles, with the SCAN interface leading to lower levels of fixed-pie perception and fixed sum error. In this study, measures of these biases were collected midway through the negotiation and again at the end of the task. None of the measures supported the predictions. There was also no relationship between the workload ratings and either fixed-pie perception or fixed sum error.

Fixed pie ratings. Examination of the data revealed that the fixed-pie perception ratings were rather low overall. In fact at the end of the task, 32 of the 48 included negotiators scored 2 or lower on the 7-point fixed-pie perception measure. Although it is possible that fixed-pie perception was not widespread, this finding may also have stemmed from confusion regarding the wording of the question designed to measure fixed-pie perception.

This question asked negotiators to rate the degree to which they and the other negotiator "disagreed" on each issue. This item was designed to tap negotiators' perceptions of the degree to which the interests of the park developer were opposed to the interests of the land manager. However, it may also have been interpreted as asking the developer to rate the perceived flexibility of the computer opponent. Although, the computer was programmed to counter with an offer that satisfied certain criteria, there were numerous possible counteroffers for each offer. Also, the computer opponent was programmed to accept any offer with an outcome that exceeded the distributive solution. Thus, participants may have perceived the computer opponent as demonstrating a fair amount of flexibility with respect to the offers it presented as well as accepted. This may have led negotiators to rate the level of disagreement between themselves and the computer as relatively low. Future studies should utilize fixed pie perception measures that are not as susceptible to multiple interpretations.

Fixed sum error. Fixed sum error, as measured midway through the task, was significantly related to the NASA-TLX ratings given to the task both midway through and at the end of the task. Specifically, those negotiators who indicated that they had a large degree of fixed sum error (incorrectly believing that the issues were of equal importance to both parties) also rated the task as having a higher degree of mental workload. Fixed sum error as measured at the end of the task, however, was not related to any of the workload measures.

The finding that fixed sum error was only related to NASA-TLX ratings when measured mid-way corresponds to what is actually meant by cognitive biases. The cognitive biases are preconceived and would be expected to decrease as the task proceeds. At the time when the first measure of cognitive bias is taken, the participant has only been working on the task for five minutes. However, by the time the last measure is taken (ten minutes into the task), the participant may have already abandoned their preconceived biases and figured out the fact that issue importance was different for each party. This can be seen in the fact that, on a scale that ranges from 0 to 3, with 3 indicating the highest level of fixed sum error, at the end of the task, 35 of the 48 negotiators who completed the task had a score 1.00 or lower. So overall, the level of fixed sum error decreased as the task proceeded, to a level that was homogeneously low. This should be expected given that the participant gains experience in the negotiation (Thompson, 1990), and may explain the absence of any significant correlation between this measure and others.

NASA-TLX

When analyzing the items measured on the NASA-TLX, it was found that the fourth item on the scale (relating to the participant's own performance) was not significantly correlated with any other item on the scale. A new workload rating was then computed based on the average of the five remaining items. This did not change any of the results except for one. With this minor change, there was a significant difference between the two administrations of the NASA-TLX (midway through and at the end). Specifically, workload was rated as higher at the end of the task than during the task. This may be due to a number of factors. First, at the midway point, the participants knew that they still had more time to negotiate and so they were not feeling the full burden of time pressure. This is indicated by the fact that the rating of temporal demand was higher at the end of the task than it was midway through the task (Ms = 65.00 and 50.64 respectively).

Offer History

By looking at the offer history of each negotiator, an overall picture of a negotiation strategy seems to emerge. Without complete analysis, it appears that those negotiators using the alphanumeric interface were more contentious that those who used the SCAN interface. Although all negotiators appeared to have high aspiration levels, when looking at the fourth offer made by the negotiator, we can see a difference among displays emerge. Those negotiators using the alphanumeric interface increased their demands from their initial aspiration level, whereas those using the mathematical help and the SCAN interfaces decreased their demands from this aspiration level. Therefore, it may have been that the SCAN and mathematical help interfaces led to a more cooperative strategy selection by the negotiators.

A preliminary analysis also indicates that a gender difference exists with respect to demands made. Specifically, it was found that female negotiators' demands (in terms of percentages of the initial aspiration level) on the fourth offer were lower when using the SCAN interface ($M = .74$) than the mathematical help and alphanumeric interfaces (Ms = .90 and 1.33, respectively), and when using the alphanumeric interface, the demands actually increased from the initial aspiration level. This lends more credence to the suggestion that the SCAN interface decreases contentiousness among negotiators.

Further support for the notion of increased feelings of competitiveness for females over males also comes from looking at the offers made at various times in the negotiation session. Hottes and Kahn (1974) found that males were more cooperative than females. This has been explained by a theory of defensive behavior on the part of the female negotiator in reaction to a perceived test of their intelligence in conjunction with a less strategic outlook on the negotiation in general (Coleman, 1982; Hottes & Kahn). This is supported when we look at the offer history data. Preliminary analysis suggests that when comparing the fourth and eighth offers made by the negotiators (in terms of a percentage difference from the initial aspiration level), they were not significantly different for female negotiators ($F = 2.27$, $p = .149$; Ms = .97 and .92, respectively). However, males offered a significantly lower offer on the eighth offer than the fourth offer ($F = 6.93$, $p = .015$; Ms = .90 and .83, respectively).

So it appears that male negotiators were more likely to decrease their demands in an attempt to cooperate with the other negotiator in order to come to a mutually agreeable solution. This may have been part of a strategy attempted by the male negotiators. Female negotiators, on the other hand, were more likely to remain committed to their initial demands, increasing the competitive atmosphere of the task either in an attempt to deal with the perceived attack on their intelligence or due to a lack of strategic thinking.

Summary

The current study only moderately supported the expectations of the researcher. Although eyeblink rate, a very sensitive measure, did yield the predicted difference between interfaces, indicating that the SCAN interface decreased workload for female negotiators, there was very little support for the presumption that displaying information in a negotiation support system graphically as opposed to alphanumerically would reduce the mental workload of negotiators, lower their reliance on cognitive biases, and lead them to discover integrative agreements. It is believed, however, that this failure to find significant effects was due primarily to limitations of measures used (heart rate and NASA-TLX), the lack of sufficient training in use of the interfaces, and to the nature of the interfaces themselves. Future research will address these issues, further expanding our knowledge of the connection between collaboration technology and negotiation behavior.

REFERENCES

Adams, J. A. (1989). Human factors engineering. New York: Macmillan Publishing.

Alberry, W. B. (1988). The effects of biodynamic stress on workload in human operators. (DTIC Report No. AD-A196 720). Wright Patterson AFB, OH: Armstrong Aerospace Medical Research Laboratory.

Andreassi, J. L. (1989). Psychophysiology: Human behavior and physiological response (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Andreassi, J. L., & Juszczak, N. M. (1984). Psychophysiological studies I: Performance and physiological response in learning, short term memory and discrimination tasks. (DTIC Report No. AD-A151018). Bolling AFB, DC: Air Force Office of Scientific Research.

Bauer, L. O., Strock, B. D., Goldstein, R., Stern, J. A., & Walrath, L. C. (1985). Auditory discrimination and the eyeblink. Psychophysiology, 22(6), 636-641.

Bazerman, M. H., Magliozzi, T., & Neale, M. A. (1985). Integrative bargaining in a competitive market. Organizational Behavior and Human Decision Processes, 35, 294-313.

Bazerman, M. H., & Neale, M. A. (1983). Heuristics in negotiation: Limitations to effective dispute resolution. In M.H. Bazerman & R. J. Lewicki (Eds.), Negotiating in organizations (pp. 51-67). Beverly Hills, CA: Sage Publications.

Bazerman, M. H., & Neale, M. A. (1992). Negotiating rationally. New York: The Free Press.

Carnavale, P. J., & Pruitt, D. G. (1992). Negotiation and mediation. Annual Review of Psychology, 43, 531-582.

Carnavale, P. J., & Lawler, E. J. (1986). Time pressure and the development of integrative agreements in bilateral negotiations. Journal of Conflict Resolution, 30(4), 636-659.

Carnavale, P. J., Pruitt, D. G., & Britton, S. D. (1979). Looking tough: The negotiator under constituent surveillance. Personality and Social Psychology Bulletin, 5(1), 118-121.

Carnavale, P. J., Pruitt, D. G., & Seilheimer, S. D. (1981). Looking and competing: Accountability and visual access in integrative bargaining. Journal of Personality and Social Psychology, 40(1), 111-120.

Carroll, J. S., Bazerman, M. H., & Maury, R. (1988). Negotiator cognitions: A descriptive approach to negotiators' understanding of their opponents. Organizational Behavior and Human Decision Processes, 41, 352-370.

Casali, J. G., & Wierwille, W. W. (1983). A comparison of rating scale, secondary-task, physiological, and primary-task workload estimation techniques in a simulated flight task emphasizing communications load. Human Factors, 25(6), 623-641.

Casper, P. A., & Kantowitz, B. H. (1987). Estimating the cost of mental loading in a bimodal divided attention task: Combining reaction time, heart-rate variability, and signal-detection theory. In J. R. Comstock (Ed.), Mental State Estimation: Proceedings of a Workshop Sponsored by NASA and Old Dominion University (pp. 211-229). Williamsberg, VA: NASA.

Coleman, A. (1982). Game theory and experimental games. New York: Pergamon Press.

Costa, G. (1993). Evaluation of workload in air traffic controllers. Ergonomics, 36(9), 1111-1120.

Dahl, J. G., & Kienast, P. K. (1990). The effect of payoff matrix induced competition on the creation of value in negotiation. In M. A. Rahim (Ed.), Theory and research in conflict management (pp. 77-85). NY: Praeger Publishers.

Deutsch, M., & Krauss, R. M. (1960). The effect of threat upon interpersonal bargaining. Journal of Abnormal and Social Psychology, 61(2), 181-189.

Druckman, D. (1994). Determinants of compromising behavior in negotiation. Journal of Conflict Resolution, 38(3), 507-556.

Fry, W. R. (1985). The effect of dyad machiavellianism and visual access on integrative bargaining outcomes. Personality and Social Psychology Bulletin, 11(1), 51-62.

Gawron, V. J., Schflett, S. G., & Miller, J. C. (1989). Measures of in-flight workload. Aviation Psychology (pp. 240-287). Brookfield, VT: Gower Technical.

Gellatly, I. R., & Meyer, J. P. (1992). The effects of goal difficulty on physiological arousal, cognition, and task performance. Journal of Applied Psychology, 77(5), 694-704.

Gerhart, B., & Rynes, S. (1991). Determinants and consequences of salary negotiations by male and female MBA graduates. Journal of Applied Psychology, 76(2), 256-262.

Goldstein, R., Walrath, L. C., Stern, J. A., & Strock, B. D. (1985). Blink activity as a function of stimulus modality and schedule of presentation. Psychophysiology, 22(6), 629-635.

Graetz, K. A., Macbeth, S., Seifert, J., Sacher, J., & Kozar, R. (1994). Effects of mental workload and electronic negotiation support on fixed-pie perception. Unpublished manuscript.

Harris, R. L., Bonadies, G. A., & Comstock, J. R. (1990). Usefulness of heart rate measures in flight simulation. In S. Griffin (Ed.), Proceedings of the Third Annual Workshop on Space Operations Automation and Robotics (pp. 353-359). Houston, TX: NASA.

Hart, S. G., & Staveland, L. E. (1988). Development of NASA-TLX (Task Load Index): Results of empirical and theoretical research. In P. A. Hancock & N. Meshkati (Eds.), Human mental workload (pp. 139-183). North-Holland: Elsevier Science Publishers B.V.

Hendy, K. C., Hamilton, K. M., & Landry, L. N. (1993). Measuring subjective workload: When is one scale better than many?. Human Factors, 35(4), 579-601.

Hicks, T. G., & Wierwille, W. W. (1979). Comparison of five mental workload assessment procedures in a moving-base driving simulator. Human Factors, 21(2), 129-143.

Hottes, J. H., & Kahn, A. (1974). Sex differences in a mixed-motive conflict situation. Journal of Personality, 42, 260-275.

Jarke, M., Jelassi, M.T., & Shakun, M. F. (1987). MEDIATOR: Towards a negotiation support system. European Journal of Operational Research, 31, 314-334.

Jelassi, M. T., & Jones, B. H. (1988). Getting to yes with NSS: How computers can support negotiations. In R. M. Lee, A. M. McCosh, & P. Migliarse (Eds.), Organizational decision support systems (pp. 75-85), Amsterdam: North-Holland.

Jorna, P. G. A. M. (1993). Heart rate and workload variations in actual and simulated flight. Ergonomics, 36(9), 1043-1054.

Kakimoto, Y., Nakamura, A., Tarui, H., Nagasawa, Y., & Yagura, S. (1988, June). Crew workload in JASDF C-1 Transport flights: 1. Change in heart rate and salivary cortisol. Aviation, Space, and Environmental Medicine, 511-516.

Kersten, G. (1985). NEGO: Group decision support system. Information & Management, 8, 237-246.

Lewicki, R. J., & Litterer, J. A. (1985). Negotiation. Homewood, IL: Richard D. Irwin, Inc.

Lindholm, E., & Cheatham, C. (1983). Autonomic activity and workload during learning of a simulated aircraft carrier landing task. Aviation, Space, and Environmental Medicine, 54(5), 435-439.

Marvin, H. M. (1960). Your heart: A handbook for laymen. Garden City, NY: Doubleday & Company.

McCloskey, K. (1987). Evaluating a spatial task: Behavioral, subjective, and physiological correlates. Proceedings of the Human Factors Society - 31st Annual Meeting, 774-778.

McCloskey, K., Morrow, M., & Perez, W. (1988). The use of psychophysiological measures in the SABER laboratories: Phase 1 (U). (DTIC Report No. AD-A206 825). Wright-Patterson AFB, OH: Systems Research Laboratories, Inc. (AAMRL-TR-88-052).

Nielson, J. (1993). Generations of user interfaces. Usability engineering (pp. 49-72). Boston, MA: Harcourt, Brace, & Company.

Nygren, T. E. (1991). Psychometric protperties of subjective workload measurement techniques: Implications for their use in the assessment of perceived mental workload. Human Factors, 33(1), 17-33.

Pruitt, D. G. (1991). Negotiation behavior. New York: Academic Press.

Pruitt, D. G., & Rubin, J. Z. (1986). Social conflict: Escalation, stalemate, and settlement. New York: McGraw-Hill.

Ragins, B. R., & Sandstrom, E. (1989). Gender and power in negotiations: A longitudinal perspective. Psychological Bulletin, 105, 51 - 88.

Samuelson, W. F. (1995). Computer-aided negotiation and economic analysis. Negotiation Journal, 11(2), 177-184.

Seibold, D. R., Heller, M. A., & Contractor, N. S. (1994). Group decision support systems (GDSS): Review, taxonomy, and research agenda. In B. Kovacic (Ed.), New approaches to organizational communication (pp. 143-163). Albany, NY: State University of New York Press.

Stern, J. A. (1987). The spontaneous eye blink in workload assessment. International Symposium on Aviation Psychology 4th Annual Meeting (pp. 658-677). Columbus, OH: Ohio State University.

Stern, J. A. (1992). The eye blink: Affective and cognitive influences. In D. G. Forgays & K. Wrzesniewski, (Eds.), Anxiety: Recent developments in cognitive, psychophysiological, and health research. Washington, DC: Hemisphere Publishing.

Stern, J. A., Boyer, D., & Schroeder, D. (1994). Blink rate: A possible measure of fatigue. Human Factors, 36(2), 285-297.

Stern, J. A., Goldstein, R., & Dobkin, R. (1992). Enhanced performance using physiological feedback (DTIC Report No. AD-A258 006). Brooks AFB, TX: Armstrong Laboratory Crew Systems Directorate (AL-TP-1992-0018).

Stern, J. A., Goldstein, R., & Dunham, D. N. (1988). An evaluation of electrooculographic head movement and steady state evoked response measures of workload in flight simulation (U) (DTIC Report No. AD-A236 505). Wright Patterson AFB, OH: Armstrong Aerospace Medical Research Laboratory. (AAMRL-TR-88-036).

Stern, J. A., Walrath, L. C., & Goldstein, R. (1984). The endogenous eyeblink. Psychophysiology, 21(1), 22-33.

Thompson, L., & Hastie, R. (1990). Social perception in negotiation. Organizational Behavior and Human Decision Processes, 47, 98-123.

Tripp, T. M., & Sondak, H. (1992). An evaluation of dependent variables in experimental negotiation studies: Impasse rates and pareto efficiency. Organizational Behavior and Human Decision Processes, 51, 273-295.

Tullis, T. S. (1981). An evaluation of alphanumeric, graphic, and color information displays. Human Factors, 23(5), 541-550.

Walton, R. E., & McKersie, R. B. (1965). A behavioral theory of labor negotiations: An analysis of a social interaction system. New York: McGraw-Hill.

Warbelow, A., & Hoffman, D. B. (1987). Graphing alternative payoffs in a conflict simulation. Simulation & Games, 18(1), 116-129.

Wickens, C. D. (1992). Engineering psychology and human performance, second edition. New York: HarperCollins Publishers.

Wierwille, W. W., & Conner, S. A. (1983). Evaluation of 20 workload measures using a psychomotor task in a moving-base aircraft simulator. Human Factors, 25(1), 1-16.

Wierwille, W. W., & Eggemeier, F. T. (1993). Recommendations for mental workload measurement in a test and evaluation environment. Human Factors, 35(2), 263-281.

Wierwille, W. W., Rahami, M., & Casali, J. G. (1983). Evaluation of 16 measures of mental workload using a simulated flight task emphasizing mediational activity. Human Factors, 27(5), 489-502.

Wilson, G. F. (1988). Measurement of operator workload with the neuropsychological workload test battery. In P. A. Hancock & N. Meshkati (Eds.), Human mental workload (pp. 63-100). North-Holland: Elsevier Science Publishers.

Wilson, G. F. (1991). Progress in the psychophysiological assessment of workload (DTIC Report No. AD-A263 609). Wright Patterson AFB, OH: Armstrong Laboratory Crew Systems Directorate. (AL-TR-1992-0007).

Wilson, G. F. (1993). Air-to-ground training missions: A psychophysiological workload analysis. Special Issue: Psychophysiological measures in transport operations. Ergonomics, 36(9), 1071-1087.

Wilson, G. F., Purvis, B., Skelly, J., Fullenkamp, P., & Davis, I. (1987). Physiological data used to measure pilot workload in actual flight and simulator conditions. Proceedings of the Human Factors Society- 31st Annual Meeting, 779-783.

Wheeler, M. (1995). Computers and negotiation: Backing into the future. Negotiation Journal, 11(2), 169-175.

APPENDICES

APPENDIX A

Informed Consent

<u>Study Overview</u>

Welcome to the study "Bargaining in Dyads". The following is a general description of the study and a reminder of your rights as a potential subject. As in any study, your participation is completely voluntary. If now, or at any point during the study, you decide that you do not want to continue participating, please let the experimenter know and you will be dismissed without penalty. Also, please remember that your name will not be associated with any of the information that you provide during the study. All of the information that you provide is absolutely anonymous and confidential.

In this study you will be asked to participate in a negotiation using a computer. During this session, we will be monitoring your heart rate and the rate at which you blink. We will use isopropyl alcohol pads to clean your skin before we attach electrodes for monitoring these responses. We will observe precautions so that discomfort is minimized. Once your skin is cleaned, we will be attaching electrodes to your ear, your forearms, and above and below your left eye. Electrodes will be attached with adhesive pads. The adhesive pads and the electrode conductivity cream we use are hypoallergenic.

There is a remote chance that you may receive a slight, non-hazardous electrical shock. This should not be a concern, since this would only occur in the case of a power outage.

<u>For Further Information</u>

This study is being supervised by Dr. Ken Graetz. Dr. Graetz would be happy to address any of your questions or concerns regarding this study. He can be reached at 229 - 2168 or in his office at SJ 317. If you feel that there is an ethical problem with this study or in any study that you have participated in, please contact:

Dr. Greg Elvers
Research Review and Ethics Committee
SJ 312
229 - 2171

If you would like to participate in this study, please sign in the space provided. Your signature indicates that you are aware of each of the following: 1) the general procedure to be used in this study, 2) your right to discontinue participation at any time, and 3) the steps taken to ensure confidentiality of the data that you will provide during this study.

Signature ______________________________
Date ________________________________

APPENDIX B

Pre-Experimental Questionnaire

Subject Number ________

Instructions: Please answer the following questions by marking directly on the questionnaire.

1. Please circle your gender: M F

2. Are you currently a student? Y N

3. If you are currently a student, what is your class standing?

   Freshman Sophomore Junior Senior

4. If you are currently a student, what is your major? ______________________

5. If you are not a student, what is your occupation? ______________________

6. Are you currently taking a college mathematics course? Yes No

   If so, what course are you taking?

7. How good are you at math?

1	2	3	4	5	6	7
Bad						Excellent

8. How comfortable are you using a computer?

1	2	3	4	5	6	7
Not At All Comfortable						Very Comfortable

9. How comfortable are you using a mouse?

1	2	3	4	5	6	7
Not At All Comfortable						Very Comfortable

APPENDIX B (continued)

Because this study involves the recording of physiological measures, it would be helpful to know some of your personal habits. Please answer the following questions.

10. Approximately how often do you exercise (30 minutes or longer) per week?

None 1 2 3 4 5 or more

11. Do you participate in a sporting activity on a regular basis? Yes No
If so, what? ______________________________

12. Have you consumed a beverage containing caffeine within the past 4 hours (e.g., soda pop, coffee, tea)?

Yes No

13. Have you consumed more than one alcoholic beverage within the past 24 hours?

Yes No

10. Do you smoke?

Yes No

11. Have you used a tobacco product within the past 24 hours?

Yes No

12. Have you used a tobacco product within the past 2 hours?

Yes No

APPENDIX C

Instruction Sheet

This study is designed to investigate negotiations. In a few minutes you will be asked to play the role of a negotiator and negotiate using a computer. The computer will play the role of the other negotiator.

During this negotiation, I will be recording some physiological measurements. In order to do this, I must place five electrodes on you. Please let me assure you that this is not a painful procedure, as the electrodes I am using are one-way electrodes, allowing recording of measures only. First I will clean your skin in the areas where the electrodes will be attached. Once this is complete, the electrodes will be placed as follows: 1) above and below your left eye, 2) behind your ear, and 3) on each of your arms, one inch below your elbow. Once the electrodes are in place you should try to limit your movement so as not to loosen the electrodes.

Do you have any questions about this so far? OK. Then I'm going to attach them now so that you have a chance to get used to them.

[Attach the electrodes]

A negotiation is said to occur when two or more people try to reach a satisfactory resolution to some conflict. In your own life, you have probably taken part in thousands of negotiations. In all real-life negotiations, the goal is usually the same: each negotiator is trying to reach a deal that results in the best possible outcome for him/herself or for his/her company. We have tried to simulate some of the characteristics of real-life negotiation in this study. But instead of using a familiar negotiation scenario, we have purposely selected a situation with which you will be unfamiliar.

You will be paid $10 at the end of the session. In addition, your name may be placed in a drawing for a $100 bonus prize. You will receive a certain value during the negotiation in a manner that will be described later. The $100 prize will be awarded at the completion of the entire study (around the end of July) to the individual negotiator who receives the highest value. If there are a number of negotiators who have obtained a high and equivalent value, I will randomly pick the winner from among the pool of these negotiators.

The negotiation in which you will participate involves an amusement park developer and a land manager representing the state. You will play the role of the park developer. Your company wants to build a large amusement park on state land. The state is also interested in this proposition. Now, you and the state land manager must work out the terms of the agreement. There are four issues on the negotiating table: (a) the number of acres the park will occupy, (b) the number of years it will take to open the park, (c) the percentage of the park's gross profits that would go to the state, and (d) the percent of in-state employees that the developer would be required to hire to construct and staff the park. Your supervisors have selected you to close the deal because of your proven negotiating ability. You and the land manager may not always agree, however your company wants you to close the deal today.

Your supervisors have provided you with a Briefing Sheet describing each negotiation issue as well as their interests in each issue. Please read the Briefing Sheet at this time.

APPENDIX D

Briefing Sheet for the Park Developer

Negotiation Issues for the New Amusement Park

Acres: This refers to the size of the park in acres. This region could support a large theme park. We would like you to try to negotiate as high a number of acres as possible.

Opening Day: This refers to the estimate of the earliest day that we could open the park. We could finish construction of the park sometime between 1 to 5 years. The earlier we open, the sooner we'll bring in profits. Try to negotiate the earliest opening day that you can.

% of Gross Profits Going to the State: This refers to the percentage of our profits that we would have to hand over to the state. Obviously, we want to pocket as much of the profit as we can. Try to negotiate for the lowest percentage possible.

% of In-State Employees: This refers to the percentage of people we would have to hire from within the state, both to build the park as well as to staff the park later. We may be able to acquire cheaper labor from out of state. Try to negotiate the lowest number of in-state employees as you can.

Final Advice: We understand that you may not be able to satisfy all of our requests for all four issues. We trust your judgment. Remember, it is the final package that counts. Try to negotiate an overall agreement that is good for our company.

APPENDIX E

Pre-Experimental Exercise

Instructions: This exercise is designed to help familiarize you with the issues involved in the negotiation, as well as how to use the electronic negotiation support system. Please answer all of the questions below. Feel free to ask the experimenter for help at any time.

1) Using your computerized negotiation support system, determine the best possible outcome for you on each of the issues. What level would you prefer for each issue?

Acres: ____________
Earliest Opening Day: ____________
% of Gross: ____________
% of In-State Employees: ____________

2) Using your computerized negotiation support system, determine the worst possible outcome for you on each of the issues. What level would you least prefer for each issue?

Acres: ____________
Earliest Opening Day: ____________
% of Gross: ____________
% of In-State Employees: ____________

3) Using your computerized negotiation support system, compare the following two agreements. Circle the one that would be best for you.

Agreement A	**Agreement B**
90 Acres	100 Acres
Opening in 4 years	Opening in 3 years
State Gets 8% of Gross	State Gets 4% of Gross
Hires 30% In-State Employees	Hires 10% In-State Employees

If you have any questions about the upcoming negotiation, please ask the experimenter at this time.

APPENDIX F

Intermediate Questionnaire

Instructions: We would like you to evaluate your experience so far using the following six scales. Please read the descriptions of the scales carefully. If you have a question about any of the scales, please ask the experimenter about it. It is extremely important that they be clear to you. Evaluating the task so far, on the "Rating Sheet" (on pg. 3), please place an "X" on each of the six scales at the point which matches your experience. Each line has two endpoint descriptors that describe the scale. Note that "performance" goes from "good" on the left to "poor" on the right. This order has been confusing for some people. Please consider your responses carefully. Consider each scale individually. Your ratings will play an important role in the study being conducted. Thus, your active participation is essential to the success of this study and is greatly appreciated.

APPENDIX F (continued)
Rating Scale Definitions

Title	**Endpoints**	**Descriptors**
MENTAL DEMAND	Low/High	How much mental and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
PHYSICAL DEMAND	Low/High	How much physical activity was required (e.g., pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding. slow or brisk, slack or strenuous, restful or laborious?
TEMPORAL DEMAND	Low/High	How much time pressure did you feel due to the rate or pace at which the tasks or task elements occurred? Was the pace slow and leisurely or rapid and frantic?
PERFORMANCE	Good/Poor	How successful do you think you were in accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance in accomplishing these goals?
EFFORT	Low/High	How hard did you have to work (mentally and physically) to accomplish your level of performance?
FRUSTRATION LEVEL	Low/High	How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during the task?

APPENDIX F (continued)

Rating Sheet

Subject ID: ______________ Task ID: ____________________

RATING SHEET

MENTAL DEMAND

Low High

PHYSICAL DEMAND

Low High

TEMPORAL DEMAND

Low High

PERFORMANCE

Good Poor

EFFORT

Low High

FRUSTRATION

Low High

APPENDIX F (continued)

Instructions: Please answer the following questions regarding your perceptions about the negotiation. Answer by marking directly on the questionnaire.

1. Listed below are the four issues that were on the negotiating table during the previous negotiation. While you never had direct access to your opponent's preferences, you probably had some idea as to the extent to which you and your opponent disagreed on each issue. Please use the scale below to estimate the degree to which you and the other negotiator disagreed on each issue. Place a number in the space provided.

1	2	3	4	5	6	7
Very Much Agreed						Very Much Disagreed

Level of Disagreement	**Issue**
_____	Acres
_____	Earliest Opening Date
_____	% of Gross Profit
_____	% of In-State Employees

2. Listed below are the four issues that were on the table during the previous negotiation. While you never had direct access to the computerized negotiator's preferences, you probably had some idea as to how important each issue was to your opponent. Please rank order the issues according to how important you believe each issue was to your opponent. Use whole numbers (e.g., 1,2,3, ...) with "1" representing the "most important issue". If you believe that two or more issues are equally important for your opponent, give them the same number.

Rank	**Issue**
_____	Acres
_____	Earliest Opening Date
_____	% of Gross Profit
_____	% of In-State Employees

APPENDIX F (continued)

3. Could you please describe the basic strategy you are using during this negotiation - how are you attempting to come to an agreement with the other negotiator?

APPENDIX G

Post Experimental Questionnaire

Instructions: We would like you to evaluate your experience so far using the following six scales. Please read the descriptions of the scales carefully. If you have a question about any of the scales, please ask the experimenter about it. It is extremely important that they be clear to you. Evaluating the task so far, on the "Rating Sheet" (on pg. 3), please place an "X" on each of the six scales at the point which matches your experience. Each line has two endpoint descriptors that describe the scale. Note that "performance" goes from "good" on the left to "poor" on the right. This order has been confusing for some people. Please consider your responses carefully. Consider each scale individually. Your ratings will play an important role in the study being conducted. Thus, your active participation is essential to the success of this study and is greatly appreciated.

APPENDIX G (continued)
Rating Scale Definitions

Title	Endpoints	Descriptors
MENTAL DEMAND	Low/High	How much mental and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
PHYSICAL DEMAND	Low/High	How much physical activity was required (e.g., pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding. slow or brisk, slack or strenuous, restful or laborious?
TEMPORAL DEMAND	Low/High	How much time pressure did you feel due to the rate or pace at which the tasks or task elements occurred? Was the pace slow and leisurely or rapid and frantic?
PERFORMANCE	Good/Poor	How successful do you think you were in accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance in accomplishing these goals?
EFFORT	Low/High	How hard did you have to work (mentally and physically) to accomplish your level of performance?
FRUSTRATION LEVEL	Low/High	How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during the task?

APPENDIX G (continued)

Rating Sheet

Subject ID: ______________ Task ID: ____________________

RATING SHEET

MENTAL DEMAND

Low High

PHYSICAL DEMAND

Low High

TEMPORAL DEMAND

Low High

PERFORMANCE

Good Poor

EFFORT

Low High

FRUSTRATION

Low High

APPENDIX G (continued)

Instructions: Please answer the following questions regarding your perceptions about the negotiation you just completed. Answer by marking directly on the questionnaire.

1. Listed below are the four issues that were on the negotiating table during the previous negotiation. While you never had direct access to your opponent's preferences, you probably had some idea as to the extent to which you and your opponent disagreed on each issue. Please use the scale below to estimate the degree to which you and the other negotiator disagreed on each issue. Place a number in the space provided.

1	2	3	4	5	6	7
Very Much Agreed						Very Much Disagreed

Level of Disagreement	**Issue**
_____	Acres
_____	Earliest Opening Date
_____	% of Gross Profit
_____	% of In-State Employees

2. Listed below are the four issues that were on the table during the previous negotiation. While you never had direct access to the computerized negotiator's preferences, you probably had some idea as to how important each issue was to your opponent. Please rank order the issues according to how important you believe each issue was to your opponent. Use whole numbers (e.g., 1,2,3, ...) with "1" representing the "most important issue". If you believe that two or more issues are equally important for your opponent, give them the same number.

Rank	**Issue**
_____	Acres
_____	Earliest Opening Date
_____	% of Gross Profit
_____	% of In-State Employees

Instructions: For the following questions, simply circle your answer on the scale.

3. How satisfied are you with the total number of points you received in this negotiation?

1	2	3	4	5	6	7
Not at All Satisfied						Very Satisfied

4. Ignoring the final agreement, how satisfied are you with the overall quality of the negotiation that just took place?

1	2	3	4	5	6	7
Not at All Satisfied						Very Satisfied

5. To what extent would it have been helpful to have had more time to negotiate this agreement?

1	2	3	4	5	6	7
Not at All Helpful						Very Helpful

6. How difficult was it using the computer to communicate offers with the other negotiator?

1	2	3	4	5	6	7
Not at All Difficult						Very Difficult

7. Could you please describe your basic strategy during this negotiation - how did you attempt to come to an agreement with the other negotiator? Did your strategy change at any point during the negotiation?

APPENDIX H

Debriefing Protocol

The study itself is now over. However, at the end of every psychology study there is a period of time called debriefing. This is when the experimenters explain the purpose of the study and you have an opportunity to ask any questions that you might have.

You have just participated in a study designed to investigate whether computer aids can assist in negotiation and, if so, what form they should take. In this study, there are three alternate computer interfaces being tested. We are testing to see which display will decrease the amount of work that a person has to do. Previous research has shown that when a person has more work to do mentally, such as adding together point totals, there are certain physiological changes that occur such as an increased heart rate and a decrease in eyeblink rate

I am also interested in seeing which interface will increase the point totals that negotiators acquire. In many negotiations, instead of being a strictly win-lose situation in which what you win is accompanied by a loss to the other party, there may exist a solution that is beneficial to both you and the other party. We are hoping that one of these interfaces will increase the probability of finding that mutually beneficial solution.

Previous research has indicated that there may be a gender difference in the types of agreements reached due to the numerical nature of the task. It is hoped that one of the three interfaces will eliminate these gender differences.

I'd like to ask that you do not tell anyone who may be participating in this study what it is about. If people knew a lot about the study beforehand, they might not behave naturally. So please do us a favor and keep the details of the study to yourself. You could tell people that this study is available, but please do not tell them about the nature of the negotiation or the agreement that you decided on.

If you have any questions regarding this study, feel free to ask the experimenter at this time. If you would like to learn more about negotiations, I can give you the names of some valuable references.

Thank-you very much for participating.