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Social intelligence, problem construction, and leadership: The trait approach revisited

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SOCIAL INTELLIGENCE, PROBLEM CONSTRUCTION, AND LEADERSHIP: THE TRAIT APPROACH REVISITED

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Abstract

Social intelligence is a personality trait that refers to an individual's ability to correctly interpret their environment and take the appropriate action. Recent research (Gilbert, 1994) found social intelligence to be an important and significant predictor of leader effectiveness across multiple situations. Because the social intelligence construct can account for effective leadership behavior across multiple situations, it may represent a reconciliation of the trait and situation theories of leadership.

The purpose of this study was to continue this line of research on social intelligence and leadership by examining the role of social intelligence in creative problem solving. Problem construction is the first phase of this process where the goals, objectives, and constraints of the problem situation are determined (Mumford, Reiter-Palmon, & Redmond, 1994). Because leaders must solve problems in a complex social environment, it was proposed that social intelligence would be a significant predictor of a leader's ability to

effectively construct and solve social problems. Socially intelligent leaders may be more effective across multiple situations because they "ask the right questions" and, therefore, arrive at a better solution for the organization.

In this study, 120 Reserve Officer Training Corps (ROTC) cadets from two mid-western universities took an academic intelligence test, a social intelligence background data measure, a leadership activities scale, and performed two problem solving exercises with open-ended, ill-defined problems. In the problem solving exercise, the cadets were asked to write as many problem restatements (a measure of problem construction) as possible and then to write one solution to each problem. The problem restatements and solutions were rated for appropriateness and originality. In addition, the number of restatements provided (fluency) was calculated for each cadet.

Overall, this study had three major findings. First, academic intelligence was an important predictor of problem restatement appropriateness and originality. Additionally, there was a strong problem effect in that the cadets consistently performed better on one of the two problems

than the other. However, the social intelligence background data measure did not significantly predict the appropriateness or originality of the problem restatements and solutions as hypothesized in this study.

Introduction

The study of leadership is as important today as it has been for the last fifty years, and probably even more so. Leaders are counted on every day to run million dollar industries, military organizations, or almost any group situation where decisions have to be made and goals need to be achieved (Bass, 1990). Leaders provide the direction and motivation to guide organizations through numerous changes, all in the pursuit of organizational objectives.

To look at the possible role of social intelligence on the leader decision making process, leadership must be operationally defined. Mumford (1986) proposed that leadership should be approached from an organizational context. Leaders must operate in elaborate social systems in pursuit of the goals established by that organization. Organizations should be viewed as open systems because they have dynamic internal and external interactions. Because of this complex social environment, people establish various boundary roles to successfully integrate the systems and subsystems of this open system (Katz & Kahn, 1978).

These boundary roles become important as leaders attempt to solve organizational problems. Leadership arises through interpersonal influence in the dynamic interaction of individual and situational variables. Mumford and Connelly (1992) explain that effective leaders take overt and covert actions to enhance system or subsystem goal attainment. They further suggest that leaders operate in a social domain that is by its very nature ill-defined. Mumford, Zaccaro, Harding, Fleishman, and Reiter-Palmon (1991) argue that the role of a leader is to "specify and advance organizational goals and to facilitate transformation processes in the organization" (p.ii). They further explained that leadership can be defined as "discretionary problem solving in ill-defined domains" (p.ii).

An important component of creating and solving ill-defined problems is the process of defining or constructing the problem appropriately. Problem construction, also called problem finding or problem definition, is the first phase of the problem solving process where the goals and objectives of the problem situation are defined (Reiter-Palmon, 1993).

Recent research has demonstrated that the problem construction process is unique and separate from the problem solution. Problem construction is an especially important process as the underlying structure of the problem situation decreases (Mumford, Reiter-Palmon, & Redmond, 1994).

This study looked at the role of social intelligence in problem solving, especially the problem construction phase of the process. It is well recognized that leaders must make decisions in the pursuit of organizational goals (Mumford et al., 1991). To do this, they must be able to correctly interpret environmental stimuli and other social cues to develop the correct problem. How the problem is constructed by the leader will be critical to the final solution attained (Mumford & Connelly, 1992). The ability to interpret the social cues, or social perceptiveness, and the ability to take the appropriate action, or behavioral flexibility, should greatly affect the success that the leader will have across multiple, unique situations (Zaccaro et al., 1991).

To summarize, the goal of this research was to examine leader problem solving in an organizational context. In

doing so, this research linked the trait and situation approaches to leadership. A brief review of leadership theories will be reported, as well as a review of the research on social intelligence. Finally, problem solving literature will be reviewed, with special concentration on the problem construction phase of the process. Results of this study will further Gilbert's (1994) work on social intelligence and leadership by proposing that how leaders construct or define the problems they encounter will determine the success they will have across situations.

Theoretical Foundations

Before examining social intelligence as an individual difference predictive of leadership and potentially important to the problem construction process, a brief overview of various theories of leadership is conducted. This review is relevant since social intelligence is encompassed by one of these theories, the trait theory of leadership.

Overview of Early Leadership Theories

Early leadership theories looked for the traits that made a person a good leader, often referred to as "great man" theories (Bass, 1990). Although early research concentrated on a trait theory approach, this research significantly decreased after two noted reviews concluded that no traits consistently differentiated leaders from non-leaders across a variety of organizational situations (Stogdill, 1948; Mann, 1959). Stogdill (1948) reviewed over 120 different studies that looked at traits and leadership. He found many variations in traits and measures used across studies, as well as the definitions of leadership that were

used. Stogdill (1948) categorized traits into six general areas: capacity, achievement, responsibility, participation, status, and situation. He concluded that leadership is a relationship contingent on both the leader and the situation. Leaders in one situation may not be leaders in another. Although some consistent patterns did exist, the results greatly varied and the overall average relationships were low.

Mann (1959) also summarized research on individual personality traits and leadership. Over 500 different measures of personality were reviewed in his study. He found intelligence to be the best predictor of an individual's performance. In no case did he find a personality variable to correlate more than .25 with leadership, and in most cases the median correlations were closer to .15. Mann's (1959) and Stogdill's (1948) findings basically put an end to trait theories of leadership for quite some time.

Because of the devastating results of the studies mentioned above, researchers began to concentrate on situational variables that contribute to successful leadership. Under the general umbrella of expectancy

theories, House (1971) proposed a theory of leadership known as the path goal theory of leader effectiveness. This theory of leadership looked at leadership behaviors that facilitate goal attainment. He proposed that the behavior of a leader is extremely important because the leader determines what extrinsic reward will be associated with goal attainment and the expectancy that the subordinate has for reaching the desired rewards.

In line with House's (1971) research, Vroom and Jago (1974) developed a normative model of leadership which emphasized the role of leader behavior. Leadership was viewed as a social process where leaders make decisions. Vroom and Jago (1974) provide prescriptions for how decisions should be made by attempting to optimize acceptance of the decisions based on differing situational variables. They conclude that variance in behavior attributed to situational characteristics is usually larger than the variance that is attributable to individual differences.

Fiedler (1971) proposed a contingency model of leadership using the Least Preferred Co-worker (LPC) scale

scores. Fiedler suggested that by measuring how a leader views his or her least preferred co-worker, it can be determined whether a leader is task oriented or relationship oriented. According to Fiedler's contingency model, leaders cannot change their style, but rather are effective in different situations.

Although some of the situational theories were moderately supported, these theories could not account for the same leader being effective (or emerging) in multiple situations that required completely different demands on the leader. Researchers continued to believe that there must be some personality trait or construct that could account for a leader's ability to be effective across these different situations. The next section outlines several reasons that justify a renewed emphasis on trait theories of leadership.

Recent Research Supporting Trait Perspective on Leadership

At least three compelling reasons existed to reconsider trait theories. First, new meta-analytic techniques indicated the role of leader traits in accounting for leadership behavior(Lord, DeVader, & Alliger, 1986). Second, results from longitudinal assessment center studies

demonstrated the effectiveness of using traits for predicting the long term success of managers (Howard & Bray, 1988). Finally, improved designs in leadership studies revealed that a significant percent of variance in leader emergence is, in fact, trait based (Kenny & Zaccaro, 1983; Zaccaro, Foti, & Kenny, 1991).

Lord, De Vader, and Alliger (1986) reanalyzed earlier reviews of trait research using improved statistical methods to account for variation and error across studies. These new meta-analytic techniques found stronger relationships between traits and leader effectiveness than had been previously reported. Lord et al. (1986) argued that low associations between traits and leadership could be attributed to sampling error, unreliability, and range restriction in Mann's (1959) review. They argued that Stogdill's and Mann's work using the median correlation probably did not provide a good estimation of population parameters. Lord et al. (1986) offered three ways in which Stogdill's and Mann's results were misinterpreted. First, the studies did not include group effectiveness as rated by independent observers as a dependent variable. Second,

statistically significant relationships did exist, but were not reported. Third, Mann's (1959) conclusions were based on only 28 studies. Lord et al. concluded, "Personality traits are associated with leadership perceptions to a higher degree and more consistently than popular literature indicates" (p. 407).

New statistical models continued to aid the search for cross-situational consistency in leader emergence. Barlund (1962, cited in Kenny & Zaccaro, 1983) created a rotation design that varies both the task and member composition of groups and computes the correlation of leadership rank in one group with the average leadership ranks of the other groups. Rotation designs are based on the idea that, if leadership is a function of the characteristics of a leader, the same person will continually emerge as the leader across situations. Using a Social Relations Model developed by Kenny (1981, cited in Kenny & Zaccaro, 1983), and Barlund's rotation design, Kenny and Zaccaro (1983) found that between 49% and 82% of leadership variance could be attributed to stable characteristics of the leader.

In addition to the new analytical techniques, longitudinal studies also provided critical evidence that leader effectiveness could be predicted over long periods of time using the trait approach. Howard and Bray (1988) conducted a longitudinal study of leaders through the use of assessment centers. This study looked at Bell System managers over a 30 year time-frame. Between the years of 1956-1960, psychological measures were administered to young managers at the beginning of their careers in an attempt to predict their long-term success. The criterion for success was promotion to higher levels of management. Many characteristics were significantly correlated with this criterion even after 20 years, and included self-esteem (r=.12), ambition (r=.37), interpersonal ability (r=.20), administrative skills (r=.16), and cognition (r=.38), to name a few (Howard & Bray, 1988). The results of this research were clear: certain characteristics were predictive of leader success, even over long periods of time.

Building on the contingency and normative theories of leadership, Zaccaro, Foti, and Kenny (1991) tested the idea that some individuals should be better able to interpret a

situation and respond accordingly. Specifically, high self-monitoring individuals should be better able to monitor and control their expressive behaviors which should lead to their emergence as a leader across different situations. After administering Snyder's (1974) self-monitoring scale, Zaccaro et al. (1991) rotated each subject through four different situations. Group composition was changed in each rotation to see if the same individuals would consistently emerge as leaders even when the situational demands changed. Results demonstrated that 59% of the variance in leadership emergence seemed to be attributable to some stable characteristic of the leaders. This study provided further support for the results found by Kenny and Zaccaro (1983) and Lord, De Vader, and Alliger (1986) that emergent leadership is, in fact, stable across group situations and that this stability can be attributed to characteristics of the individual. Zaccaro et al. (1991) hypothesized that a leader's ability to recognize different group requirements and respond accordingly could be responsible for leader stability across multiple situations. Although these abilities, termed social perceptiveness and behavioral

flexibility, were provided as two possible explanations for the findings, the Snyder Self-monitoring Scale (1974) used by Zaccaro et al. (1991) only tapped into behavioral flexibility.

Continuing the line of research completed by Kenny and Zaccaro (1983) and Zaccaro, Foti, and Kenny (1991), Albright and Forziati (1995) also examined cross-situational stability in leadership by having leaders interact with non-leaders on four different tasks. Participants identified as leaders held current leadership positions at a university, although the leaders were not aware that they had been asked to participate because of their status. Using a rotational design that varied both group composition and task, Albright and Forziati had concealed observers code leadership behaviors. After the tasks were completed, participants rated themselves and each other on leadership. Results revealed that participants accurately rated themselves and others when their ratings were compared to the concealed judges' ratings. In addition, the average correlation between leadership behavior in different tasks was .46, thus

providing further support for cross-situational consistency of leaders.

Although early research quickly discredited trait approaches (Mann, 1959; Stogdill, 1948), recent research has consistently concluded that certain stable characteristics enable leaders to perform across multiple situations (Albright & Forziati, 1995; Lord, DeVader, & Alliger, 1986; Zaccaro, Foti, & Kenny, 1991). It also seems clear that a leader's ability to interpret environmental stimuli and act accordingly is a characteristic contributing to this cross-situational consistency. In the following section, I will review the development of the social intelligence construct and its role in effective leader problem solving.

Social Intelligence

Social intelligence is a person's ability to correctly perceive the cues in the social environment and take an appropriate behavioral action based on these cues (Gilbert, 1994). Social intelligence can be important in any situation where interpersonal issues are a concern. Leaders operate in a social domain everyday and are expected to correctly interpret the social situations they encounter in order to

take the best course of action for the organization. The ability of a leader to attend to the right cues and respond accordingly would seem to differentiate effective leaders from ineffective leaders (Gilbert, 1994). Therefore, social intelligence seems to be a trait that accounts for effective leadership across differing situations.

Development of the social intelligence construct. One of the first theorists to identify social intelligence as a construct was Thorndike (1920). Thorndike (1920) proposed a distinction between social intelligence and abstract intelligence. Social intelligence was a person's ability to interpret thoughts and actions of people directly interacting with them, while abstract intelligence was more concerned with general thoughts and ideas. Thorndike explained, "It [social intelligence] is the ability to understand and manage men and women, boys and girls - to act wisely in human relations" (p. 228).

Strang (1930) believed that it may be impossible to separate constructs of abstract and social intelligence. He proposed that social intelligence was based on two components. First, a person must have the necessary

knowledge to choose an appropriate action. Second, the person must have the ability to make the correct choice when confronted with real situations. Although the second part can be separated from abstract intelligence, having the appropriate knowledge would be difficult to isolate from abstract intelligence.

Keating (1978) attempted to separate the domains of social and academic intelligence. He used three common paper and pencil measures of social intelligence and three measures of academic intelligence and factor analyzed the results. He was not able to produce any identifiable "social" factor. Using the Social Maturity Index (SMI; Gough, 1969) as a measure of social skill, Keating (1978) concluded that academic measures were better at predicting social competence than the social measures. He recommended that future attempts to make an accurate assessment of social intelligence may require an in situ observation approach to the measurement of the construct.

Although these early searches for the construct of social intelligence were not successful, later attempts met with more success (Ford & Tisak, 1983; Gilbert, 1994;

Marlowe, 1986). Ford and Tisak (1983) used multiple measures of social and cognitive intelligence on a large sample of participants and concluded that social intelligence was indeed a distinctive domain. Their success is probably attributed to the use of behaviorally-based measures of social intelligence, as Keating (1978) had recommended. Marlowe (1986) suggested that previous attempts to isolate the domain of social intelligence failed because they were plagued by both definitional and psychometric problems. He explained that social intelligence is a multidimensional construct and when defined in terms of social effectiveness, it does represent a distinctive domain that is not confounded with academic ability. Through factor analysis of several social skills inventories, Marlowe (1986) concluded that social intelligence was comprised of five factors: prosocial attitude, social skills, empathy skills, emotionality, and social anxiety. None of these factors was found to significantly correlate with measures of verbal intelligence.

Wong, Day, Maxwell, and Meara (1995) performed two multitrait-multimethod studies of academic and social

intelligence to try to distinguish between the constructs. They defined social intelligence in terms of three dimensions: (a) social perception, (b) social knowledge, and (c) social behavior. Through confirmatory factor analyses, social intelligence and academic intelligence could be discriminated, although their components were correlated between .14 and .25. Wong et al. (1995) cautioned against the future use of self-reports of academic and social intelligence because of the problem of shared method variance.

Gilbert's (1994) research concentrated on the role that social intelligence plays as an individual difference variable that is important to leader effectiveness. As part of a larger study with the United States Army, Gilbert (1994) found the most convincing evidence for the establishment of separate academic and social intelligence domains. Using background data measures of social intelligence, she was able to significantly predict leader effectiveness above and beyond what the general cognitive abilities predicted. Gilbert's (1994) findings are very important because they not only isolate the domain of social

intelligence, but they demonstrated the usefulness of the social intelligence construct in the leadership arena.

Although social intelligence has been defined in many ways, an underlying theme has been to define it in terms of accurately perceiving the social environment and taking the appropriate action (Gilbert, 1994; Strang, 1930; Wong, Day, Maxwell, & Meara, 1995; Zaccaro, Foti, & Kenny, 1991; Zaccaro, Gilbert, Thor, & Mumford, 1991). Consistent with previous definitions and findings, Zaccaro, Gilbert, Thor, and Mumford (1991) proposed defining social intelligence in terms of behavioral flexibility and social perceptiveness. They viewed social perceptiveness as the perception and understanding of critical social information. People are bombarded with many different, and often conflicting, social cues. Social perceptiveness refers to one's ability to attend to the most important cues in order to understand the nature of the problem at hand. This can be linked closely to development of declarative knowledge structures that would contain information about different types of persons, situations, and episodes. Zaccaro et al. (1991) stated that social perceptiveness should significantly aid leaders to

interpret the problems that impede an organization's progress.

Gilbert (1994) further divided social perceptiveness into the subcomponents of interpersonal perceptiveness and system perceptiveness. Interpersonal perceptiveness refers to the ability to understand the needs, goals, and demands of others, while system perceptiveness refers to the ability to "be aware and sensitive to the interrelationships, goals, and demands of the surrounding environment" (Gilbert, 1994, p.29).

Behavioral flexibility refers to taking the best course of action based on the demands of the situation (Zaccaro et al., 1991). It can be linked with procedural knowledge or the "how to" of getting something accomplished. Zaccaro et al. described behavioral flexibility as the ability and willingness to respond in significantly different ways to correspond to different situation requirements. This ability would seem to rely on individuals' having social knowledge structures that promote situational variability.

The ability to attend to the most important cues, accurately interpret these cues, and take the correct action

may be what differentiates effective leaders from ineffective leaders. This line of reasoning is what led Zaccaro, Foti, and Kenny (1991) to conclude, "social intelligence is a particularly important leader attribute precisely because it promotes success in organization settings that are characterized by novelty, changeability, ambiguity, and high social risk" (p. 335).

Several theorists have proposed that the trait of social intelligence integrates the trait and situation approaches to leadership (Gilbert, 1994; Zaccaro, Gilbert, Thor, & Mumford, 1991). The traditional trait approach searched for leadership traits that would allow leaders to be effective across different domains, while the situational approach believed that leaders would perform differently based on varying situational demands. Defining social intelligence as social perceptiveness and behavioral flexibility helps to reconcile these two competing viewpoints. Zaccaro et al. (1991) explained, "Behavioral flexibility results in leadership responses that correspond to different functional demands of groups and organizations. Social perceptiveness means that leaders are better than

non-leaders in becoming aware of these demands and what they mean for individual collective action" (p.323).

Social intelligence and social knowledge structures. Although the work of Zaccaro, Gilbert, Thor, and Mumford (1991) and Gilbert (1994) fits nicely into the leadership domain, it is prudent to review the work of Cantor and her colleagues (Cantor & Harlow, 1994; Cantor & Kihlstrom, 1989) in the area of social knowledge structures. Cantor and Kihlstrom (1989) defined social intelligence as a multifaceted, domain and task specific knowledge that is reformulated in each significant life encounter. Social intelligence should be viewed on an individual level representing an individual's effort to solve his or her life problems and work toward his or her life goals. An individual's problem solving efforts are an active attempt to work on life tasks. Therefore, it would only be possible to measure whether or not a behavior is socially intelligent by knowing the goals and objectives of a specific individual.

Cantor and Kihlstrom's (1989) and Cantor and Harlow's (1994) work has made significant contributions in the area

of social cognition and the use of knowledge structures to solve problems. Based on their work, it may be expected that individuals with higher levels of social intelligence will have a more sophisticated and better organized store of social knowledge than those individuals with lower levels of social intelligence. In this study, however, the emphasis is placed on the organizational level, not the individual level. Socially intelligent behavior will be viewed as accurately perceiving the environment and taking the appropriate course of action to further organizational goals.

Social intelligence and leadership. As Gilbert (1994) recognized in her work, social intelligence is not the only trait that contributes to leader effectiveness. However, it should play an important role in a leader's ability to interpret a broad range of social stimuli and take the appropriate course of action, especially when solving ill-defined or novel problems in a social domain. In fact, social intelligence was found to be a significant predictor of leader effectiveness in Gilbert's (1994) research with the United States Army. However, it is not known how social

intelligence contributes to leader effectiveness. The ability of a leader to properly construe a social situation, to include understanding the overall systems and subsystems effecting the organization, seems important. It is probable that it is not just a leader's ability to solve problems that is important, but it is also the leader's ability to interpret the social environment and create the appropriate questions that is important. The final step of taking the appropriate action may only occur after the correct problem has been identified. It is, therefore, suggested that one possible way that social intelligence influences leaders' effectiveness is through its effect on problem construction.

Problem Construction

Problem construction, also commonly referred to as problem finding or problem formulation, is the first step of the creative problem solving process (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). It is the process of defining the goals and objectives of the problem situation, including a plan of action to solve the problem (Mumford, Reiter-Palmon, & Redmond, 1994; Reiter-Palmon, 1993). Problem construction is at the heart of the creative thought

process and has been found to be distinct and separate from problem solving (Dillon, 1982; Mumford, Reiter-Palmon, & Redmond, 1994). Because it occurs first, the quality of the problem construction may determine the quality of the problem solution.

Much of the research on problem construction has originated in the creative problem solving literature (Reiter-Palmon, 1993). Creative problem solving research is most relevant because it involves problem solving in ill-defined domains which result in the production of novel and useful solutions (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Creating appropriate problem constructions is critical to leaders who are continually solving problems in ill-defined domains to support organizational goals. The leader often does not have a clear-cut problem, but instead the leader must attend to the most important cues, formulate the problem, and take an appropriate course of action. Although problem construction would seem to have some interesting implications for leadership research, some of the first research on problem construction was conducted in

an artistic domain (Getzels, 1975, 1976; Getzels & Csikszentmihalyi, 1975).

Development and importance of problem constructions. Getzels (1975, 1979) was one of the first researchers to separate the problem construction phase from the problem solution phase by proposing that the quality of the question asked is the forerunner to the quality of the solution attained. Problem situations can be divided into one of the three classes. The presented problem already exists and is just waiting to be solved. The discovered problem also already exists, but it is discovered by the person rather than given by another. This problem may or may not have a known formulation, method of solution, or even a known solution. Finally, the created problem is a problem that does not exist until it is invented. Getzels (1979) concluded that problem finding (construction) can be studied empirically and that individual differences exist in the formulation stage just as they do in the solution stage. He also went on to propose that the quality of the problem that is found will be related to the quality of the solution attained.

Getzels and Csikszentmihalyi (1975) studied problem finding with art students at the School of Art Institute of Chicago. They set up a table with 30 objects collected from their studio classroom and asked each of the students to compose a still-life on a second table using as many of the objects as they wished. Finally, the participants were to make a drawing of the still life they had composed. Getzels and Csikszentmihalyi (1975) used three measures of problem finding: (a) number of objects handled, (b) the kinds of interactions with the objects, and (c) the uniqueness of the objects selected. Each of the behavioral variables of problem finding was significantly related to the ratings in originality and overall aesthetic value of the drawing. They also assessed the long term success of the artists by following up their participants seven years later. The success of these artists correlated $r = .41$, $p < .01$ with the total behavioral problem finding score obtained seven years earlier, thus providing clear support for the importance of problem construction.

Creating a problem is sometimes more difficult than solving an existing problem. Smilansky (1984) performed a

study to empirically test this relationship. Using items from the Raven Progressive Matrices Test, participants solved problems and created matrix-type problems. Results demonstrated that a reliable and valid quality score could be given to the newly created matrix, and a low correlation existed between the ability to solve an existing matrix problem and the ability to create new ones. Smilansky (1984) concluded that creating a new problem was a more difficult task than solving an existing problem.

Runko and Okuda (1988) studied the role of problem finding using divergent thinking tests. Three divergent thinking tests were administered to adolescents, each test containing three presented problems and one discovered problem. In the discovered problem situation, the adolescents were allowed to think of a problem and then provide solutions. Their results indicated that the adolescents generated significantly more responses to the discovered problems than the presented problems. Runco and Okuda (1988) concluded, "Problem discovery is a particularly important component in the creative process because it

occurs first, and because the quality of a problem may in part determine the quality of solutions" (p. 212).

This line of research on problem finding has significantly contributed to the understanding of the importance of the problem construction phase of the problem solving process. It seems clear that the problem construction phase is a separate and important phase in the process. This phase should be especially relevant to leaders who are attempting to solve problems in an organizational setting. A leader's problems are by their very nature ill-defined, which means that often the problem construction or formulation is left strictly up to the person discovering the problem. To further understand the possible impact that problem construction has on leadership, expert problem solving research from other domains is also reviewed.

Expert problem solving. Another line of research that has demonstrated progress in determining good constructions from poor ones has been in the area of research dealing with novices and experts. Since leaders can be viewed as experts in solving organizational problems, a leader's social intelligence should effect the appropriateness of their

resulting problem constructions. A review of expert problem solving in various domains may provide insight into how expertise affects the problem construction process. Chi, Glaser, and Rees (1982) compared expert and novice problem solving in physics. They determined that novice difficulties can be attributed mainly to inadequacies of the knowledge bases and not to limitations in the architecture of their cognitive systems. Novices often cannot identify the key and relevant features of situations which would allow them to infer further knowledge.

Continuing this line of research on experts and novices, Lesgold (1988) studied the difference between expert radiologists and student radiologists. He concluded that experts are able to make a thorough representation of the problem which significantly aids them at arriving at the appropriate solution. They exhibit flexibility at fine tuning their well developed schema. Lesgold (1988) explained, "The essence of problem solving is being able to deal with novel situations, or problems one has not been specifically trained to solve" (p. 205).

With a more cautionary note, Linville and Clark (1989) looked at problem solving and coping procedures within a production system framework, and summarized the impact of domain specific knowledge and expertise on problem solving. First, problem solving changes from one situation to another. Second, the processes change qualitatively as experience increases within a given domain. Finally, domain expertise is based on specialized strategies and representations of knowledge about the relevant domain. They cautioned that experts may not always perform better in novel situations because experts may be less flexible when their rules have been proceduralized. This study is important because it suggests that too much domain specific knowledge could actually lead to inflexibility, which suggests that there may be some optimal level of expertise.

In a similar vain, Chand and Runco (1993) concluded that there is an optimal level of expertise when dealing with creative problem solving, where the person has the required knowledge base while maintaining the flexibility necessary for creativity. Research on expert problem solving suggests that experts sometimes make mistakes in problem

solving by jumping straight to solutions and not spending enough time evaluating the problem situation, thus demonstrating the importance of the problem construction process, even for experts.

Research on the problem solving process and research on experts has continued to demonstrate the importance of the problem construction process (Getzels & Csikszentmihalyi, 1975; Lesgold, 1988; Wakefield, 1985). Finally, Rostan (1994) examined the relationship between critically acclaimed professional producers in art and science and professionally competent artists or scientists. She found that experts (critically acclaimed professionals) spend proportionately more time building a basic representation of the problem situation before searching for a solution. Problem formulation seems to be extremely important to the success of artists and scientists.

Leadership, Social Intelligence, and Problem Construction

To be successful, leaders must be able to understand and interpret various environmental stimuli to include the systems and subsystems, goals, limitations, and other factors in the environment in which they operate. This study

proposed that socially intelligent leaders are more effective because of their ability to construct a problem situation more appropriately and more originally.

The problem construction process is important in any situation calling for solving ill-defined problems. A leader's problem solving efforts must account for the embedded nature of social systems and the need to address multiple problems in an integrated fashion (Mumford & Connelly, 1992). Therefore, a leader's social intelligence should have a marked impact on the problem construction process due to their better organized and more sophisticated store of social knowledge (Cantor & Kihlstrom, 1987). Mumford, Zaccaro, Harding, Fleishman, and Reiter-Palmon (1991) determined that competencies stemming from high social intelligence are vital for both the interpretation of social problems and the generation and implementation of effective solutions: "Leaders' having high social intelligence are then able to make more fine-grained distinctions among types of persons, situations, and social episodes, and apply a more elaborate social information store to the interpretation of social stimuli" (Zaccaro,

Gilbert, Thor, & Mumford, 1991, p. 327). This increase in domain specific knowledge in social situations should increase the appropriateness of the problem constructions.

Hypothesis 1: Participants who score higher on a measure of social intelligence will make more *appropriate problem constructions* on a social problem, but not on a problem that is non-social in nature.

Creativity is demonstrated in the production of novel solutions (Mumford, Reiter-Palmon, & Redmond, 1994). As demonstrated earlier, creativity in the arts and sciences would seem to exemplify some degree of discovered problem situation (Dillion, 1982). Reiter-Palmon's (1993) research demonstrated the importance of knowledge availability and contextual influences on the generation of problem constructions and creative solutions. More socially intelligent leaders should have a larger knowledge domain and, subsequently, more original constructions to ill-defined problems.

Hypothesis 2: Participants who score higher on a measure of social intelligence will develop *more original problem*

constructions on a social problem, but not for a problem that is non-social in nature.

Another measure of the extent of participant's domain specific knowledge for social situations is fluency. Fluency represents the number of different responses that a person can create. Because leaders who are more socially intelligent should have more elaborate social knowledge structures, they should be able to create more representations of a problem situation and take into account more goals and constraints.

Hypothesis 3: Participants who score higher on a measure of social intelligence will create *more problem constructions* on the social problem than participants who score lower on the social intelligence measure.

The quality of the problem construction has continually been found to affect the quality of the final problem solution (Getzels & Csikszentmihalyi, 1975; Wakefield, 1985). In addition, experts have been found to be effective at solving problems relevant to their domain (Chi, Glaser, & Reese, 1982; Lesgold, 1988). Because a leader can be viewed as an expert at solving organizational problems, a leader's

social intelligence should represent his or her domain specific knowledge that can be utilized to solve social problems. Therefore, social intelligence should effect the appropriateness and originality of the problem solutions.

Hypothesis 4: Participants who score higher on a measure of social intelligence will develop *a more appropriate problem solution* on a social problem, but not on a problem that is non-social in nature.

Hypothesis 5: Participants who score higher on a measure of social intelligence will develop *a more original problem solution* on a social problem, but not on a problem that is non-social in nature.

Sternberg (1985) outlined three different types of intelligence, to include academic intelligence, creative intelligence, and common sense. He suggests that academic intelligence is what intelligence tests typically measure and that these tests are good predictors of academic performance. This study uses the Wonderlic to measure academic intelligence, and it uses a background data measure to measure social intelligence. Using this background data measure, Gilbert (1994) found social intelligence to be a

significant predictor of levels of leadership obtained above and beyond that which would have been predicted using an academic intelligence test alone. Social intelligence should reflect this same relationship on the constructions and solutions to the social problem, but not on the non-social problem.

Hypothesis 6: Social intelligence should be a significant predictor of the *appropriateness* of the problem *constructions* above and beyond what would be predicted using only academic intelligence.

Hypothesis 7: Social intelligence should be a significant predictor of the *originality* of the problem *constructions* above and beyond what would be predicted using only academic intelligence.

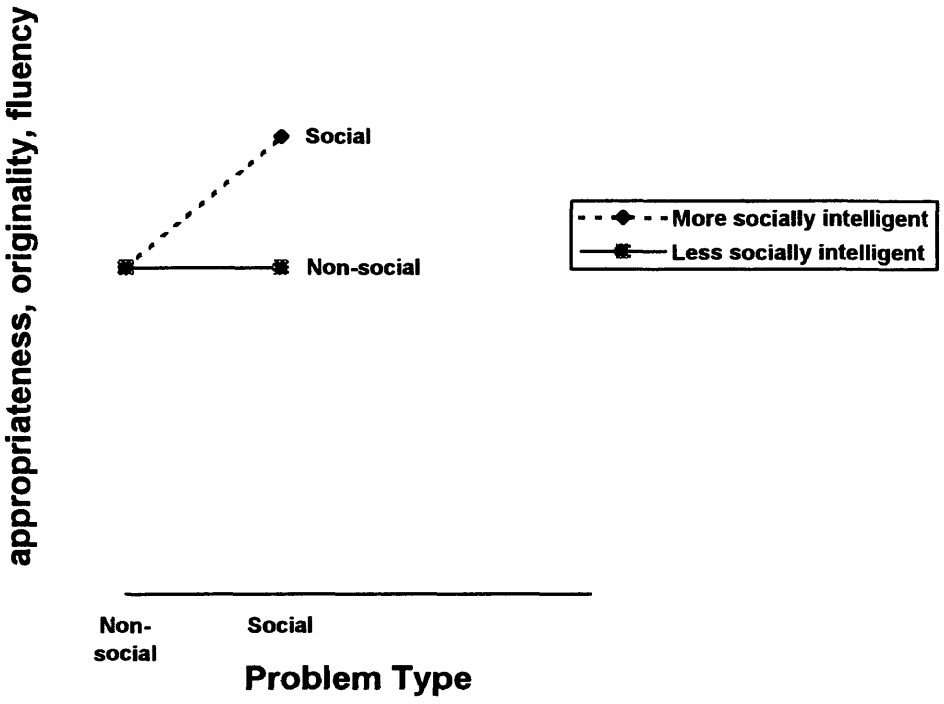
Hypothesis 8: Social intelligence should be a significant predictor of the *appropriateness* of the problem *solution* above and beyond what would be predicted using only academic intelligence.

Hypothesis 9: Social intelligence should be significant predictor of the *originality* of the problem *solution* above and beyond what would be predicted using only academic

intelligence.

In conclusion, social intelligence is expected to be a significant predictor, beyond academic intelligence, for appropriateness, originality, and fluency of the problem constructions for a problem situation requiring the use of relevant social knowledge structures. However, a person's social intelligence should not affect his or her ability to create constructions or solutions to problems that do not tap into these social skills. This relationship should also hold for the appropriateness and originality of the problem solutions. Figure 1 graphically demonstrates this predicted relationship.

Figure 1. Relationship between problem type, social intelligence, and the dependent variables.



Method

Participants

Participants were 120 students enrolled in the Reserve Officer Training Corps (ROTC) at two Mid-Western Universities. Permission was granted by their commanding officers to administer the test to the students one class at a time. Normally, all ROTC students meet once a week for their Leadership class. Administration of the measures for this project was conducted during their normally scheduled leadership class. This study is appropriate for inclusion in a leadership class, as will be demonstrated below in the measures. Table 1 lists some of the characteristics of the participants self-reported during the study.

Although it was not tested empirically, ROTC students should be comparable to other college students. Most of these students have had little leadership or management experience, even though this training and

Table 1

Self-reported Descriptives of the Participants

Characteristic	Mean	Stand. dev	Range
High School GPA	3.01	0.96	1.8-4.0
College GPA	2.75	1.38	1.8-4.1
Age	20.9	6.42	19-32
Gender*	73 male	44 female	n/a

*Note: Three students did not indicate their gender.

experience will occur in their future. Junior and Senior students have received more leadership training than the Freshmen and Sophomore students because they have already attended the Cadet Summer Training before their Junior year. This difference in experience probably resulted in increased variance in the independent variable of social intelligence. The breakdown by grade level was 18 Freshman, 13 Sophomores, 54 Juniors, and 32 Seniors (three students did not mark their grade).

Students were not forced to participate in this project. During the administration of instructions, students signed a consent form if they wished to participate. Students not wishing to participate were allowed to use the hour as a study hall. Confidentiality was also insured. Students were briefed that no individual results would be provided to their instructors. Only 3 students opted not to participate in the project.

Procedure

Students were tested during their regularly scheduled leadership classtime. As previously stated, participation was voluntary. Students were asked to read the instructions

on the handout while the instructions were read to them aloud. The entire battery was passed out to each student at the beginning of the class period. Participants first answered the Wonderlic Personnel Test which was timed. They then took the Divergent thinking test, which included 2 different items. After the divergent thinking test, the participants proceeded with the problem solving exercise. Students read one problem and then were asked to restate it. After restating the problem, they were asked to solve the problem and then answer the manipulation check questions. This was repeated with the second problem. To prevent order effects, the two problems were counter balanced. Finally, the students filled out the questionnaires consisting of background data measures, self monitoring scale, and demographic information.

Students were thanked for their participation and told that they were welcome to review the results of the study upon its completion. Again, it was emphasized that their individual scores would not be provided to their instructors.

Design

Three independent variables were used in this study. Social intelligence and academic intelligence were used as between-subject variables. Problem type (social/non-social) was used as a within-subjects variable with the order of the problems counterbalanced. Two sets of dependent variables were used. Problem constructions were evaluated for appropriateness, originality, and fluency, while problem solutions were evaluated for appropriateness and originality only (since only one solution was generated).

Measures

A copy of the all the measures used in this project, with the exception of the Wonderlic Personnel Exam, are included in the appendices. The Wonderlic is a commonly used test of academic intelligence that is available for commercial use. Copyright laws prohibit its inclusion in the appendices.

Social intelligence. Social intelligence was measured using a background data instrument (see Appendix A) that was previously used by Gilbert (1994). This background data measure contained 30 questions that could be subdivided into

three components of the social intelligence construct. Interpersonal perceptiveness referred to an individual's ability to comprehend the needs, goals, and demands of others, while systems perceptiveness referred to ones ability to interpret the interrelationships in the surrounding environment. The third component, behavioral flexibility, is the individual's willingness and ability to take the best course of action based on the unique demands of the situation.

Items for this measure were written by a panel of psychologists in accordance with the guidelines outlined by Mumford and his colleagues (Mumford & Owens, 1987; Mumford & Stokes, 1992). The procedure for developing this instrument was explained by Gilbert (1994). Nine individuals were trained on the methodology of writing background data questions. The panel included three industrial/ organizational psychologists, two Army personnel psychologists, and four graduate students. After receiving procedural and operational definitions of the components of social intelligence, the panel developed hypotheses about the experiences and behaviors that should be relevant within

a social intelligence domain. Then they translated the hypotheses into items using the consensus of the entire panel to determine appropriateness of fit.

The psychometric properties of the instrument were evaluated by Zaccaro, Zazanis, Diana, and Gilbert (1992; cited in Gilbert, 1994). Convergent validity was determined by finding possible correlations with Lennox and Wolfe's (1984) self-monitoring scale and O'Sullivan and Guilford's (1975) test of social intelligence. Interpersonal and system perceptiveness were positively correlated with O'Sullivan's and Guilford's test, as well as Lennox and Wolfe's scales of social sensitivity and self presentation. Lennox and Wolfe's ability to modify self presentations was significantly and positively correlated with behavioral flexibility. Discriminant validity was assessed using the Wonderlic Personnel Test and the Armed Service Vocational Aptitude Battery (ASVAB). Neither the Wonderlic nor the ASVAB was related to any of the dimensions of social intelligence. Gilbert(1994) found the internal consistency reliability of the dimensions to be .71 for systems perception, .62 for behavioral flexibility, and .79 for interpersonal

perception. For this study, the internal consistencies were similar to Gilbert's and were found to be .65, .56, and .74, respectively. The internal consistency reliability for the entire measure was a respectable .80. Reliabilities in this range are expected and desired for background data measures, because background data measures are somewhat heterogeneous by design (Mumford & Owens, 1987).

Academic intelligence. Academic intelligence was measured using the Wonderlic Personnel exam. The Wonderlic Personnel Exam is a timed, 12 minute, 50-question test that measures a person's problem solving ability. The score is computed by adding the number of correct answers. This test has been widely used in the literature as a reliable and valid measure of academic intelligence. Test-retest reliabilities are reported to range from .73 to .95. Since the test questions get progressively more difficult as the participant proceeds through the test, the use of the Kuder-Richardson KR-20 is used to determine internal consistency and is reported to be .88.

Problem scenarios. Each subject was asked to read two open-ended problem scenarios (see Appendix B). Following

each problem scenario, the participants were asked to restate the problem and then to solve it. The social problem is a leadership problem which requires the use of social skills to adequately solve. The non-social problem is also a leadership-based problem, but requires a lower degree of social skills to arrive at an appropriate solution. Both problems were relevant to the participants in the study. A pilot test was completed prior to final selection of the problems to ensure the social problem indeed required more social skills than the non-social problem. This test was conducted with ten graduate students involved in a problem solving research group. They confirmed that the two scenarios required different levels of social skills to solve.

Problem restatements. In order to evaluate problem construction, a procedure used by Baer (1988) and Reiter-Palmon (1993) was used. Participants first read a problem scenario, and were then asked to restate the problem in their own words. The instructions read:

"This is a test to find out how many different ways you can think of to state a problem. After reading the

problem situation, you should try to find as many different ways to restate the problem in the form of a question (e.g., 'How can I' or 'How can we') and then write the problem."

This procedure measures a participant's problem finding or problem construction ability by looking at how the subject conceptualizes the situation. The problem restatements were rated on appropriateness and originality using rating scales similar to those originally used by Redmond, Mumford, and Teach (1993) and adapted from a procedure used by Hennesey and Amabile (1988). In accordance with this procedure, the three judges were asked to rate the appropriateness and originality of problem restatements obtained from sample problems. Appropriateness was defined as a plausible and viable restatement of the problem scenario, while originality was defined in terms of the novelty of the response. The judges were then brought together to discuss discrepancies in their ratings. Reiter-Palmon, Mumford, Boes, and Runco (in press) found this procedure to be an effective method of training raters to judge the creativity of responses generated by participants.

After training was complete, the judges were given the restatements generated by the participants and were asked to evaluate each of them on their appropriateness and originality. See Appendix G for to review the rating criteria.

Interrater reliability of the three raters for the final study was assessed using only the interclass correlations (Shrout & Fleiss, 1979) for the appropriateness and originality ratings of the 1,100 problem restatements generated by the 120 participants. The interclass correlation can be viewed as the ratio of the variance of interest over the sum of the variation of interest plus error. This measure of interrater reliability is appropriate when each target (restatement or solution) is rated by each of the same judges, who are the only judges of interest (Shrout & Fleiss, 1979). The interclass correlation for this study was .778 for appropriateness and .653 for originality of the problem restatements.

Participants were asked to generate as many restatements of the two problems as possible. The total number of restatements generated for each problem is known

as fluency. An average of 4.34 (SD=2.20) restatements were generated for the social problem, while an average of 4.86 (SD=2.03) restatements were generated for the non-social problem.

Solution generation. After completing the problem restatement step, the students turned the page and were asked to provide the best possible solution to the problem scenario. All 240 problem solutions were judged on appropriateness and originality using the same procedure as used for the restatements reported above. The interclass correlations were .82 and .72 for the appropriateness and originality ratings, respectively.

Additional measures. In addition to the measures listed above, three measures were administered to further understand the structure of the underlying constructs. Snyder's 25 question Self Monitoring Scale (see Appendix D), which was originally used by Zaccaro, Foti, and Kenny (1991) to test for behavioral flexibility across group situations, so it should bear a close resemblance to Gilbert's (1994) background data measure of behavioral flexibility. Zaccaro et al. (1991) reported a Cronbach's alpha of .67 on the

Self-monitoring scale, which is similar to the .64 reliability found in this study. Mumford, O'Connor, Clifton, Connelly, and Zaccaro's (1993) Adolescent Leadership Activities Scale (see Appendix E) measures an individual's leadership experience. This is relevant when analyzing the complete relationship of social intelligence, problem constructions (and solving), and leadership. The Adult Leadership Activities Scale had a Cronbach's alpha of .85. Finally, all participants received a divergent thinking test (see Appendix F). This test asks participants to generate a list of possible consequences to two situations. This measure of divergent thinking is known as fluency, or quantity of responses generated by the subject. Because divergent thinking is considered an important measure of creativity (Guilford, 1967), its relationship to leadership problem construction and solution should be examined. An average of 6.37 responses was given in the first scenario for the divergent thinking exercise, and an average of 5.86 responses for the second scenario.

Analyses

First, manipulation checks were conducted to determine if participants indeed perceived one problem as requiring them to tap into relevant social knowledge structures more than the other problem. Second, multiple regression was used to determine if social intelligence significantly contributed to any of the dependent measures, to include problem restatement appropriateness, problem restatement originality, problem restatement fluency, problem solution appropriateness, and problem solution originality. If significant results were obtained using multiple regression, then hierarchical regression analysis was conducted. Using hierarchical regression, verbal intelligence was entered into the equation first, with the social intelligence entered into the analysis in the second step. This procedure was used to determine if social intelligence provided a significant contribution to the prediction of dependent variables above and beyond what was contributed by academic intelligence.

These analyses were carried out separately for each dependent variable and for each problem. Because regression

analyses cannot handle within subject variables, a repeated measures ANOVA technique was used to determine whether problem type had any effect. For the purpose of the repeated measures ANOVA, a median split was used to divide academic intelligence and social intelligence into two groups, high and low. Where appropriate, these results are reported immediately following the multiple regression results.

Results

The data set was analyzed using the SPSS-X statistical analysis program on the University of Nebraska VAX system. Table 6 reports the mean, standard deviation, and range of each of the measures used in this study. When each of the three subscales of the social intelligence test are added together for the full scale, a total of 140 points is possible (28 questions, 5 points each). Judges rated participants on the appropriateness and originality of the restatements and solutions to the social and non-social problems on a 5 and 6 point scale, respectively. Values reported are the mean ratings across all judges for each problem solution or set of restatements. Snyder's Self-monitoring scale is scored by summing all true responses out of a possible 25 true/false questions. Finally, academic intelligence was scored by totaling all correct responses with a possible score of 50.

Correlations among all key measures are reported in Table 3. As would be expected based on the results of Gilbert's (1994) work, leadership activity is highly

Table 2 Descriptives for full sample

Variable	Mean	SD	Range	Possible Range
Systems Perception	30.31	4.37	19-41	9-45
Interpersonal Perception	36.50	4.69	25-47	10-50
Behavioral Flexibility	31.83	3.64	21-41	9-45
Social intel(full scale)	98.66	9.91	73-124	28-140
Verbal Intelligence	26.15	4.50	12-39	0-50
Adult Lead. Activity	59.92	9.37	36-82	17-85
Self-monitor Scale	36.73	3.82	28-45	25-50
Problem Restatement - Appropriateness				
Social problem	2.49	.48	1.33-3.56	1-5
Non-social problem	2.87	.50	1.17-3.92	1-5
Problem Restatement - Originality				
Social problem	2.60	.50	1.33-3.83	1-5
Non-social problem	2.81	.46	1.17-3.89	1-5
Problem Restatement - Fluency				
Social problem	4.30	2.23	1-15	*
Non-social problem	4.86	2.03	1-15	*
Problem Solution - Appropriateness				
Social Problem	4.34	.84	1.0-5.0	1-6
Non-social problem	4.62	.80	1.67-6.0	1-6
Problem Solution - Originality				
Social Problem	3.73	.74	1.0-4.67	1-6
Non-social problem	4.45	.76	1.33-5.33	1-6

Note* - Participants generated as many as they wished.

Table 3 Correlations Among All Key Variables

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	.66**	.87**	.78**	.57**	-.02	-.11	.03	.06	.00	.11	.22*	.04	.03	.00	.02	.02	.06
2	1	.87**	.21*	.41**	-.08	-.18	-.04	.09	.05	.02	.12	.06	.06	.11	.04	.05	-.02
3		1	.56**	.51**	-.05	-.12	.05	.08	.00	.19*	.23*	.09	.09	.05	.04	.05	-.04
4			1	.40**	.09	.03	.04	-.02	-.03	.04	.16	-.06	-.06	-.09	-.07	-.04	.19*
5				1	.03	-.15	-.15	-.14	.09	.01	-.14	.07	.00	.06	-.12	.00	.16
6					1	-.04	-.08	-.01	.11	-.06	-.04	-.07	-.06	-.01	-.20*	-.23*	.04
7						1	.19*	.16	.03	.26**	.19*	.12	.11	.13	.15	.10	.26**
8							1	.38**	.21*	.31**	.21*	.12	.35**	.12	.18*	.21	.02
9								1	.09	.37**	.36**	.15	.38**	.31**	.16	.28**	-.04
10									1	-.05	-.05	.42**	.21*	.08	.03	.03	.07
11										1	.75**	.13	-.01	.09	.21*	.22*	-.01
12											1	.15	.02	.12	.09	.14	-.03
13												1	-.01	.07	.06	.15	-.06
14													1	.63**	.34**	.24**	.07
15														1	.36**	.27**	.09
16															1	.58**	.03
17																1	-.02
18																	1

Note* - p<.05

Note** - P<.01

See variable key following this table.

Table 3 Variable Key

#	Variable name
1	SITBDS=Social Intelligence Scale
2	SITBFS=Behavioral Flexibility
3	SITIPS=Intersonal Perception
4	SITSPS=Systems Perception
5	LEADACT=Leadership Activities
6	SMSCALE=Self-monitoring Scale
7	VIT-Academic Intelligence
8	SOCRESAPP=Restatement Appropriateness for Social Problem
9	SOCRESORI=Restatement Originality for Social Problem
10	SOCFLUE=Fluency for Social Problem
11	NSOCRESAPP=Restatement Appropriateness Non-social Problem
12	NONSOCRESORI=Restatement Originality for Non-social Problem
13	NSOCFLUE=Fluency for Non-social Problem
14	SOCSOLAPP=Appropriateness of Solution for Social Problem
15	SOCSOLORI=Originality of Solution for Social Problem
16	NSOCSOLAPP=Appropriateness of Solution Non-social Problem
17	NSOCSOLORI=Originality of Solution for Non-social Problem
18	CONSEQAVE=Average Number of Items Generated on Consequences Test

correlated with the social intelligence scale (r=.57, p<.01). It is also interesting to note that the Wonderlic Personnel Exam, a measure of academic intelligence, was not significantly correlated with the social intelligence scale (r=-.11, ns); thus the two measures seem to be tapping different domains of knowledge.

As expected, the appropriateness and originality ratings were correlated with each other to a moderate degree. For the social problem, the appropriateness of the restatements was correlated with the appropriateness of the solutions (r=.35, p<.01). Likewise, the appropriateness of the restatements and solutions to the non-social problem were also correlated (r=.22, p<.05). For originality, the results were similar. Again, the originality of the restatements correlated with the solutions for the social problem (r=.31, p<.01). However, the originality ratings of the restatements and solutions did not significantly correlate for the non-social problem (r=.15, p>.05).

Contrary to expectation, self-monitoring did not correlate with social intelligence, behavioral flexibility, or leadership activities. This could be a result of the low

Cronbach's alpha found for this measure. However, the self-monitoring scale did significantly correlate with the solution appropriateness (r=.20, p<.05) and originality (r=.23, p<.05) for the non-social problem. Although the self-monitoring scale was not one of the major independent variables in this study, its correlation patterns were certainly not what were expected.

Manipulation checks

Two Likert-type multiple choice questions were answered by the participants immediately following each problem solving exercise. The same two questions were asked after the social and non-social problem. These questions served as the manipulation check and determined the extent that the participants believed that the social situation actually required more social skill to solve than the non-social problem.

For the first manipulation check question, "To what extent did you need to consider other people's thoughts, feelings, or actions when thinking about Tom's/Clara's problem?", the mean for the social problem (Tom's problem) was 3.87 (SD=1.14) and was 2.48 (SD=1.14) for the non-social

problem (Clara's problem). The social problem was confirmed as requiring significantly more social skills to solve, $t(120)=10.80$, $p<.01$. Results were almost identical for the second of manipulation check question, which stated, "To what extent does a resolution to Tom's/Clara's problem seem to impact other people?" Means were 3.57 ($SD=1.01$) and 2.54 ($SD=1.16$), respectively. Again this difference in means was significant, $t(120)=8.17$, $p<.01$.

Social Intelligence Background Data Measure

As described earlier, the total social intelligence measure was broken down into three subscales, to include interpersonal perception, systems perception, and behavioral flexibility. As one might expect due to the larger number of items, the alpha for the entire social intelligence background data measure had a higher value than each of the subscales. Correlations among the subscales and total score are presented in Table 3. The subscales were moderately to highly correlated with each other. As the table depicts, systems perception was only slightly correlated with behavioral flexibility. This seems logical since understanding the organization and structure in the

surrounding environment (systems perception) does not signify a willingness to use varied behaviors (behavioral flexibility). Because they were only moderately to highly correlated, it is probable that each of the subscales is tapping into a different dimension of social intelligence. These results justify the need for the separate subscales.

Average Restatement Appropriateness

The first hypothesis predicted that participants who score higher on a measure of social intelligence would make more appropriate problem constructions on a social problem, but not on a problem that is non-social in nature. Hypothesis six continued this line of reasoning by predicting that social intelligence would predict appropriateness above and beyond measures of verbal intelligence.

Social intelligence. Table 4 summarizes the relationship of the full social intelligence scale as a predictor of problem restatement appropriateness for both the social and non-social problems. Using multiple regression, the social intelligence background data measure was not found to be a significant predictor of the

Table 4

Regression Analysis - Problem Restatement Appropriateness

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Soc. Intel. Test (full)	.001	.03	.08	.77
		Non-social Problem		
Soc. Intel. Test (full)	.012	.11	1.46	.23

appropriateness of the problem constructions created for the social problem (R^2=.001, F(1,116)=.08, p>.05). As expected, social intelligence was also not a significant predictor of the appropriateness of the problem constructions for the non-social problem (R^2=.012, F(1,117)=1.46, p>.05).

Using multiple regression each of the subscales of social intelligence was entered separately to see if individually they would predict problem restatement appropriateness, as seen in Tables 5 through 7. As with the entire scale, none of the social intelligence subscales, to include behavioral flexibility, interpersonal perception, and social perception, were significant predictors of the social problem. Unexpectedly, the interpersonal perception subscale was found to significantly predict the appropriateness of the problem restatements created on Clara's problem (R^2=.035, F(1,117)=4.32, p<.05), the non-social problem.

Academic intelligence. As displayed in Table 8, academic intelligence was found to be a significant predictor of the appropriateness of the problem restatements

Table 5

Interpersonal Perception - Restatement Appropriateness

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Interperson Perception	.003	.05	.29	.59
		Non-social Problem		
Interperson Perception	.036	.19*	4.32	.04*

Note* - significant at the level indicated

Table 6

Systems Perception - Restatement Appropriateness

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Systems Perception	.002	.04	.23	.63
		Non-social Problem		
Systems Perception	.001	.04	.15	.70

Table 7

Behavioral Flexibility - Restatement Appropriateness

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Behavioral Flexibility	.002	-.04	.23	.63
		Non-social Problem		
Behavioral Flexibility	.0003	.02	.03	.86

Table 8

Academic Intelligence - Restatement Appropriateness

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Academic Intelligence	.035	.19*	4.27	.04*
		Non-social Problem		
Academic Intelligence	.067	.26*	8.45	.001*

Note* - significant at the level indicated

created for the social (R^2=.04, F(1,117)=4.27, p<.05) and non-social problem (R^2=.04, F(1,117)=8.45, p<.05).

Hierarchical regression analysis was conducted to determine if the interpersonal perception subscale of social intelligence significantly contributed to the appropriateness of problem restatements after taking into consideration the contribution of academic intelligence. As Table 9 demonstrates, hierarchical regression revealed that the interpersonal perception subscale was also significant after taking into account verbal intelligence, R^2change=.049, Fchange(1,117)=6.40, p<.05.

Repeated Measures ANOVA results. Before analyzing the results using an analysis of variance technique, a thorough review of the distribution was conducted to ensure the all the statistical assumptions were met. First, a review of the histograms and skewness index revealed that the distributions approached normal distributions. In addition, there was reasonable homogeneity of variance. Since the assumptions were met, multivariate analysis of variance was conducted with the appropriateness of the restatements for both the social and non-social problems entered as the

Table 9

Hierarchical Regression Analysis in Predicting Problem Restatement Appropriateness for the Non-social Problem

Predictor	Beta	R^2
Step 1:		
Academic Intelligence	.26*	.068*
Step 2:		
Academic Intelligence	.29*	
Interpersonal Perception	.22*	.116*
Change in R^2		.049*

Note* - $p<.05$

dependent variables and academic intelligence and social intelligence (full scale) entered as the independent variables. As Table 10 depicts, two results were significant. Between participants, there was a significant main effect for academic intelligence. In other words, participants who scored higher on the academic intelligence test wrote more appropriate restatements for both problems. Within participants, there was a main affect for problem type (social or non-social), where participants generally were rated as generating more appropriate restatements to the non-social problem than the social problem. Analysis of the means, shown in Table 11, demonstrate these findings.

Average Restatement Originality

Hypothesis two predicted that participants who scored higher on a measure of social intelligence would develop more original problem constructions on a social problem, but not for a problem that was non-social in nature. Hypothesis seven continued this logic by stating that this relationship would hold true even after taking into account academic intelligence.

Table 10

Repeated Measures ANOVA Results: Restatement Appropriateness

Source of Variance	MS	DF	F	p
Acad. Intell.(AI)	2.49	1	7.98	.006*
Soc. Intell.(SI)	.24	1	.76	.387
Problem	8.49	1	54.67	.001*
AI X SI	.04	1	.14	.708
AI X Problem	.43	1	2.73	.102**
SI X Problem	.07	1	.46	.497
AI X SI X Problem	.03	1	.20	.66

Note* - significant at the level indicated

Note** - approached significance

Table 11

Means for Restatement Appropriateness

		Problem		
		Social	Non-social	
Academic	Low	3.33(.51)	3.81(.53)	3.57
Intelligence	High	3.62(.42)	3.92(.47)	3.77
		3.49	3.87	

Note - Standard deviation listed in parentheses.

Social intelligence. As shown in Table 12, the results were the opposite of the hypotheses. Using multiple regression, the entire social intelligence scale was found to be a significant predictor of the originality of the problem restatements created for the non-social problem, R^2=.05, $F(1,117)$=6.05, p<.05. However, it was not a significant predictor of the problem restatements created for the social problem, R^2=.004, $F(1,117)$=.48, p>.05.

Tables 13 through 15 report the results of simple regression with each subscale of social intelligence as a predictor of problem restatement originality. As Table 13 and 14 demonstrate, the interpersonal perception and systems perception subscales were both significant predictors of problem restatement originality when entered independently using simple regression. Again, this is contrary to what was hypothesized. None of the subscales were hypothesized to be significant predictors for the non-social problem.

Academic intelligence. In line with the results on appropriateness, multiple regression analysis revealed that academic intelligence was a significant predictor of problem restatement originality on the non-social problem (R^2=.03

Table 12

Regression Analysis - Restatement Originality

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Soc. Intel. Test (full)	.004	.06	.48	.49
		Non-social Problem		
Soc. Intel. Test (full)	.049	.22*	6.05	.02*

note* - significant at the level indicated

Table 13

Interpersonal Perception - Restatement Originality

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Interper. Perception	.007	.08	.76	.39
		Non-social Problem		
Interper. Perception	.052	.23*	6.42	.052*

Note* - significant at the level indicated

Table 14

Systems Perception - Restatement Originality

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Systems Perception	.004	-.02	.04	.84
		Non-social Problem		
Systems Perception	.024	.16**	2.92	.09**

Note** - approached significance

Table 15

Behavioral Flexibility - Restatement Originality

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Behavioral Flexibility	.009	.09	1.03	.31
		Non-social Problem		
Behavioral Flexibility	.015	.12	1.79	.18

$F(1,117)=4.26$, $p<.05$) and approached significance on the social problem ($R^2=.025$, $F(1,117)=3.00$, $p<.10$). Results are depicted in Tables 16.

Hierarchical regression analysis, shown in Table 17, revealed that the social intelligence background data measure accounted for a significant amount of variance in problem restatement originality above and beyond academic intelligence for the non-social problem, R^2change=.06, Fchange$(2,115)=7.66$, $p<.05$. Of the subscales, only the interpersonal perception subscale was significant after taking academic intelligence into account, R^2change=.06, $F(2,116)$change=8.22, $p<.05$.

Analysis Using High Quality as a Dependent Variable

Further analysis of the problem restatements was conducted using the proportion of restatements created by each subject that were considered high quality on either the appropriateness or originality ratings. High quality was defined as the number of restatements produced that were above the median score achieved on appropriateness or originality. The results exactly mirrored the result reported above when the average of all restatements were

Table 16

Academic Intelligence - Restatement Originality

Measure of Interest	R^2	Beta	F	p
		Social Problem		
Academic Intelligence	.025	.16**	3.00	.09**
		Non-social Problem		
Academic Intelligence	.035	.19*	4.26	.04*

Note* - significant at the level indicated

Note** - approached significance

Table 17

Hierarchical Regression Analysis in Predicting Problem Restatement Originality for the Non-social Problem

Predictor	Beta	R^2
Step 1:		
Academic Intelligence	.19*	.037*
Step 2:		
Academic Intelligence	.22*	
Interperson Perception	.25*	.10*
Change in R^2		.06*

Note* - P<.05

considered. In other words, social intelligence approached significance as a predictor of the proportion of high quality, appropriate restatements produced to the non-social problem (R^2=.03, F(1,117)=3.41, p<.10), but not on the social problem (R^2=.01, F(1,116)=.014, ns). Social intelligence was a significant predictor of the proportion of high quality, original problem restatements produced for the non-social problem (R^2=.04, F(1,117)=4.46, p<.05), but not on the social problem (R^2=.001, F(1,116)=.00, ns).

Fluency

It was also predicted that participants who score higher on a measure of social intelligence will create *more* problem constructions on the social problem than participants who score lower on the measure of social intelligence. Social intelligence did not seem to affect the quantity of problem constructions produced for either the social problem (R^2=.00, F(1,117)=.002, ns) or non-social problem (R^2=.002, F(1,117)=.22, ns).

Appropriateness of Problem Solutions

Hypothesis five predicted that participants who score higher on a measure of social intelligence will develop a

more appropriate problem solution on a social problem, but not on a problem that is non-social in nature. Hypothesis eight extended this logic to predict that social intelligence would be predictive even after taking into account academic intelligence.

Multiple regression analysis. As predicted, social intelligence was not a significant predictor of the solutions to the non-social problem (R^2=.00, $F(1,117)$=.00, ns), but it was not predictive of the social problem solutions either (R^2=.00, $F(1,117)$=.18, ns). Academic intelligence was not significantly correlated to the appropriateness of either problem solution (R^2=.02, $F(1,117)$=.15, ns; R^2=.01, $F(1,117)$=.11, ns).

Repeated Measures ANOVA results. As shown in Table 18, repeated measures analysis revealed two interesting effects. First, approaching significance, participants who scored higher on the academic intelligence measure consistently scored higher on both problems, $F(2,115)$=3.72, p<.10. Second, a significant within-subjects problem effect was discovered for problem solution appropriateness, $F(2,115)$=9.57, p<.01. Analysis of the means, presented in

Table 18

Repeated Measures ANOVA Results: Solution Appropriateness

Source of Variance	MS	DF	F	p
Academic Intelligence(AI)	3.26	1	3.72	.06*
Social Intelligence(SI)	.99	1	1.13	.29
Problem	4.40	1	9.57	.002*
AI X SI	2.27	1	2.59	.11**
AI X Problem	.01	1	.03	.87
SI X Problem	.09	1	.20	.66
AI X SI X Problem	.07	1	.15	.70

Note* - significant at the level indicated

Note** - approached significance

Table 19, revealed that participants consistently received a higher appropriateness rating on the non-social problem than on the social problem.

Originality of Problem Solutions

Hypothesis four predicted that participants who score higher on a measure of social intelligence will develop a more original problem solution on a social problem, but not on a problem that is non-social in nature. Hypothesis nine continued this logic by stating that social intelligence would be a significant predictor of the originality of the solution after taking into consideration academic intelligence.

Multiple regression. As expected, social intelligence did not significantly predict the originality of the solutions to the non-social problem (R^2=.00, F(1,117)=.07, ns), but it also failed to predict the originality of social problem solutions (R^2=.00, F(1,117)=.07, ns). Academic intelligence was not significantly correlated to the originality of solutions to either problem (R^2=.01, F(1,117)=.10, ns; R^2=.01, F(1,117)=.13, ns).

Table 19

Means for Solution Appropriateness

		Problem		
		Social	Non-social	
Academic	Low	4.23(.93)	4.50(.77)	4.36
Intelligence	High	4.43(.86)	4.72(.82)	4.57
		4.34	4.62	

Note - Standard deviation listed in parentheses.

Repeated Measures ANOVA results. As Table 20 depicts, repeated measures analysis of variance identified a significant within-subjects problem affect for problem solution originality, just as it did for problem solution appropriateness. Analysis of the means, shown in Table 21, confirmed that solutions for the non-social problem were rated as significantly more original that solutions for the social problem, $F(2,115)=71.37$, $p<.01$.

Table 20

Repeated Measures ANOVA Results: Solution Originality

Source of Variance	MS	DF	F	p
Acad. Intell.(AI)	.88	1	1.19	.28
Soc. Intell.(SI)	.13	1	.18	.67
Problem	30.14	1	71.37	.001*
AI X SI	.03	1	.04	.84
AI X Problem	.01	1	.03	.86
SI X Problem	.00	1	.01	.93
AI X SI X Problem	.19	1	.46	.50

Note* - significant at the level indicated

Table 21

Means for Solution Originality

		Problem		
		Social	Non-social	
Academic	Low	3.67(.84)	4.38(.72)	4.03
Intelligence	High	3.78(.66)	4.51(.79)	4.15
		3.73	4.45	

Note - Standard deviation listed in parentheses.

Discussion

Overview

This study attempted to further Gilbert's (1994) work on social intelligence and leadership by proposing that how leaders construct or define the problems that they encounter will determine the success that they will have across varying situations. It was also hypothesized that social intelligence would be a significant predictor above and beyond academic intelligence.

As expected, academic intelligence did significantly predict appropriateness and originality of the problem constructions. In addition, social intelligence was predictive of adolescent leadership activity, which is also consistent with Gilbert's (1994) findings. Although the results of this study were in general agreement with Gilbert's (1994) study, increased social intelligence did not lead to more appropriate or original problem restatements or solutions for the social problem.

Hypotheses review

Problem restatement appropriateness. To review the results, hypothesis 1 predicted that participants who score higher on a measure of social intelligence would make more appropriate problem restatements on a social problem, but not on the non-social problem. As expected social intelligence did not predict appropriateness of the problem restatements for the non-social problem, but it also did not predict appropriateness for the social problem. Hypothesis 6 was also not supported, since it continued the line of reasoning not supported in hypothesis 1.

Problem restatement originality. Hypothesis 2 proposed that participants who scored higher on a measure of social intelligence would develop more original problem restatements on a social problem, but not on the non-social problem. In fact, the opposite results were found; social intelligence predicted problem construction originality for the non-social problem. Hypothesis 7 proposed that social intelligence would be predictive above and beyond measures of academic intelligence for the social problem. This held true, but only on the non-social problem.

Problem solutions. Hypotheses 5 and 8 proposed that participants who score higher on a measure of social intelligence will generate a more appropriate problem solution for the social problem, but not for the non-social problem. As expected, social intelligence did not significantly predict appropriateness of the solution to the non-social problem. However, it did not predict appropriateness of the solution for the social problem either. Academic intelligence approached significance in predicting appropriateness of the solutions to both problems.

Hypotheses 4 and 9 proposed that participants who score higher on a measure of social intelligence will develop a more original problem solution for the social problem, but not for the non-social problem. This was proposed to hold true even after taking into account academic intelligence. Although social intelligence did not significantly predict the originality of either problem solution, academic intelligence again approached significance as a predictor of problem solution originality.

Problem restatement fluency. The last hypothesis predicted that participants who scored higher on a social intelligence measure would create more problem constructions on the social problem than participants who score lower on that measure. This hypothesis was not supported, because social intelligence did not seem to affect the quantity of the problem constructions produced for either problem.

Implications of Findings

Academic intelligence. Academic intelligence was found to be an important and significant predictor of problem restatement appropriateness and originality. It seems logical that academic intelligence would be important in analyzing ill-defined problem scenarios and creating appropriate and original restatements and solutions. More academically intelligent participants, as compared to less academically intelligent participants, are more likely to have a larger domain of knowledge to draw upon. Additionally, this may have been accentuated with the written format of this study, because a written format probably relies heavily on a participant's verbal skills to read, interpret, and write problem restatements and

solutions. Participants who excel at these verbal skills (academic skills) may even be rated higher by the raters just due to writing ability alone. Overall, academic intelligence was expected to be important in problem solving and this was reaffirmed.

Problem type. Repeated measures ANOVA techniques revealed a main effect for problem type throughout this study. As the previously reported tables demonstrated, the non-social problem scenario (Clara's problem) elicited significantly more appropriate and original problem restatements and solutions, than the social problem scenario (Tom's problem). This finding is consistent with other recent problem solving research that has found the characteristics of a problem to exert main and interactive effects on problem solving and decision making behavior (Scherer, Weiss, Reiter-Palmon, & Goodman, 1994).

For this study, it is believed that some characteristic of Tom's or Clara's problem caused the main effect for problem type. Although it cannot be tested post hoc, this main effect may have been caused by participants having a stronger affective reaction to the social problem. Butler

and Scherer (1996) and Scherer and Billings (1996) have reported similar results where the number and quality of solutions generated to open-ended problems differed for the two problems presented in each study. Scherer et al. (1994) studied participant reactions to a large sample of ill-defined questions and found that different problems elicited different affective reactions. Although not tested, this is one possible cause for the strong problem effect found in this study.

This study brings new light to this recent research, since it suggests that the affective reactions to problems are exhibited in the problem construction phase of the problem solving process, not just in the solution phase, as previously discovered.

Social intelligence. As a general pattern, social intelligence was not predictive of the appropriateness or originality of the problem restatements or solutions for the social problem. However, social intelligence (or one of it's subscales) did significantly predict the non-social problem on a couple of occasions, which was contrary to what was hypothesized. The difficult question to answer in this study

is why social intelligence did not influence the appropriateness and originality of the problem restatements and solutions for the social problem. A review of the operational definitions of academic intelligence, social intelligence, and leadership may provide a partial explanation for some of the results obtained in this study.

As detailed in the literature review, Thorndike (1920) reported that at least two different types of intelligence existed. One type, which he called abstract intelligence, is similar to the what this study reports as academic intelligence and is concerned with an individual's general thoughts and ideas. In this study, Academic intelligence was measured using the Wonderlic Personnel Exam, which is a commonly recognized measure of academic intelligence. This measure requires participants to solve verbal and quantitative type problems and should adequately predict an individuals ability to interpret a problem and provide a solution to it. Therefore, it was no surprise that academic intelligence did significantly predict the appropriateness and originality ratings of the restatements, since analyzing

the problem scenarios and writing the restatements was a cognitively demanding task.

Thorndike (1920) also believed in the importance of social intelligence. He defined social intelligence as the ability to interpret thoughts and actions of people directly interacting with them. Previous research (Gilbert, 1994), found social intelligence to be predictive of leadership. Specifically Gilbert (1994) found the social intelligence background data measure, also used in this study, to be predictive of effective leader performance as measured using a self-report of leader achievement and a critical incidents technique. This study used the leadership activities scale as the measure of leadership and found that social intelligence was significant in predicting performance on this scale as well.

This study continued Gilbert's work by hypothesizing that social intelligence effects leadership through the problem solving process. But, this was not supported. Two alternatives exist to explain why social intelligence did not contribute to the appropriateness and originality of the problem constructions and solutions for the social problem.

Although the first alternative is unlikely, it is possible that a leader's superior ability to interpret problem situations and take the appropriate action is not what causes a person to be a better leader. The second alternative is that although the theory stated above is correct, this study was not an effective test of it.

Study Limitations

Several findings support the possibility that the theory proposed in this study was correct, but that it was not operationalized correctly. The two problems in this study were written to be leadership problems, but it remains unclear whether leadership skills were relevant in constructing and solving the problems. The Leadership Activities Scale did not correlate with ratings of restatements or solutions for either problem. One possible reason the problem solving activity did not correlate with the leadership scale may be because the problems required a written response which did not tap leadership skills, particularly those related to interaction with other people (social intelligence). Going back to Thorndike's (1920) definition of social intelligence, it is an individual's

interaction with other people that matters, and this study had no group interaction. The social problem attempted to tap the social skills necessary for leadership by creating a problem situation that forced the participant to consider the thoughts and actions of others. Unfortunately, there is no guarantee that a written response to this type of problem actually mirrors what the individual would do if placed in a group interaction environment.

Another reason why the hypotheses were not supported may lie in the task demands. It is possible that the problem scenarios were much more cognitively demanding than socially demanding, thus minimizing the role of social intelligence. Some support for this is provided by the fact that academic intelligence was found to be predictive of the problem restatements and solutions regardless of problem type.

Another possible problem was use of cadets as participants. It was believed that the use of cadets, which are future leaders and have received some leadership training, may be more generalizable than other samples. However, to some degree, ROTC cadets have self-selected into

the program because of their leadership capability, which is further developed once they are in the program. This may have caused a range restriction problem in the social intelligence measure. After carefully reviewing the social intelligence test scores, some credence can be given to this theory. Out of a possible range of 112, participants were clustered within 50 points (at the high end) on this scale.

The problem effect that was discovered using the repeated measures ANOVA statistic, may provide on final explanation why social intelligence did not work as a predictor of the problem solving process. The problem effect, which is believed to stem from an affective reaction to Tom's problem (the social problem), probably resulted in decreased quality and quantity of responses.

Tom's problem, which involved an ROTC cadet who continued to miss his leadership laboratory class although he no longer had a valid excuse to miss it, refers to an officer candidate not doing what is morally "right". Cadets are repeatedly taught about honesty and integrity as two very important values for officers, which may have led to the subsequent affective reaction to Tom's problem. A recent

meta-analysis conducted by Johnson and Eagly (1989) reported the impact of value-level involvement on attitude change. Clearly, they found that value-level involvement inhibited attitude change. It is easy to see how Tom's problem could hit at the very core of officer values, resulting in an affective reaction to the problem. An affective reaction to Tom's problem could significantly hinder the participant's ability to consider both sides of the problem, thereby limiting the number and quality of the restatements and solutions generated. In fact, the affective reaction may even have led to the results that were opposite of what was hypothesized.

Although the hypotheses were not supported, one strength of this study was the use of the behaviorally based background data measure to measure social intelligence. This measure, first used by Gilbert (1994), seems to represent a different domain of knowledge than academic intelligence. In fact, the two measures were not significantly correlated in this study. This fact adds further support that social and academic intelligence do involve different abilities altogether. In addition, the

reliability coefficients of the interpersonal perception, systems perception, and behavioral flexibility subscales were almost identical to those received by Gilbert (1994) which furthers the credibility of using a background data measure as an effective tool to measure social intelligence.

In regards to the validity of the social intelligence background data measure, the interpersonal perception and systems perception subscales were highly correlated. This was expected since they are both components of the social perception component of social intelligence. Although behavioral flexibility is also significantly correlated to interpersonal perception and systems perception, it is to a lesser degree and, therefore may, represent a different ability altogether. Overall, this study lends more support for the notion that social intelligence and academic intelligence are separate constructs. The social intelligence background data measure seemed to be tapping a domain that is different from what is tapped with traditional academic or verbal intelligence tests.

Future Research

Recent studies have consistently found social intelligence to be predictive of leadership activity (Reiter-Palmon, Collins, & Koch, 1997), but the mechanism of action for this finding is still unclear. This study hypothesized that the social intelligence effect occurs in the problem construction and problem solving processes, but this was not supported. Since it does seem probable that social intelligence somehow works through the problem solving process, a modification of this study should be accomplished using group interaction or situational tests. If the participants are free to interact with each other to solve problems, it would seem more probable that social intelligence would have an effect. Group dynamics are hard to recreate in a paper and pencil test.

Additionally, if written problem scenarios are used in the future, whether studying leadership or other phenomenon, close attention must be paid to the nature of the problems used in the study. Not only is the type of problem selected important, but participants' affective reactions to the problems should be analyzed. If problems cannot be screened

prior to use in a study, the affective reactions to the problems should be measured during the study to check for the possible influence of affective reactions on the dependent variable of interest.

A variation of this study could also be run with a written problem solving exercise and a group problem solving exercise. A study of this type would allow a comparison in results between written and situational problem solving, thereby answering for future researchers whether a written problem situation can actually duplicate the social skills required in a group interaction situation. It would also allow us to better test the relationship of leadership to social intelligence and problem solving, because a more objective leadership measure could be used. Finally, a study of this type would clarify the relationship between problem solving, social intelligence, academic intelligence, and leadership.

In conclusion, this study supported other recent research findings that social intelligence is an important personality trait that is predictive of leadership. It also furthered the notion that academic intelligence is important

in creating appropriate and original problem constructions. Because social intelligence is a trait that accounts for effective leader behavior across multiple situations, it seems to reconcile the trait and situation approaches to leadership. However, based on the results of this study, we are no further in understanding how social intelligence effects leadership. It does seem logical that social intelligence somehow operates through the creative problem solving process, but this study was not able to show it.

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Appendix A

SOCIAL INTELLIGENCE TEST

BACKGROUND DATA MEASURE

(IP: interpersonal perception; SP: social perception; BF: behavioral flexibility)

Please answer the following questions using the response scale listed below each question. Remember to mark the answer on your answer sheet. Please do not mark in this booklet. Please start on answer number 5 on our scantron answer sheet.

5. To what extent would your friends describe you as someone who is good at "reading people"? (IP)
   A) great extent
   B) large extent
   C) moderate extent
   D) slight extent
   E) not at all

6. How often has your supervisor asked you to negotiate deals on his/her behalf? (SP)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

7. How often have you wished you had not said something after you said it? (BF)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

8. How often have you known what to say to get someone back on track when they were upset? (IP)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

9. How much have you been bothered by people who have very different opinions from yours? (BF)
   A) very much
   B) much
   C) some
   D) little
   E) very little

10. Relative to others how quickly have you spotted a problem brewing? (SP)
   A) much more quickly than others
   B) more quickly than others
   C) about as quickly as others
   D) less quickly than others
   E) much less quickly than others

11. How often have coworkers come to you for advice on getting work done? (IP)

A) very often
B) often
C) sometimes
D) seldom
E) never

12. How often have you known what corners to cut in order to circumvent bureaucratic red tape? (SP)

A) very often
B) often
C) sometimes
D) seldom
E) never

13. How often have you been the one who had to bear the bad news to friends, colleagues, or bosses? (IP)

A) very often
B) often
C) sometimes
D) seldom
E) never

14. How often have you tried to avoid certain kinds of people you knew you would not be able to deal with? (BF)

A) very often
B) often
C) sometimes
D) seldom
E) never

15. How often have you become annoyed with people who suggest you try something new? (BF)

A) very often
B) often
C) sometimes
D) seldom
E) never

16. How often have you had a sense of who would fit into your organization or work group upon first meeting them? (SP)

A) very often
B) often
C) sometimes
D) seldom
E) never

17. To what extent are you able to size up a person quickly? (IP)

A) great extent
B) large extent
C) moderate extent
D) seldom
E) never

18. How easy has it been for you to tell when personal problems were bothering a friend or colleague? (IP)

A) very easy
B) somewhat easy
C) easy
D) not very easy
E) not at all easy

19. How often have you become annoyed with people who suggest you try something new? (BF)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

20. Relative to others, how quickly have you spotted problems brewing in groups and organizations to which you belong? (SP)
   A) very quickly
   B) somewhat quickly
   C) quickly
   D) not very quickly
   E) not at all quickly

21. How comfortable have you been working with groups having very different goals and agendas? (BF)
   A) very comfortable
   B) comfortable
   C) somewhat comfortable
   D) little uncomfortable
   E) very uncomfortable

22. How often have you changed your approach according to the person/people you are addressing? (BF)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

23. How often have you been the person in your family to tell it like it is in order to improve family relationships? (SP)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

24. To what extent have you been able to predict group decisions before they occur? (SP)
   A) great extent
   B) large extent
   C) moderate extent
   D) slight extent
   E) not at all

25. How difficult is it for you to know what mood your friends are in? (IP)
   A) extremely difficult
   B) very difficult
   C) difficult
   D) not very difficult
   E) not at all difficult

26. How often have you blurted out a comment you later regretted? (IP)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

27. How often have you been asked to be a liaison to other work groups? (SP)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

28. How comfortable have you been working on a variety of different tasks? (BF)
   A) very comfortable
   B) comfortable
   C) somewhat comfortable
   D) little uncomfortable
   E) very uncomfortable

29. How often have people become angry with you for no reason? (BF)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

30. How easy has it been for you to communicate with others? (IP)
   A) very easy
   B) somewhat easy
   C) easy
   D) not very easy
   E) not at all easy

31. How often have friends asked you for advice on how to talk to others? (IP)
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

32. In group settings, how frequently were you selected to be the spokesperson for your group? (SP)
   A) very frequent
   B) frequently
   C) sometimes
   D) seldom
   E) never

33. How much difficulty have you had dealing with changes in job demands? (BF)
   A) very much
   B) much
   C) some
   D) little
   E) very little

34. How comfortable have you been in a rapidly changing work environment? (BF)
   A) very comfortable
   B) comfortable
   C) somewhat comfortable
   D) little uncomfortable
   E) very uncomfortable

Appendix B

PROBLEM CONSTRUCTION EXCERCISE

PROBLEM FINDING EXCERCISE

This is a test to find out how many different ways you can think of to state a problem. After reading the problem situation, you should try to find as many different ways to restate the problem in the form of a question (e.g., " How can we" or "How can I") and then write the problem.

Here is a simplified sample situation as a problem.

Problem description: Mice are in my basement.

Sample problem statements:

1. How can I build a better mousetrap?

2. How can we get rid of the mice?

3. How can I not be bothered by the mice?

Of course, there are many more possible problem statements that could have been written.

There will be two different problems on this test somewhat like the one above. For each problem you will be asked to write down as many different ways to state the problem as you can. Please number each new statement and remember to state them in the form of a question.

Subject number _____

TOM'S PROBLEM:

John is a Sophomore ROTC cadet with a very hectic schedule. John originally tried to de-conflict all his classes, but was unable to prevent one class, Chemistry Lab, from conflicting with Cadet Leadership Lab that meets on Wednesday from 1230 to 1350 hours. The ROTC staff realizes that sometimes cadets will have classes that interfere with Leadership Lab, and so they offer a *1-hour* makeup *once* a month for these cadets. This is a good deal, since all the meetings for the month are made up in one makeup meeting. Soon after the beginning of the semester, the Chemistry instructor decided to change the meeting time of the class to 1500 hours on Wednesdays. Although this is somewhat good news, John enjoyed being able to attend the much easier makeup session. One day about a month into the semester, Tom, also a Sophomore cadet, learned from one of the other cadets, Sandy, that John's Chemistry Lab had been moved to 1500 hours. Tom was surprised because John had still been attending the makeup sessions instead of attending the weekly Leadership Lab. Tom is unsure how to approach this problem.

LIST AS MANY DIFFERENT PROBLEM STATEMENTS AS YOU CAN:

Solution to Tom's Problem

In the space provide, please provide the single best solution to Tom's problem described on the previous page. Remember, please provide only <u>one</u> solution.

Subject Number _____

CLARA'S PROBLEM:

Clara, a Junior, ROTC cadet, is working part-time, and taking a 15 hour credit load at school. Clara enjoys ROTC very much and is looking forward to graduation so she can become an Officer. Her current job as an "Assistant manager" at a local import store requires her to work 25 hours a week which really cuts into her available study time. In fact, she is barely getting "C's" in two of the classes she needs to graduate. Clara desperately needs the money and the pay as Assistant Manager is good, but she is not getting a lot of practical leadership experience. Clara does not want to drop any of her classes as she needs them to remain in the ROTC program, and especially to go into the service as an Officer. Up until now, Clara has been able to work at her job and still get good grades, but the difficult courses she is taking now require much more of her time. Clara is not sure how to solve her problem.

LIST AS MANY DIFFERENT PROBLEM STATEMENTS AS YOU CAN.

Solution to Clara's Problem

In the space provide, please provide the single best solution to Clara's problem described on the previous page. Remember, please provide only <u>one</u> solution.

Appendix C

Manipulation Check

Please answer the following questions using the response scale listed below each question. Please circle the answer to each question.

To what extent did you need to consider other people's thoughts, feelings, or actions when thinking about Tom's problem?

a. Great extent
b. Large extent
c. Moderate extent
d. Slight extent
e. Not at all

To what extent does a resolution to Tom's problem seem to impact other people?

a. Great extent
b. Large extent
c. Moderate extent
d. Slight extent
e. Not at all

Manipulation Check

Please answer the following questions using the response scale listed below each question. Please circle the answer to each question.

To what extent did you need to consider other people's thoughts, feelings, or actions when thinking about Clara's problem?

a. Great extent
b. Large extent
c. Moderate extent
d. Slight extent
e. Not at all

To what extent does a resolution to Clara's problem seem to impact other people?

a. Great extent
b. Large extent
c. Moderate extent
d. Slight extent
e. Not at all

Appendix D

SELF-MONITORING SCALE
(Snyder, 1974)

Please answer the following questions as True of False using the response scale listed below. Remember to mark the answer on your answer sheet. Please do not mark in the booklet. Start on answer number 54 on your scantron answer sheet.

A. True
B. False

54. I find it hard to imitate the behavior of other people.

55. My behavior is usually an expression of my true inner feelings, attitudes, and beliefs.

56. At parties and social gatherings, I do not attempt to do or say things that others will like.

57. I can only argue for ideas which I already believe.

58. I can make impromptu speeches even on topics about which I have almost no information.

59. I guess I put on a show to impress or entertain people.

60. When I am uncertain how to act in a social situation, I look t the behavior of others for cues.

61. I would probably make a good actor.

62. I rarely need the advice of my friends to choose movies, books, or music.

63. I sometimes appear to others to be experiencing deeper emotions than I actually am.

64. I laugh more when I watch a comedy with others than when alone.

65. In a group of people I am rarely the center of attention.

66. In different situations and with different people, I often act like very different persons.

67. I am not particularly good at making other people like me.

68. Even if I am not enjoying myself, I often pretend to be having a good time.

69. I'm not always the person I appear to be.

70. I would not change my opinions (or the way I do things) in order to please someone else or win their favor.

71. I have considered being an entertainer.

72. In order to get along and be liked, I tend to be what people expect me to be rather than anything else.

73. I have never been good at games like charades or improvisational acting.

74. I have trouble changing my behavior to suit different people and different situations.

75. At a party I let others keep the jokes and stories going.

76. I feel a bit awkward in company and do not show up quite so well as I should.

77. I can look anyone in the eye and tell a lie with a straight face (if for a right end).

78. I may deceive people by being friendly when I really dislike them.

Appendix E

LEADERSHIP EXPERIENCE TEST

ADOLESCENT LEADERSHIP ACTIVITIES SCALE

(Mumford, O'Connor, Clifton, Connelly, and Zaccaro, 1993)

Please answer the following questions using the response scale listed below each question. Remember to mark the answer on your answer sheet. Please do not mark in this booklet. Start on answer number 35 on our scantron answer sheet.

35. How often did you direct others in group activities?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

36. How likely were you to participate in high school activities, even when you disliked the people involved in the activities?
   A) very likely
   B) likely
   C) somewhat likely
   D) not very likely
   E) not at all likely

37. How often did you feel personally capable of participating fully in high school activities?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

38. How often did you participate in student and/or school politics?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

39. How often were you at influencing other people in high school?
   A) very effective
   B) effective
   C) sometimes effective
   D) seldom effective
   E) never effective

40. How effective were you at understanding the feelings of others?
   A) very effective
   B) effective
   C) sometimes effective
   D) seldom effective
   E) never effective

41. How often did you hold leadership positions in high school?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

42. How did you get to pick people for teams?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

43. How effective were you at meeting the demands of social situations in high school?
   A) very effective
   B) effective
   C) sometimes effective
   D) seldom effective
   E) never effective

44. To what extent would you describe yourself as a leader in high school?
   A) great extent
   B) large extent
   C) moderate extent
   D) slight extent
   E) not at all

45. To what extent did you go out of your way to help people with personal problems?
   A) great extent
   B) large extent
   C) moderate extent
   D) slight extent
   E) not at all

46. To what extent did pressure tend to increase your performance?
   A) great extent
   B) large extent
   C) moderate extent
   D) slight extent
   E) not at all

47. Often did you consider other peoples feelings before taking action?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

48. When you were angry with a close friend, how often would you calm down to discuss solutions together?
   A) very often
   B) often
   C) sometimes
   D) seldom
   E) never

49. When you were hurt by someone, to what extent would you try to straighten out the problem?
A) great extent
B) large extent
C) moderate extent
D) slight extent
E) not at all

50. To what extent would you feel pressure to participate when you did not want to participate?
A) great extent
B) large extent
C) moderate extent
D) slight extent
E) not at all

51. To what extent did you feel that classmates respected you?
A) great extent
B) large extent
C) moderate extent
D) slight extent
E) not at all

52. To what extent were you active on the school newspaper, magazine, or annual?
A) great extent
B) large extent
C) moderate extent
D) slight extent
E) not at all

53. To what extent were you active in political clubs and/or student council?
A) great extent
B) large extent
C) moderate extent
D) slight extent
E) not at all

Appendix F

DIVERGENT THINKING TEST

Consequences Test

This is a test of your ability to think of a large number of ideas in connection with new and unusual situations.

Sample item:

What would be the result if people no longer needed or wanted sleep?

Sample answers:

1. Get more work done

2. Alarm clocks not necessary

3. No need for lullaby song books

4. Sleeping pills no longer used

Of course, there are many more possible results that could have been written.

There will be two different situations somewhat like the one above, each on a separate page. Four examples will be included for each item. You will be given two minutes on each page to write down as many other possible results as you can. Your score will be the total number of different consequences that you write in the time given. Please number each of your answers.

Are there any questions?

STOP HERE, WAIT FOR FURTHER INSTRUCTIONS.

Subject Number _____

1. LIST AS MANY DIFFERNT CONSEQUENCES AS YOU CAN

What would be the result if no one needed food in order to live?

a. No need for farmers
b. No plates, knives, and forks
c. No grocers
d. Save time

1.

Subject Number _____

1. LIST AS MANY DIFFERENT CONSEQUENCES AS YOU CAN

What would be the result if everyone suddenly lost the sense of balance and were unable to stay in the upright position for more than a moment?

a. People would fall down
b. Could not walk
c. Many accidents
d. Confusion

Appendix G

Problem Solution Ratings

Each solution will be rated separately.

Appropriateness - the degree to which the solution is realistic/viable, and is a step toward solving the problem.

1. Solution is inappropriate - does not address the problem at all.
2. Solution tries to address some aspects of the problem but is unrealistic and does not accomplish any goals.
3. Solution is realistic and is a step toward a goal but will not necessarily accomplish a goal.
4. Solution will accomplish at least one goal and is realistic.
5. Solution is realistic and addresses some aspects of the problem, addresses more than one goal.
6. Solution is realistic and addresses all aspects of the problem, addresses multiple goals.

Originality - The degree to which the solution is not structured by the problem presented and goes beyond it. The degree of novelty and uniqueness of the solution.

1. Very common response. Solution completely structured by problem as presented.
2. Solution less common but very structured by problem as presented.
3. Solution somewhat unique and very structured by problem as presented.
4. Solution somewhat unique and somewhat structured by problem as presented.
5. Solution somewhat novel and unique and not structured by problem as presented.
6. Solution novel and unique, and not structured by problem as presented.