From the knowledge of understanding to military deception

A Monograph
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Abstract

FROM THE KNOWLEDGE OF UNDERSTANDING TO MILITARY DECEPTION by Major Marcel P. Buis, Royal Netherlands Army, 56 pages.

Military deception is as old as war itself and it adheres to a logical process. This monograph explores how an increased understanding of pattern recognition as part of human decision-making can enhance the effectiveness of military deception operations.

Before one can exercise the art of military deception, one must understand the science of it. One can find the science of military deception in the way that people make decisions. Therefore, we first have to investigate how humans make decisions. One of the prerequisites involved in decision-making is the fact that you need to have knowledge about the issue upon which you are about to decide. Therefore, it is necessary to investigate the subject and theory of knowledge. This exploration leads us to ask three questions. First, how do we acquire knowledge? When we have acquired knowledge, how do we retain it? Finally, how do we use knowledge? This last question leads us back to decision-making.

After the exploration of the theory, I sought to establish a causal relationship between pattern recognition and decision-making. Experimental research could lead to a validation of the theory. In the experiment, I tried to cause a decrease in ambiguity and therefore facilitate erroneous orientation of the decision-maker. I expected that this would make him decisive, certain, and wrong. However, according to statistics the experiment does not show conclusive evidence that previous experiences influence people in making decisions. However, there is strong evidence that indicate a relationship. Further research with a larger sample size might show a significant statistical relationship.

In order to let military practitioners rise above the subconscious level of the science of military deception, it is necessary to provide them education and training. It is therefore necessary to implement this subject into relevant military doctrine and into the curriculum of military education. An appreciation of the science of military deception will provide the professional soldier the tools to apply the art of military deception. Give the soldiers the tools, enable them to create a story that fits the experience of the target and surprise him. By doing this, victory is more likely to be on our side.

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I am equally grateful to Colonel Bob Taylor for reading my different versions and providing me with insightful comments. In Mr. Jim Varner, I have found a teacher in the American version of English. His meticulous reading and relentless efforts to improve my writing have made this a legible document.

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In my innocence of conducting an experiment, I never realized that interpreting the data is a profession of its own. I was lucky enough to be able to fall back on the help of the Army Research Institute. Dr. Alice Garven of the aforementioned institute and Miss. Margot Woller from Kansas State University helped me with the correct statistical tests and how to interpret the results.

For me writing a paper like this meant spending nights and weekends in my workroom. Ultimately, the family pays the price. I am thankful for my wife's support in this endeavor, and I am glad that Damocles' sword never fell.

Introduction

Background

The rationale of this monograph is to explore how pattern recognition, as part of human decision-making can enhance the effectiveness of military deception operations. Military deception, as a subset of information operations, has an aura of mysticism surrounding it. By reviewing history, we are able to lift this mysterious atmosphere and come to realize that military deception is as old as war itself and that it adheres to a logical process. Perhaps the most famous example is that of the Trojan horse, which was used in the Greek siege of Troy in the twelfth century BC. Today the Trojan horse refers to malicious computer software that looks harmless, but actually contains a computer virus. Throughout history, we can find examples of military deception, although more recent military operations show few examples, due to security classification. By studying military history the majority of military leaders subconsciously realize the importance of military deception, but due to lack of education and training in this particular field, they do not have the tools to rise above the subconscious level and turn it into an effective force multiplier and surprise the adversary.

Research question

The element of surprise is a principle of war and regarded as a force multiplier. Military deception contributes to this principle. Joint Publication 3-13.4 defines military deception as "Those actions executed to deliberately mislead adversary decision makers as to friendly military capabilities, intentions, and operations, thereby causing the adversary to take specific actions (or inactions) that will contribute to the accomplishment of the friendly mission."[1] So how does military deception work? Key in the aforementioned definition is 'the adversary decision maker.'

[1] Joint Staff. *Joint Publication 3-13.4.*(July 2006), I-1.

Although knowing whom you will be targeting with military deception is of extreme importance, this is not yet our primary concern. In order to be able to effectively target your audience, you have to know how they make decisions. To put it more generally, how do human beings make decisions? From the day we are born our five senses are constantly stimulated, and we store these data in our unconscious. This is the process of learning; we store hypotheses in our brain. Our cultural and sociological background influence the experience we build. Our thought process constantly mirrors the hypotheses in our brain to the situation we are facing. Malcolm Gladwell calls this "thin slicing" in his book *Blink.* So if we find proof that fits our mental model we tend to accept this and reject the other. In cognitive psychology, this process is known as pattern recognition. This monograph will investigate whether pattern recognition is a key element in human decision-making, and how it is a key component of military deception.

Significance

Would the Allied invasion of Normandy have succeeded if it had not been supported by the biggest and most successful deception plan of the twentieth century, Operation Bodyguard? Hitler might not have chosen to keep his Panzer divisions near the Pas de Calais. The Germans, in the worst case, could have caused the Allied invasion to fail or at least delay it significantly. This would have given the Soviets more time for their rapid advance towards Berlin. Would they have stopped at Berlin, or could they have gone much farther west? One thing must be clear, if not for Operation Bodyguard, Europe as we know it today might look quite different.

Although it is not emphasized in our current doctrine, in today's environment the art and science of military deception has by no means lost its importance. It plays a significant role because it creates surprise. History has shown more than once, that this can lead to victory. Nevertheless, one can only exercise the art of military deception if one understands the science of it. One can find the science of military deception in the way that people make decisions. It is

therefore important to investigate how humans make decisions. The answer to this will allow us to maximize the art within military deception.

Methodology

This paper examines whether pattern recognition is a key element in human decision-making and how it is a key component of military deception. Therefore, the relationship between military deception and human decision-making will be described. One of the key points in this relationship is the aspect of knowledge. In order to make the correct inferences about a target, it is not sufficient to just gather data about your opponent. It is of equal importance to understand how your target uses his own knowledge in order to make decisions. The latter leads us to a relatively young field of study which deals with the scientific study of knowledge, namely cognitive psychology. If one understands how people use knowledge to make decisions, it becomes rather obvious that the study of the opponents' decision-maker is critical. It is necessary to look into his cultural and social background, his education and experience concerning decision-making. These experiences provide patterns, and human decision-making is largely dependent on pattern recognition. Numerous scholars agree that "knowledge and experience" (Orasanu and Connolly, *The Reinvention of Decision Making*, 7) and therefore pattern recognition is central to human decision-making.

This paper then builds on and examines how the theory holds up in practice. Through experimental research, I sought to establish a causal relationship between pattern recognition and decision-making. This paper ends with a discussion of the results and recommendations for further research.

Human decision-making

Since the aim of military deception is to cause adversaries to take specific actions or inactions, it is crucial to fully comprehend how they reach the decision to act or not. When facing a traditional, conventional opponent it is the commander, supported by his staff, who makes

decisions. Therefore, decision making comes down to an individual who is responsible for inducing actions or inactions. Even when facing a non-traditional opponent, decision making still comes down to individuals who process information and make decisions. Military deception terminology refers to the individual decision maker as the target. This boils down to the fact that military deception can only be effective if you know how the target makes decisions. One of the prerequisites involved in decision-making is the fact that you need to have knowledge about the issue upon which you are about to decide. Thus in order to understand an individual's decision-making process, it is necessary to delve into the subject of knowledge. The field of study that deals with the scientific study of knowledge is cognitive psychology. Cognition includes all processes of consciousness by which knowledge is accumulated, such as perceiving, recognizing, conceiving, and reasoning.[2] This young science deals with how people remember, pay attention, and think.

This leads to three questions that need to be answered in this chapter. The first inquiry is about how we acquire knowledge. The exploration of this subject will direct the investigation toward the second question, which deals with the retainment of knowledge. The outcome of the former analysis will comprise the nuts and bolts necessary in order to be able to answer the last question; how do we use knowledge? It is this last question that addresses the issue of decision-making, the prerequisite for effective military deception.

How is knowledge acquired

In general, we can describe the human learning process as a loop, which begins when our senses pick up stimuli. When we pick up a new stimulus, we compare it to what we have paid attention to in the past. Thus, our experience shapes our perception and processing of new stimuli.

[2] Encyclopedia Britannica online,http:www.britannica.com/eb/article-9024661/cognition [accessed October, 26 2007]

Through this process, we create an expectation or hypothesis. Finally, we accept or reject the hypothesis. This ends the learning loop.

Before we can get more specific on how humans acquire knowledge it is necessary to address the process of perception, how we sort objects and understand them. We do not merely detect stimuli; we take them in, process them, and give the information meaning and relevance. Currently you are reading these sentences. You have recognized letters, made combinations of these letters, which read as words and these words have become sentences. Perhaps you are even capable of doing this in different languages. When you recognize these objects, you are identifying or categorizing the objects in your environment.[3] Cognitive psychologists call the previously mentioned process pattern recognition.

How do we recognize objects? A common explanation is that we recognize objects by the smaller pieces they consist of. We recognize a tank, because we see the tracks, the turret and the barrel. Even if this tank is partially hidden in a forest of a WWII movie you are watching, you would still recognize it as such. However, would you still recognize it immediately if it were partially hidden on a parking lot near a shopping mall? It would probably be more difficult to distinguish. The point here is that the context in which you see an object is of such importance that it can even determine whether you recognize an object.

So, how do we recognize parts? According to Daniel Reisberg, "recognition might begin with the identification of features in the input patterns – features such as vertical lines, curves or diagonals. With these features appropriately catalogued, you can start assembling larger units: If you detect a horizontal together with a vertical, you know you are looking at a right angle. If you have detected four right angles, you are looking at a square."[4]

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[3] Daniel Reisberg, *Cognition, exploring the science of the mind*,1st ed. (New York-London: W.W. Norton & Company)

[4] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 71

The final question than becomes how we recognize features. Although this is an important question, this issue is out of the scope of this paper. In order to move on, we have to make the assumption that we are inherently capable of doing this.

Daniel Reisberg's explanation of object and word recognition provides great insight into the concept of pattern recognition.[5] His study provides a firm base for pattern recognition. His clarification is, to a large extent, applicable to and feeds into human decision-making.

Tachistoscopic tests show that two effects increase recognition. First, there is the frequency effect. Jacoby and Dallas (1981) established a relationship between the frequency of occurrence of words and the level of recognition of these words. A higher repetition of words in print leads to these words being easily recognized in tachistoscopic tests. Subjects recognized frequent words over infrequent words more than twice as often. The cause of the second effect is repetition priming. The more recently that you have seen the word, the easier it is to recognize. As stated previously, context matters, but how?

Studies performed by Rummelhart & Siple (1974) have indicated that we recognize words easier than letters shown by themselves, because we can apply our knowledge of the vocabulary of the language.[6] We can enhance recognition by creating helpful context. "Consider these two strings of letters: 'JPSRW' and 'GLAKE.' Strings as 'JPSRW' are very difficult to recognize when presented tachioscopically. With exposures of 20 or 30 milliseconds, participants will identify one or two letters from a string like this, but no more. The nonword 'GLAKE' however is far easier to recognize, even though it is no more familiar than 'JPSRW.' A string like 'GLAKE' will often be read correctly with a 20 or 30 milliseconds exposure."[7] Herein lays the

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[5] Ibid,73

[6] David E. Rummelhart and Patricia Siple, "Process of recognizing tachistoscopically presented words," *Psychological review* volume 81, No 2 (March 1974): 99

[7] Daniel Reisberg, *Cognition: exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 76

risk of making errors. We may read words for what we think or assume they may say. Our recognition is guided by our perceived knowledge. We do not realize we made a mistake. This leads us to the fact that we do not correctly identify the input, rather, we misperceive it.

Knowledge is acquired by recognition. The aforementioned findings together indicate that recognition is shaped by learning, often relying on inference, and certainly influenced by the regularities that exist in our environment.[8]

How is knowledge retained

This leads us to the study of memory. Now that we have gained an appreciation for perception, we are ready to explore the acquisition of memory itself. First, I will cover memory in general. Then, I will be more specific and deal with short-term memory, long-term memory, and then the connection between them. Finally, I will address the retrieval of information from memory.

In explaining the complexity of a memory, it is helpful to try to illustrate this by using the analogy of a computer. We can compare the input for a computer to the stimuli that reaches our senses. We store the new information in our short-term memory or working memory. We can compare this by placing a file on our desktop. We store files on our desktop when we use them often. This is the same for our working memory; we store information in there which we will use soon. Information that we do not need immediately we store in our long-term memory. Files on a computer that we do not often need we save in an underlying folder.

The computer analogy is useful for an overall view, but is limited in explaining the more profound issues. Studies have indicated that the working memory provides us easy recall capability, but that it has a limited capacity. On average people can store "7 plus-or-minus 2"

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[8] Daniel Reisberg, *Cognition: exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 101

items in their working memory.[9] We can use this limited capacity efficiently because the working memory is not one entity, but it exists of multiple parts. In this way, it can hold information while concurrently working on something else. One crucial component of the working memory is the central executive. The rehearsal loop and the visuospatial buffer both support this component. The rehearsal loop stores verbal material, while the visuospatial buffer stores visual material. The latter two take care of simple tasks, and in that way they free up capacity in order for the central executive to perform complex matters. In essence, the working memory depends on current activity.

The opposite seems true for the long-term memory. The brain can store memories from the past for a long time and retrieve them when necessary. How do we store information in our long-term memory? What comes to mind is the process of maintenance rehearsal. However, this mechanical process has no long-term benefits. Studies have shown that relational or elaborative rehearsal is more effective. When one studies for an exam, it is beneficial to think about what one is studying and try to create relationships. By creating relationships, one is better equipped to retrieve the information from long-term memory whenever necessary because one has made a retrieval path. How do we optimize these connections? Two things can help. First, one can improve connections by creating structure. Organization improves recall. The second thing is to understand the studied material because people remember best what they understand. The positive side effect of understanding is that it reduces the load on memory.

The aforementioned tells us that establishing the connections between acquisition and retrieval is vital in learning and for the retention of knowledge. There is obviously no point in storing information in long-term memory if one is unable to regain it when it is needed. The encoding of information in order to store it is contaminated by a person's physical, mental, and

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[9] Frank N. Dempster, "Memory Span: Sources of Individual and Developmental Differences," *Psychological Bulletin* volume 89, No 1 (January 1981): 63

emotional circumstances at that time. Retrieving and decoding of the information from long-term memory when called upon is facilitated when the contamination circumstances are the same. This would directly relate to the military point of view which states: Train as you fight. The underlying issue is that whenever one attempts to recall information and the perspectives are not the same as when he initially took in the information, he might not find what he is looking for. Therefore, to enhance learning it is wise to create more retrieval paths, learning by looking at the issue from multiple perspectives. These different points of view increase the probability of finding the memory one seeks.

How is knowledge used

What does one do with the gathered knowledge? This question drives us to the study of judgment and decision-making. On the account of judgment, the dual-process model consists of two different systems of thinking about evidence.[10] The first one, the heuristic or intuition approach, is less sophisticated than the second, the reasoning approach, but we seem to be able to use both. In terms of decision-making, the discussion of two theories and the issue of confirmation bias should prove enlightening.

In making judgments, people think about evidence and make inferences. One can subdivide the intuition approach of evaluating the evidence further into three different strategies. The first one is the availability heuristic, the second is the representative heuristic, and the third is anchoring and adjustment. Are these strategies reliable enough to lead a person to the 'right' answer?

Availability heuristics is all about how easy things come to mind. In a family, who is more likely to wash the car, the man or the woman? It may be easier to come up with more

[10] Jonathan Evans, "In Two Minds: dual-process accounts of reasoning," *TRENDS in Cognitive Sciences* volume 7, no 10 (October 2003):454.

examples of men rather than women washing cars. If that is your estimation, you are probably correct. You have just made an accurate assessment based on frequency. There are other issues involved as well. If I would ask you whether more Americans are being killed in Iraq or in the continental United States, you would probably say Iraq. Statistics however show that this is not the case. Nevertheless, the overwhelming coverage of U.S. soldiers dying in Iraq every day influences our findings. The ease of which this comes to mind affects one's judgment negatively.

The representative heuristic strategy states that one can use a sample of our findings as a generalization for the entire category. Therefore, people make inferences on a sample and extrapolate these inferences for an entire group. Often this will work well if the sample is representative of the group. A conclusion one can draw after studying one army is that its soldiers possess guns. It would be a fair inference from this one observation to state that all armies have guns. However, this sort of reasoning can also lead us astray. Looking at the evening news, we see soldiers in a war shooting at the enemy. This might lead to the inference that every soldier in a war is actively engaged in shooting the opponent. However, we know that this is not true. The tooth to tail ratio tells us that there are more soldiers working logistics, staff duties, and other jobs who make it possible for a smaller group to really engage the enemy.

The third heuristic strategy is called anchoring and adjustment. The idea behind this strategy is that when people do not know an answer to a question, they do have an idea in what direction to search for that answer, dropping a mental anchor in that area and coming up with an answer. Moreover, we start adjusting our reply from that point on. Like the former heuristics, this has its drawbacks as well. For a summary of the heuristic strategies for judgment, see appendix A.

Consider a more complicated system of thinking about evidence and drawing inferences, the reasoning approach. This system, as opposed to the heuristic system, is slow, requires more effort and is inefficient. However, it is more accurate and can overcome the errors of the heuristic system. So why not just use the more complicated one? Apparently, the circumstances trigger

people to use one or the other system. When they are under time pressure or are distracted, they use the fast system, namely the heuristic one. According to the Reisberg study "people with high IQs, would be more successful in using the reasoning system to overrule the automatic (habit based) conclusions of the heuristic system."[11] An important issue that one should not overlook is that people appear to make better judgments when the information is presented in a frequency format rather than a probability format. It is easier to make inferences about 10 out of a hundred people than it is when portraying it as 10% of the people. Finally, Fong, Krantz, and Nisbett (1986) show us that training in the field of statistics influences the use of the reasoning system in a positive way. They state, "Statistical training serves to enhance the use of statistical principles in reasoning. The effects of training are impressive in their generality across method, context, type of subject, and even event domain."[12] An overview of the dual process model is given in appendix B.

This finally leads to reasoning about choices or, in other words, making decisions. The first of the two theories is the normative theory, a theory about how people ought to make decisions. The second is the descriptive theory, which describes the way people tend to make decisions. The final point will be linking this to the previously discussed dual process model.

In looking at how people ought to make decisions, one must consider the utility theory. One weighs costs and benefits in this economic approach. By and large there are multiple ways available to reach a long or short-term goal. People use criteria, like values, to subjectively weigh the advantages and disadvantages of the different paths that lead them to their respective aims. They then choose the road where they expect to maximize utility. I would argue that the United States Army's Military Decision-Making Process (MDMP) fits the utility theory. It is a rational,

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[11] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 428

[12] Geoffrey Fong, David Krantz, and Richard Nisbett, "The effects of Statistical Training on Thinking about Everyday Problems," *Cognitive psychology* volume 18, no 3 (July 1986): 280

logical process. We all like to think that this is the way we make decisions. However, studies show that this is not the case; our reasoning does not appear to follow the rules of logic! We are, among other things, influenced by framing effects and confirmation bias.

It is desirable to subdivide these framing effects into framing of outcomes and framing of questions and evidence. To illustrate the first one, Reisberg uses the following example:

> Consider the question posed in appendix C, research participants show a clear preference between these options, and 72% choose program A. (Tversky & Kahneman, 1987). Now consider the question posed in appendix D. This problem is the same as the one in appendix C, 200 people saved out of 600 is identical to 400 people dead out of 600. Therefore, the utilities involved in this problem have not changed one wit. Nonetheless, this change in how the problem is phrased--that is, the frame of the decision--has a strong impact on participants' choices. In the "lives saved" frame , they favor program A by almost a 3-to-1 margin. In the "will die" frame, this pattern of preferences reverses, and 78% opt for program B.[13]

Other studies show that the same is true for the way that we frame a question.

In weighing the alternatives, people have a strong inclination to find evidence that supports their preferred course of action and take it at face value. Further, they do not tend to adjust their path even when finding evidence that is detrimental to the chosen route. They try to belittle the evidence and diminish its significance. The aforementioned is called confirmation bias.

The decisions we tend to make cannot be fully explained by the utility theory, but can be better clarified by also looking at the descriptive theory of reasoned based choice. There seems to be some similarities between this and the dual process system in terms of making judgments. Do people use different system when under time pressure? Gary Klein, chief scientist at the Klein associates, Inc and author of the book *Sources of Power, How People Make Decisions*, seems to think so.

Klein took the research on decision-making out of the laboratory-like situations and studied how people make decisions in field settings. This is what he refers to as naturalistic decision-making.[14] Features that help define a naturalistic decision-making setting are time pressure, high stakes, experienced decision-makers, inadequate information, ill-defined goals, poorly defined procedures, cue learning, context, dynamic conditions and team coordination (Orasanu and Connolly 1993). The results of his research and that of Peer Soelberg (1967) support the claims made by Reisberg, that people do not use logical decision-making strategies, but rather use it to construct a justification when the decision is already made. However, Klein's research shows a new phenomenon. Inexperienced people do seem to use a rational approach to new problems. They actually compare different approaches to solve a problem, whereas experts come up with one course of action. Novices get more benefits out of rational decision-making than experts do. In this way, novices build up experiences and in time gradually change their decision-making process from rational to intuitive. The evidence cited previously suggests that intuition has nothing to do with having a sixth sense, but rather with recognizing situations from previous experiences. Klein's research led to the development of the Recognition-Primed Decision Model.

In this model the decision-makers arrives at a situation. They recognize the circumstances and take action. They understand what goals they have to achieve and prioritize them accordingly. At the same time, they focus on relevant cues, which prevent them from having information overload. Furthermore, they expect a situation to develop according to their experience. When they realize that they have seen this situation before, they react by choosing a familiar course of action that they are convinced will succeed. If the situation does not develop

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[13] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 457

[14] Klein, Gary. *Sources of power, how people make decisions.* Massachusetts of technology, 1999

according to what they expect, the decision-maker seeks clarification. He can collect more data or create a mental story, which will allow him to make inferences of the situation and start again. When the decision-maker comes up with a course of action, he will play the execution of it in his mind and see if it will work. If it works, he will implement. If it does not work, he will modify and implement.

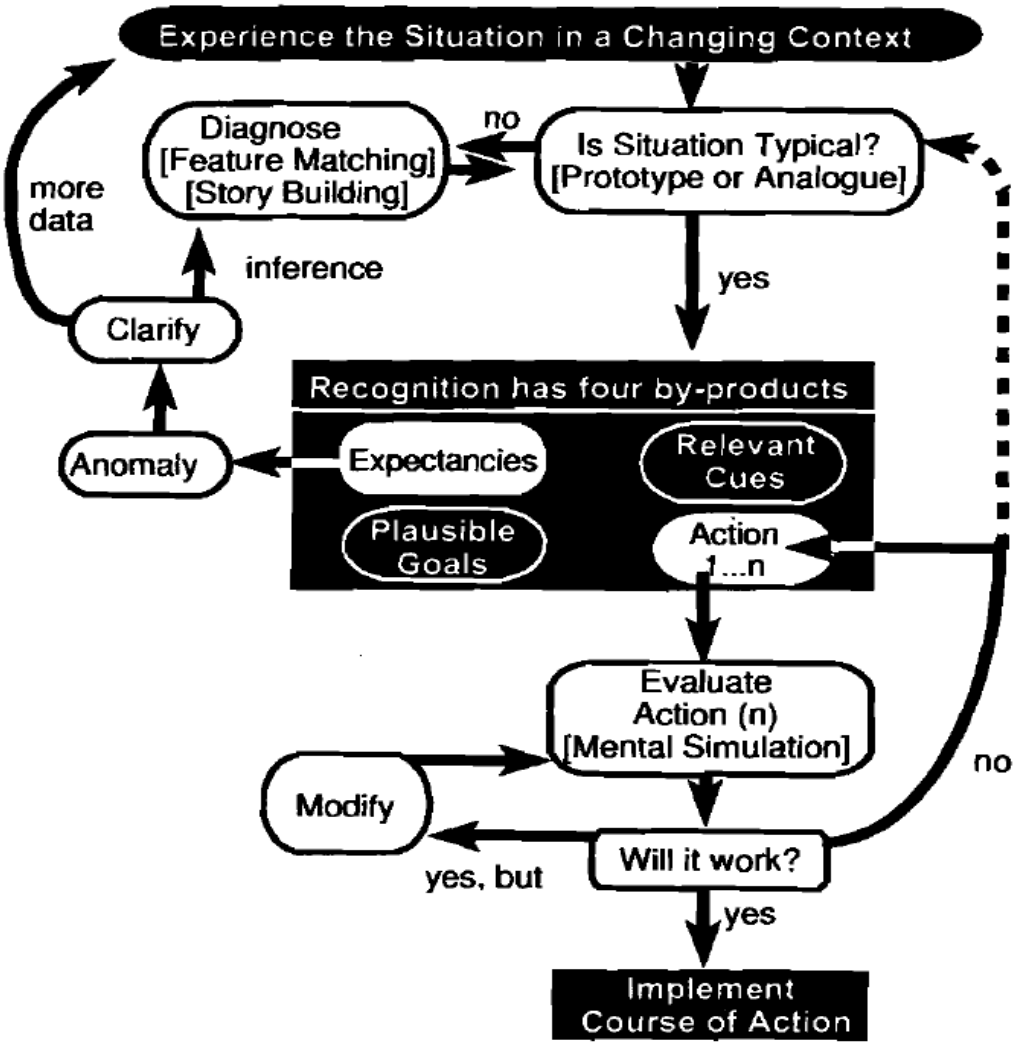

Figure 1 Integrated version of recognition-primed decision model.[15]

[15] Ibid, 27

So far, we have seen that knowledge is acquired through recognition. Retrieving and decoding of that knowledge from the long-term memory is facilitated when the circumstances are the same as when stored in this memory. For military deception, we target experienced decision makers. These targets are only likely to use a rational decision making model if they are put into a situation that they cannot relate to from previous experiences. When put into a familiar situation, they will go with their initial thought to the solution of the problem. For the application of military deception this means that we have to create a story that fits the experiences of the target.

Experimental Research

In the previous chapter, I have laid the theoretical foundation for pattern recognition and its relationship to decision-making. The relevance of this monograph will increase if I can validate the preceding theory. If I can accomplish this, it will open the door for practical application, e.g. military deception. In order to find confirmation for the theory I will conduct an experiment. Experimental research is the most conclusive of scientific methods.[16] It is a very powerful instrument to test my hypothesis, and it allows me to establish cause-and-effect relationships. It is unique because one can compare groups who have been primed to those that have not been conditioned by manipulating the independent variable. One has to try to control all the other variables in order to have them not affect the outcome.

In this trial, I will use Boyd's Observe, Orient, Decide and Act-loop (OODA) concerning decision-making. The experiment will focus on the orient phase, as it precedes the decide phase. There are two ways one can influence this phase. One can increase ambiguity and impede the decision-maker's orientation. In this manner, it is possible to confound his decision by making him unsure. However, my intent is to cause a decrease in ambiguity and therefore facilitate erroneous orientation of the decision-maker, in this case the experiment group. I expect that this

[16] Jack Fraenkel and Norman Wallen, *How to design and evaluate research in education, 6th edn* (New York: McGraw-Hill, 2006),7

will make them decisive, certain, and wrong. This is the impact I seek for the decision phase. The relevance is rather obvious. If we can get a target to make decisions that favor us, we can gain great advantage. Therefore, we need a practical military application that can decrease ambiguity in the orient phase. This is the principle objective of military deception.

Hypothesis

Officers of the School of Advanced Military Studies (SAMS) who have been cognitively primed will be slower to recognize a changing operational situation than SAMS officers who have not been conditioned.

Null Hypothesis

There is no difference in SAMS officers who have been cognitively primed to SAMS officers who have not been conditioned in recognition of a changed operational situation

Population

Operational level decision-makers, whether they are Brigade, Division or Corps commanders are responsible for the decisions made within their unit. However, it must be understood that they have a staff that works for them that helps them make decisions. It is a fair statement that the lead operational level planners' advice in most cases will be executed as the commander's decision. Having said this, when I am discussing operational level decision-makers I am also addressing the lead operational level planners.

For this experimental research, my target population is the American operational level decision-makers. This of course is a far too large and diverse group to look at in order to come up with generic inferences. What these operational level decision-makers and planners have in common is that they typically have attended the School of Advanced Military Studies at Ft. Leavenworth, where they are taught to become operational level planners. My accessible

population therefore is the students of the Advanced Military Students Program of the year 2007 – 2008.

I am aware that the one-on-one relation between my target population and the accessible population might create a reason for concern; one might think that it poses a threat to validity and therefore limits the ability to generalize. However, I will address this issue when discussing threats to validity. The accessible population consisted of 82 US and five international students. Amongst the US students, there were 71 Army, 2 Navy, 6 Air force, 2 Marine officers and 1 civilian. They were all mid-grade level experienced decision makers between the ages of 33 – 53 years. Their military education and unit experiences were similar. The Advanced Military Studies Program thus provided me with a relatively homogeneous group of people. These students were divided over six seminar groups. At the start of the academic year, faculty has tried to balance these groups equally. Every class, except one, has an international officer. Faculty has also tried to have a fair share of the different services and branches present in the classes. Therefore, students were categorized and divided over the seminar groups. This was done to ensure near equivalence of distribution in background, experience, and specialties. There are arguments for both sides to call this random or non-random.

Due to time constraints, I had to pick a sample from the accessible population in order to conduct the experiment. In a school environment, it is not easy to select individuals. Classes are all bound to schedules. So, I chose cluster random sampling. It is similar to selecting individuals, but now you select classes. To make sure I had a fair representation I wanted four classes to participate. In order to randomly pick classes for the experiment I let class schedules be the objective variable. I now had my sample size. For a detailed description of the sample size, see appendix E (sample characteristics).

Instrumentation

According to the theories described in the previous chapters, pattern recognition is key in human decision-making. As you have read, this has become my hypothesis. In order to test this hypothesis, I have used the Randomized Posttest-Only Control Group design as described by Fraenkel and Wallen in *How to Design and Evaluate Research in Education.* In this experimental design, there are two groups involved both randomly chosen. One group, the treatment group, gets conditioned. The other group, the control group, does not get primed. Then both groups are tested on the dependent variable. In this way, I will try to establish a causal relationship by manipulating the independent variable.

"In this design, the control of certain threats is excellent. Through the use of random assignment, the threats of subject characteristics, maturation, and statistical regression are well controlled for. Because none of the subjects in the study are measured twice, testing is not a possible threat. This is perhaps one of the best designs to use in a experimental study."[17]

Another part of instrumentation is that of the administration. There are three conditions that an instrument used in data collection has to meet. It has to adhere to validity, reliability and objectivity.[18] For me it also had to be practical. It had to be easy to score and easy to interpret results. I also wanted to use an existing instrument that had proven to be a valid instrument in research. As a result, I used a subject-completed instrument. This instrument comprised of a combination of selection items and short answers. These short answers would provide me more depth in my data.

Finally, in addition to the subject-completed instrument I chose to use a computer simulation in phase two. There were four reasons for that choice. First, I needed a visual

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[17] Jack Fraenkel and Norman Wallen, *How to design and evaluate research in education, 6th edn* (New York: McGraw-Hill, 2006),273

representation that evolved over time. Persons taking part would have to look at a static state and assess the situation. Then I would let the situation evolve over time and determine if participants would alter their appraisal, and if so, when and why. The second motive relates to efficiency. I could have multiple computers running the same simulation and therefore have more people taking the experiment in a shorter time. The third rationale finds its roots in accuracy. As soon as contributors changed their appreciation of the situation, they could stop the simulation and write down the software time the change occurred. This would provide me with data on when participants viewed the situation differently. Finally, I had computers and software free at my disposal. Due to the aforementioned, a computer simulation seemed the obvious choice.

Pilot study

In order to ensure that the experiment ran as envisioned I conducted a pilot study. On 7th January four faculty members who had not been primed agreed to participate in the pretest. Their feedback was extremely valuable and made me adjust my experiment at some points. The pilot study also made it clear that the experiment would take 30 minutes. With the suggested alterations incorporated in the final instructions, I felt confident that the experiment would run as planned.

Procedures

The experiment took place in two phases. In the first phase, the control group did not take part. However, I did condition the experiment group. I have provided them with a visual and auditive experience. In this way, I fired up their detectors as discussed in the previous chapter. Now that I had raised the basic level of the detectors involved, they would need less strong stimuli for them to rise above the response threshold. The second phase of the experiment was a

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[18] Jack Fraenkel and Norman Wallen, *How to design and evaluate research in education, 6th edn*

computer simulation. This resembled, but was not identical to, the priming experience of the experiment group. Both the experiment and control group participated in this simulation. I expected the experiment group to focus their involved detectors on what they expected. They did not expect other stimuli, so there was no reason for them to prepare their other detectors. As a result, the stimulus, when it is presented, falls on unprepared and thus unresponsive detectors.[19] Due to this, I expected two outcomes. First, participants of the experiment group would make a wrong assessment of the situation as they saw it on the computer simulation, and therefore make wrong decisions. Furthermore, I assumed that while the simulation was in progresses they would notice the unexpected stimuli and would have to change their initial decision. It was interesting to find out just how soon they realized that they had made a wrong estimation and thus a wrong decision.

As previously stated, the control group would not be primed. Since they would not be exposed to relevant stimuli, their involved detectors would not be fired up and would respond from their basic level. The effects that I assumed would take place when they were exposed to the stimuli in the computer simulation were that these people would make a correct initial assessment of the situation from the start and therefore make correct decisions. Second, if they did make an initial wrong estimate, they would be faster in correcting it because they had not been conditioned.

Priming

What I wanted to investigate (and the reasons for it) and the experimental design have previously been made clear. The pressing issue now was how to mold these ideas into a feasible experiment and create the necessary conditions to execute this. While the issue of the content of

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(New York: McGraw-Hill, 2006),113

the experiment remained, three more problems had to be solved. First, if I wanted the full effect of the experiment, it was essential that none of the students would be aware of the fact that they were participants. If they were aware, it could skew the data. But, how do you keep the priming of a segment of fellow students and the computer simulation executed by the experiment and control group a secret amongst fellow students? This could only succeed if the topic of the experiment would be a military subject, relevant to the students' study, and have it put on their calendar as one of their preplanned lessons. Second, the topic I would choose had to be one where the participants had no personal experience. Personal experience would have an effect on the data, and this was something I had to avoid. Finally, the topic should not be too complicated. Participants had to be able to address the questions raised in the simulation without prior study.

The solution to the problem of the content of the experiment and the secrecy almost presented itself. A study of the Golan Heights campaign, as part of the 1973 Yom Kippur war, would meet all the requirements. The students were too young to consciously have experienced this war. It was a relatively simple conflict because of the linear battlefield and the symmetric form of warfare. It could serve as a historical case study on decision-making. This would not raise any suspicion amongst the students. Not to put a big strain on my fellow students I decided that the study of the first 36 hours of the campaign would be sufficient for my experiment. Therefore, students would only have to focus on the Syrian attack against the Israeli defense Forces (IDF). The contours of the experiment started to become clear to me.

The leadership of SAMS was more than cooperative to get this experiment going. The priming of the experiment group got its place on the schedule. Not to raise any suspicion, the cloaked name as it appeared was called operational decision-making. Thus, according to the schedule on January 8th, twenty-seven students of seminar groups three and four gathered for a

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[19] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 111

lesson on operational decision-making concerning the Golan Heights, see appendix F (advance sheet). The first hour was a lecture on the theory of operational decision-making. Boyd's OODA loop took a prominent place in the discussion. This capstone theory led to a fundamental discussion of the use of an operational reserve. Topics such as the factors impacting size and use of the reserve were all thoroughly discussed. The second hour the combined seminar groups were divided into four smaller groups. All students received a handout concerning the Golan Heights campaign.[†] Each group had to prepare a presentation which answered the following questions:

1. What factors influence the strength and location of the reserve, and how well did both sides do on this subject?

2. What is the role of the reserve and comment on the Syrian commitment of its reserve, the 3rd Armored Division?

3. The Syrian Major-General Mustafa Tlas was the overall field force commander on the Golan, as well as the Syrian minister of Defense. Reflect on his position with regards to Clausewitz's paradoxical trinity.

4. Reflect on Israeli leadership in battle (leading from the front).

5. What form of offensive maneuver did the Syrian Army conduct?

In the last hour, the groups did their presentation and discussed the answers with the other groups. The students were not aware that they were the experiment group and that they were being conditioned. The study of the Golan Heights campaign and the related questions primed them for the computer simulation, which was to take place two days later. In conducting the priming in this setting, I killed two birds with one stone. Participants studied maps of the area of operations and the disposition of forces over time. In this way, they were visually primed. The

[†] Simon Dunstan, *The Yom Kippur War 1973 (1): The Golan Heights* (New York: Osprey Publishing, 2003), 7-60

oral presentation of the answers to the questions from the advance sheet and the following discussion primed the students in an auditive manner. An advantage of priming the group as a whole was that the group members were all primed in the same way. In this way, I could rule out any pollution of data due to inconsistency of priming. At the end of the lesson, students were unaware that their involved detectors for the computer simulation had been warmed up.

Computer simulation

In the beginning of the chapter, you have read the different reasons why I chose a computer simulation for the second phase of the experiment. The already available Combined Arms Planning and Execution monitoring system (CAPES[†]) struck me as the ideal tool to use on the computer platform. While availability was one thing, there was another compelling argument. In the previous year, a course on CAPES was a prerequisite for future SAMS students. Therefore, the current population of SAMS students were already familiar with this software. However, while I was working on this monograph the designated software to make this simulation work was no longer a required program at SAMS, and was therefore no longer supported. Fortunately, the subject matter expert for this software was more than willing to put his own time into developing the Golan Heights scenario in CAPES. A detailed study of the Golan Heights campaign and frequent coordination between the CAPES expert and me bore fruit. The outcome was a simulation that was an exact replica of the aforementioned campaign. On detailed maps Syrian and Israeli units fought the battle as it had occurred in October 1973. The original time, combat power, and even the periods of light, dusk, night and dawn were incorporated. At this point, the simulation was an exact representation of what the experiment group had studied.

[†] CAPES is doctrinally based planning software, which runs on the windows operating system and is in use since 2002 by selected U.S. Army forces. It serves as the backbone of the Planning Services for the Future Combat Systems Command and Control System program.

Nevertheless, I wanted to explore if I could manipulate the participants' orient phase and thus influence their decision. As earlier stated, I wanted to decrease ambiguity and therefore facilitate erroneous orientation. I expected that this would make them decisive, certain, and wrong. This meant that I could only accomplish this by altering the simulation slightly from the way the battle was originally waged and thus from what they had studied. I chose to keep the opening and the first day of the battle unaltered. I expected that the experiment group would find confirmation of their expectations. They would recognize the situation and the development of the battle due to their previous experience. It would develop according to their initial assessment. I expected that I would have soothed them to sleep and that they would be less susceptible to deviations. In order to realize a deviation I had changed the location where the Syrian reserve Division would be committed. This was my independent variable. By doing this, the effect of the simulation was a Syrian victory within 36 hours as opposed to their defeat as it actually took place in 1973.

Now the simulation itself was finished. However, more work had to be done. As the students would sit down behind a computer, they would find instructions on paper before them. These instructions explained the duration and the flow of the experiment. In this instruction, they would find a road to war as it actually happened in 1973. Also available to them was an excerpt of an intelligence preparation of the battlefield of the Golan Heights. Furthermore, they could see on their computer screen a map of the area of operations with the disposition of the forces from both sides. Participants would be asked to answer the following three questions based on the information available.

1. When you analyze the relative combat power, do you think the enemy will be able to capture the bridges?

a. Yes

b. No

because……...

2. Which form of offensive maneuver do you expect the enemy to execute and why?

a. Envelopment

b. Frontal attack

c. Infiltration

d. Penetration

e. Turning movement

because……...

3. Where do you expect the enemy to use his reserve and why?

a. North

b. Central

c. South

because……

When this was finished they could start the simulation and watch the battle unfold before their own eyes. Whenever they wanted to make a change to their original estimate, based on the development of the simulation, they could. They were asked to stop the simulation, change the answer to a previous question. They were also asked to write down the simulation time when they changed an answer but they also had to state the reasons for the change. For the complete set of instructions see annex G. Phase two of the experiment was now finished. Curiosity took over, and I wondered how long it would take before the experiment group would realize that their initial assessment was wrong. I sought to determine if there would be a significant difference between the experiment and control group due to priming.

Threats to validity

It is crucial when one conducts an experiment that the inferences made of the collected data are applicable to the group of interest. This is what validity is all about. One can break down validity into internal and external validity. Internal validity is “The degree to which observed

differences on the dependent variable are directly related to the independent variable, not to some other (uncontrolled) variable."[20] When we talk about external validity, we mean "The degree to which results are generalizable, or applicable, to groups and environments outside the research setting."[21] When one conducts an experiment, it is necessary to recognize possible threats to the validity. When identifying them in an early stage, one can see if there are ways to guard against these threats. However, it is almost impossible to eliminate all threats. When one recognizes the threats, one can make sure not to draw the wrong inferences. In the next paragraph, I will discuss the internal and external threats for my experiment.

Traditional threats to internal validity when using the Randomized Posttest-Only Control Group Design are mortality, the Hawthorne effect and the data collector bias. The first refers to an unequal drop out of participants in the control and experiment group. This might cause dissimilarity in characteristics between the two groups. The Hawthorne effect, which shows that individual behavior may be altered because they know they are being studied, is less likely to occur. The complete secrecy of the experiment is the reason for this. The data collector bias is something that can be mitigated by having a second person check the inferences drawn from the collected data.

As stated previously, a threat to external validity is the assumed relationship between my target population and my accessible population and thus my sample. Not all of the subjects from the accessible population or sample will become operational level decision-makers. Therefore, representativeness poses a threat. However, the theory of decision-making as discussed in the previous chapter deals with the average brain and not specific brains. Therefore, the suspected threat does not become manifest.

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[20] Jack Fraenkel and Norman Wallen, *How to design and evaluate research in education, 6th edn* (New York: McGraw-Hill, 2006),G-4

[21] Ibid, G-3

Findings

In hypothesis testing, one wants to find out if the predicted relationship (the research hypothesis) is there by chance or not. As a criterion, one uses the significance level for rejecting the null hypothesis. In social research, it is common to use 5% as a level of significance. Therefore, in this experiment in order to reject the null hypothesis there has to be a $p<05$, where p stands for probability. This means that there is only a chance of five (or less) times in a hundred that the relationship could have happened by coincidence. To put in differently, one wants to be 95% sure that the relationship between variables is not due to chance. To analyze the findings of the experiment I used logistical regression, which is a type of predictive model that can be used when one deals with two variables. I will address each question separately. Per question, I will discuss what I expected to find, what I found, its significance and if possible an explanation.

The first question was, when you analyze the relative combat power, do you think the enemy (Syrian forces) will be able to capture the bridges. Participants could answer yes or no. The outcome of the computer simulation would show that the enemy would capture the bridges. Therefore, the answer yes was the correct answer as a variable for the statistical test. The experiment group had their detectors fired up two days before with the Golan Heights study, where the Syrian forces did not capture the bridges. Therefore, I assumed that they would recognize the situation in the computer simulation and that the majority would answer no. The detectors of the control group had not been fired up. They could not relate to this previous experience and I assumed that they would do the mathematical equation of combat power. According to doctrine, an attacker needs a 3:1 ratio when an enemy is in a prepared or fortified position.[22] The Syrian had a 5:1 ratio of combat power over the Israeli Defense Forces. Therefore, I expected the majority of the control group to answer yes.

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[22] Headquarters department of the Army. *FM 5-0 (January 2005).* Fig 3-10, Page 3-32

My expectations were wrong. Not only were they wrong, exactly the opposite had happened. Exactly 67% of the experiment group had answered yes and 46% of the control group had answered yes. One can find the results for the Experiment Group in Appendix H, and for the Control group in Appendix I. Logistical regression showed that the experiment group was 2.286 times more likely to answer yes than the control group. The p=0.145 and it therefore did not reject the null hypothesis. For logistical regression results, see Appendix J. Although in statistical terms this was not a significant difference, it is an important indicator. It is reasonable to assume that priming created this difference.

What can account for this opposite answer with the experiment group? The following explanation may explain this. The primed group had been conditioned with failure. During class presentations about the conflict it was made clear more than once that what the Syrians had done wrong and how we would overcome this and not make the same mistakes. The priming had caused a learning effect! Primed participants had learned from the campaign and were not going to make the same mistakes as they had happened during the actual conflict.

What could be the reason that there was almost a fifty fifty split in answers within the control group? There were no indicators that led me in definite directions. I was therefore unable to give a well-founded explanation for this outcome. In hindsight, it would have been interesting to know whether participants actually compared force ratios.

The second question was which form of offensive maneuver do you expect the enemy to execute? Participants could answer envelopment, frontal attack, infiltration, penetration or turning movement. The outcome of the computer simulation would show that the enemy would do a frontal attack and a penetration. Therefore, these two answers were combined into one variable and would be considered the correct answer. The remaining answers were considered wrong and were combined into one variable. I expected the experiment group, who had there detectors fired up, to answer penetration or frontal attack, according to their priming experience. For the control

group I did not expect a different outcome, because the disposition of enemy forces would lead to this assumption.

Here my expectations proved to be right. From the experiment group, 87% of the participants gave the right answer. For the control group this was 90%. For the results, see Appendix H (results for the experiment group) and I (results for the control group). Logistical regression showed that the experiment group was 1.350 times more likely to answer incorrectly than the control group. The p=0.730 and it therefore did not reject the null hypothesis. For logistical regression results, see Appendix J.

The third question was where do you expect the enemy to use his reserve? Participants could answer north, central or south. The outcome of the computer simulation showed that the enemy deployed their reserve on the boundary between central and south. Therefore, both these answers were considered correct and combined into one variable. The answer north would be considered incorrect. Due to the conditioning, I expected the majority of the experiment group to answer north, because this is where the Syrians did deploy their reserve. For the control group my outlook was different. I expected them to execute a terrain analysis. Where would the terrain favor the enemy's armored reserve? A quick study of the terrain showed that the south was much better suited for armored vehicles than the north. It is therefore that I expected the control group to answer central or south.

Interesting to analyze was how fast the experiment and control group would be in discovering that their initial answer of north was wrong. I expected the experiment group to be slower in realizing that wrong assessment because they thought they were sure what was going to happen. For the opposite reason I expected the control group to be faster in realizing that they had made a wrong assessment. Adding another variable also meant using another test, namely the Univariate Analysis of Variance.

The results without the time variable pointed into the direction that I predicted, however they were not conclusive. From the experiment group 45,5% answered north, for the control

group this was 34,5%. One can review these results in appendix H results for the experiment group) and I (results for the control group). Logistical regression showed that the experiment group was 1.583 times more likely to answer north than the control group. The p=0.428 and it therefore did not reject the null hypothesis. For logistical regression results, see Appendix J.

Conclusion

The results of the experiment did not reject the null hypothesis, which states that there is no difference between SAMS officers who have been cognitively primed and SAMS officers who have not been conditioned in recognition of a changed operational situation. It therefore does not show conclusive evidence in support of the hypothesis. It is the statistical five percent rule that excludes any significant difference between the experiment and control group. However, there are strong indicators that lead toward confirming the hypothesis. It seems that a bigger population might tip the scale in favor of proving the hypothesis.

An unexpected effect could be derived from the conducted experiment. As stated previously, it would have been in the line of expectations that the experiment group would answer question one different than they have done. They were conditioned that the Syrian Army would not capture the Israelian held bridges. Strange enough they were 2.286 times more likely than the control group to say that the Syrian Army would reach the bridges. The experiment group had been primed with a campaign that showed failure. They recognized the situation and adjusted accordingly. It shows that the experiment group had learned an important lesson due to conditioning.

Recommendations for further research

As aforementioned, the experimental research has not been conclusive. However, there are enough indicators that make it worthwhile to pursue additional research. This follow up research will gain in significance if the sample group would be bigger. When one extrapolates the

results, it becomes likely that a sample size of one hundred participants would have tipped the balance into rejecting the null hypothesis. Furthermore, using a successful operational campaign to condition an experiment group instead of an operation that failed might prove to create pattern recognition that leads to success instead of one that leads to failure. Finally, it would be worthwhile to investigate whether the U.S. students are a variable. One could for example execute the same experiment with Dutch students in order to rule out nationality as a variable. Implementation of these recommendations might lead to a rejection of the null hypothesis and therefore provide a scientific basis on which to enhance military deception.

Another issue worthwhile investigating is the effect of the amount of time between priming and testing. This has a direct effect on whether you are testing the explicit memory, or the implicit memory. When using military deception one typically must expect the target to use his implicit memory. So how much time should there be between priming and testing in order to test a participant's implicit memory?

Conclusion

"Usage is still unsettled. The object of science is knowledge; The object of art is creative ability. It is extremely difficult to separate them entirely in the individual."[23]The military historian and theorist Carl von Clausewitz hit the nail on the head with this statement. In this monograph, an artificial delineation between the art and science of military deception was made. This separation allowed an investigation into the science of military deception, which is how we use knowledge to make decisions. By no means did this paper address the art of military deception.

In order to make decisions, one needs to have knowledge. Knowledge is gained by processing information and giving it meaning and relevance. Pattern recognition occurs when

[23] Carl von Clausewitz, *On War*, Edited and translated by Michael Howard and Peter Paret (Princeton: Princeton University Press, 1989), 148

information in our environment is identified and categorized. These experiences are stored in each individuals long-term memory. Retrieving and decoding of that knowledge from the long-term memory is facilitated when the circumstances are similar to these stored in this memory.

For military deception, one targets experienced decision makers. When put into a familiar situation, they will use their experience based intuition to solve the problem. In the application of military deception this means that one has to create a story that fits the experiences of the target. According to theoretical research one can make this claim, but experimental research did not bear this out.

According to statistics the experiment does not show a significant difference between people that have been primed and those that have not. In prolongation, one could debate how much previous experiences or pattern recognition influences people in making decisions. The experiment in this paper did not show any conclusive evidence that it does. However, the results of the experiment show strong signs that indicate a relationship between previous experiences and decision-making. As military commanders the following is likely to be familiar; you are given a tactical or operational problem and within minutes, you believe that you know which course of action to execute. Sometimes you do not need evidence to know something exists.

Recommendations

It is important to realize that recognition-primed decision-making can have two serious negative implications that military practitioners should be aware of. During his career, a professional soldier has acquired knowledge on how to solve military problems. These can be both negative and positive experiences. When confronted with a situation that is recognized through experience it is essential to realize that experience may not be applicable to the current problem. Also, take into consideration that the threat may be using military deception. It is imperative to verify the facts before making a decision.

There is a second risk. Intuitive decision-making allows practitioners to short cut the military decision-making process. However, as a commander one is responsible for educating and training your staff. They have to get experience as well. Novices need a rational decision making process in order to reach a deliberate decision. Unless one is in a time constraint environment, let the staff complete the process in order to educate and train them. They will profit from their gained experience in due time.

A commander needs information to support his visualization and to make critical decisions in planning and execution. For a commander to specifically target an adversary decision-maker by using military deception he has specific information requirements on intelligence specific to the enemy commander, this includes the previous experiences of the target. It is essential to collect information about the targets social and cultural background. It is equally important to gain knowledge about his personal circumstances and religion. Likewise, one needs to gather data on his military education and combat experience. The whole idea is to be able to create a mental picture of your target, how does he think and make decisions. This information, or knowledge, provides the essential and critical foundation for opportunities to devise and execute successful military deception.

In order to let military practitioners rise above the subconscious level of the science of military deception, it is necessary to provide them education and training. It is therefore necessary to implement this subject into relevant military doctrine and into the curriculum of military education. An appreciation of the science of military deception will provide the professional soldier the tools to apply the art of military deception. Give the soldiers the tools, enable them to create a story that fits the experience of the target and surprise him. By doing this, victory is more likely to be on our side.

APPENDIX

A: Heuristic strategies for judgment

Strategies for judgment[24]			
Heuristic	**Purpose**	**How to use it**	**Drawback**
Availability	For judging frequency	Try to think of relevant cases. If the cases come to mind quickly and easily, conclude the category is a frequent one	Ease of thinking of cases is often influenced by factors other than actual frequency in the world
representativeness	For making inferences about the traits of a specific case or of a category.	Assume the relevant category is homogeneous. On this basis, assume that each individual in the category, will have the properties evident in the category overall. Likewise, assume that the entire category will have the properties evident in each instance you observe.	Many of the categories we think about are not homogeneous, and so small samples of evidence will sometimes not reflect the properties of the whole.
Anchoring and adjustment	For making a variety of quantitative estimates	Start with a known anchor an estimate that is in the same ballpark as the right answer. Then adjust that anchor to make it a better approximation of the right answer.	We often under adjust, and we are too much influenced by the initial anchor.

[24] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 414

B: Overview of the dual process model

Overview of the dual process model				
	Characteristics	**Trigger**	**Error probability**	**Accuracy**
Heuristic system	Fast, automatic, efficient	Time pressure. People are distracted. Probability format	Higher	Lower
Reasoning system	Slow, more effort, inefficient	Time available. People are able to focus. Frequency format	Lower	Higher

C: The Asian Disease problem: Positive frame[25]

Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat this disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If Program A is adopted, 200 people will be saved.

If program B is adopted, there is a ⅓ probability that 600 people will be saved, and a ⅔ probability that no people will be saved.

There is clearly no right answer to this question; one could defend selecting the "risky" choice (Program B) or the less rewarding but less risky choice (Program A). The clear majority of people, however, lean toward Program A, with 72% choosing it over Program B. Note that this problem is "positively" framed in terms of lives "saved."

[25] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 458

D: The Asian Disease problem: Negative frame[26]

Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat this disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

If Program A is adopted, 400 people will die.

If Program B is adopted, there is a ⅓ probability that nobody will die, and a ⅔ probability that 600 people will die.

The problem is identical in content to the one shown in appendix C: 400 dead out of 600 people is the same as 200 people saved out of 600. Nonetheless, people react to the problem shown here rather differently then they do to the one in appendix C. In the "lives saved" version, 72% choose Program A. In the "will die" version, 78% choose Program B. Thus by changing the phrasing, we reverse the pattern of people's preferences.

[26] Daniel Reisberg, *Cognition, exploring the science of the mind*,3rd media ed. (New York-London: W.W. Norton & Company, 2007), 459

E: Sample characteristics

		Primed	Not Primed
Gender	Male	22	29
	Female	2	1
Rank	Major	23	28
	Ltcol	1	2
Age	33	1	
	34	6	6
	35	6	6
	36	4	8
	37	1	2
	38	1	1
	39	2	1
	40	2	1
	41		2
	42	1	
	43		1
	45		1
	53		1
Branch	Inf	4	4
	En	4	3
	Armor	2	4
	Signal Corps	1	
	Aviation	2	3
	Field Art	1	3
	Logistics	2	2
	MI	2	2
	Psychological Operations	1	
	Quarter Master	1	
	Special Forces	1	2
	OD	1	
	Air Defense	1	
	Navigator	1	
	CSAR		1
	MP		2
	B-52		1
	Surface Warfare		1
	NSW		1
Service	Army	22	24
	Air Force	1	2
	Marine Corps	1	
	National Guard		1
	Navy		2
International officer	Army		1
Combat experience: When	1989	2	
	1990	1	1
	1991		1

	1993	1	1
	1995	3	
	1997	1	1
	2000		1
	2001		1
	2002	3	7
	2003	10	12
	2004	5	7
	2005	6	7
	2006	2	2
	2007	2	2
Combat experience: Where	Iraq	19	21
	Kosovo	1	
	Panama	2	
	Haiti	2	
	Afghanistan	3	9
	Pakistan	1	
	Yemen	1	
	Bosnia	1	
	Kuwait	3	1
	Oman	1	
	Qatar	1	2
	East Timor		1
Combat experience: Position	Co CDR	11	6
	Officer in charge of reconstruction	1	
	Deputy G6	1	
	Assistant group S3	1	
	Battle captain	1	
	Battalion Assistant S3	1	2
	Transition team XO	1	
	Joint Log planner	1	1
	Lno	2	2
	Chief psyops element	1	
	Assistant S2	1	
	Compagny XO	2	
	CI detachment commander	1	
	Platoon leader	1	3
	Spo planner	1	
	Chief of plans	1	
	Sus BDE plans	1	
	Battalion operations officer	1	
	Team Leader	1	
	LRSD commander	1	
	Navigator	1	
	CAOC sole rep	1	
	Assistant Bde engineer	1	
	Military adviser to Iraqi General Staff	1	

	Bn S3	2	3
	Info ops planner		1
	Squadron XO		1
	Chief of tactics		1
	Flight lead		1
	Recon Troop Commander		1
	Door gunner		1
	Contingency planner		1
	USACE resident engineer		1
	S2 planner CENTCOM		1
	Undersea warfare officer		1
	CALL observer		1
	Opns officer		1
	Bde S3		1
	Dep Div eng		1
	B-52 EW, weapons and tactics		1
	B-52, CAOC LNO		1
	Deputy TU CDR + Ops and TU CDR		1
	Dep S 35 JSOTF-AP		1
	ODA Commander		2
	Targeting officer		1
	NATO Spokesperson		1
	Troop commander		1
	MITT		1
	Advisor Trainer		1
	Iraqi Bn Adviser		I

F: Advance sheet Golan Heights

Classification: **UNCLASSIFIED**

Caveats: NONE

AMSP 2007-08

Operational Decision-Making: The Golan Heights campaign (Yom Kippur 1973) Date: January 8th

Lesson Author: Mr. Rob McClary

Mode: Presentation, Seminar Discussion

Introduction.

A commander in battle has three means of influencing the action: Fire support; his personal presence on the battlefield, and the use of his reserve.

LTG Harold G. Moore (USA, Ret.)

We Were Soldiers Once…and Young

In this period of instruction, students will explore operational decision-making. The class will cover decision-making in general and the commander's use of the reserves specifically. After discussing the theory and its current codification in Army doctrine, students will use the battle of the Golan Heights in order to evaluate and comment on the theory and doctrine of operational decision-making compared against a historical case.

There is no specific requirement for reading in advance. The reading listed below will be provided as handout in class, and time in class will be allocated for student reading and preparation of group presentation.

Learning Objectives

a. To study battlefield leadership

b. To study the use of the reserve (specifically the Syrian reserve)

Student Requirements

Readings [total of 59 pages]

Simon Dunstan, The Yom Kippur War 1973 (1), *The Golan Heights.* (Campaign 118, Osprey publishing 2003), pp. 7-66 [59 pages]. Student handout.

References

Herzog, Chaim. *The Arab-Israeli Wars* (Arms and Armour press, Lionel Leventhal Ltd, London, 1984)

Lesson Agenda

This lesson will be divided into three periods. The first period will consist of guided discussion covering the theory of operational decision-making and use of the reserves. During the second period students will study the Golan Heights campaign until the Israeli counterattack and prepare group presentations answering the questions below. In the third period students will give their presentations and discuss the learning points.

Questions to be addressed in group presentations:

What factors influence the strength and location of the reserve, and how well did both sides do on this subject?

What is the role of the reserve and comment on the Syrian commitment of its reserve, the 3rd Armored Division.

The Syrian Major General Mustafa Tlas was the overall field force commander on the Golan, as well as the Syrian minister of Defense. Reflect on his position with regards to Clausewitz' paradoxical trinity

Reflect on Israeli leadership in battle (leading from the front).

What form of offensive maneuver did the Syrian Army conduct?

Classification: **UNCLASSIFIED**

Caveats:.

G: Complete set of instructions

You are about to conduct a practical exercise on the subject of commanders visualization. The total amount of time that is available for you is 30 minutes.

In these 30 minutes, you will have to do the following:

- Read a single page on the road to war, in conjunction with a CAPES overlay of the disposition of blue and red forces;
- Answer three questions about your estimation of the situation;
- Start the simulation and watch the battle unfold. If you let the simulation run uninterrupted, it will take 7 minutes.
- As the situation develops before you, you may want to change your initial estimate of the situation. At any point, you may do so.

Now fill in your name, rank, age, branch and combat experience below. When ready let an aid in the classroom know in order to start the PE. THIS IS A NON-GRADED PE!!

Seminar:……..

Name:……..

Rank:……...

Age:…….

Branch:……

Service:……...

Combat experience:

When:……..…

……

Where:…….

..……..……

Position:……..

……..……

Road to War

3 May	the president of the red forces visits Moscow and acquires massive new shipments of Soviet weapons including the most modern air defense system.
7 May	following major red maneuvers, blue orders partial mobilization.
13 September	Blue and red combat planes clash. Red looses 13 aircraft.
24 September	using the air battle as a pretext, red moves large forces to the disengagement line on the plateau.
26 September	Blue orders the 7th Armor Brigade to the plateau in support of the already present Brigade.

General

- You are the blue overall field commander;
- Red acts according to Soviet cold war doctrine;
- Red has five Divisions, Blue has two Brigades;
- Red and blue weapon systems are equal in capabilities;
- Morale: Blue forces consider themselves superior. Red has been humiliated before and is motivated to rid the previous humiliation;
- It is October 5th, tomorrow is the most holy day of the year and your countrymen are preparing for this. Your staff provides you with the following information.

1. **Terrain**

Orientation

The AO can be characterized as follows; In the W there is a valley, where the river J flows from N to S and it discharges in the sea of G. The valley rises steeply towards the E where it becomes a plateau at about 1.000 meters above sea level. This plateau covers an area of 900 square kilometers. It rises steadily from S to N and leads to Mount Hermon with a peak of 2814 meters. The northern part of the plateau is made of extensive lava fields, covered with basalt boulders and rock outcrops. The southern part consists of grasslands. The mobility S is better than the mobility N. The UN demilitarized zone (purple) is less than 500 meter wide. From N to S, W of the DM-zone we have the following major towns: MASADA,

KUNEITRA, NAFEKH, RAFID and EL AL. On the W side of the DM zone there are two major roads from N to S. The first runs from MASADA to RAFID. The second is a maintenance road for the underground Trans Arabian Pipeline (TAP). In the J valley there are five major roads running from W to E. From N to S these roads cross the following bridges: The Bridge at DAN, at GONEN, the Bennot Ya'akov Bridge and the Arik Bridge. These bridges have MLC 70

Blue forces dug in front of their defensive positions an anti-tank ditch of six meters wide and four meters deep along the W-side of the purple line. They also created fortified positions numbered A1-A11 and laid minefields.

2. **Disposition**
   a. See CAPES overlay
   b. 7th (RED) Div North, 9th (RED) Div Central, 5th (RED) Div South, 1st (RED) Div Central rear. 3rd (RED) Div is the reserve.
3. **Objectives**
   Red's aim is the capture of the plateau and the bridges over the river J within 36 hours.
   Blue's aim is to prevent penetration of the W-side of the DM zone

You are convinced that a red attack is imminent. You must prevent Red forces from capturing the bridges. Your intelligence officer has not been able to provide you with the most likely or most dangerous ECOA. You fire him; you have some quick decisions to make.

By answering the following three questions, you will provide your estimate of the situation.

Please circle your answer and briefly describe why you think that to be the case.

1 When you analyze the relative combat power, do you think the enemy will be able to capture the bridges?

   a. Yes
   b. No

   Because……
   ……
   ……

……
……

2 Which form of offensive maneuver do you expect the enemy to execute and why?

a. Envelopment
b. Frontal attack
c. Infiltration
d. Penetration
e. Turning movement

Because……
……
……
……
……

3 Where do you expect the enemy to use his reserve and why?

a. North
b. Central
c. South

Because……
……
……
……
……

You have just made an estimation of the situation. Let an aide in the classroom know that you have reached this point. He will assist you in starting the simulation in CAPES. The simulation will let you see how the battle unfolds.

Your initial estimate may prove valid throughout the simulation run. If your estimation changes during the simulation, please stop the simulation and indicate the change(s) in the format below:

Write down the “simulation time” as portrayed in CAPES as well as the number of the question that you would like to adjust and the reason why.

Example:

CAPES time: H+ 3 hours 25 minutes

Change Question # 2 to Choice letter b

Because ……

Change 1 to estimation

CAPES time: H + …….....

Change Question # …... to Choice letter ……

Because……

……

……

……

……

Change 2 to estimation

CAPES time: H + ……...…...

Change Question # …... to Choice letter ……

Because……

……

……

……

……

Change 3 to estimation

CAPES time: H + …….....

Change Question # …... to Choice letter ……

Because……

……

……

……
……

Change 4 to estimation

CAPES time: H + …….....

Change Question # …... to Choice letter ……

Because……

……

……

……

……

Change 5 to estimation

CAPES time: H + ……..….....

Change Question # …... to Choice letter ……

Because……

……

……

……

……

Change 6 to estimation

CAPES time: …….....

Change Question # …... to Choice letter ……

Because……

……

……

……

……

H: Results for Experiment Group

Nr	Gend	Rank	Age	Service	Branch	Q 1	Q 2	Q 3	Ch Q1	Time	Ch Q2	Time	Ch Q3	Time
1	M	Maj	36	Army	FA	Yes	P	N	No	6.57	F A	17.58	S	8.32
2	M	Maj	34	Army	Engineer	No	P	N	Yes	25	F A	11.05	C	12.3
											P	18.23		
3	M	Maj	40	Army	Armor	No	P	N	Yes	28.2	F A	16.45	C	21
4	M	Maj	35	Army	Aviation	No	P	S	Yes	17			C	17
5	M	Maj	39	Army	Signal C	Yes	P	S					C	20.36
6	M	Maj	34	Army	Engineer	No	P	N	Yes	15.53			S	5.21
7	M	Maj	35	Army	Infantry	Yes	P	S					C	18.36
8	M	Maj	35	Army	Logistics	Yes	F A	C					S	5.27
													C	15.21
9	M	Maj	36	Army	Infantry	Yes	P	S					C	12.26
10	M	Maj	38	Army	MI	Yes	P							
11	M	Maj	39	Army	Psyops	Yes	T M	N			F A	3.4	C	17.42
											P	25.42		
12	M	Maj	36	Army	MI	Yes	P	S						
13	F	LtC	42	Army	QM	No	P	N	Yes	27.55			S	18.51
14	M	Maj	40	Army	Engineer	Yes	F A	S						
15	M	Maj	37	MC	Infantry	Yes	P	N					S	7.2
													C	19
16	M	Maj	35	Army	SF	No					F	0.11	C	14.44
											P	17.46		
17	M	Maj	34	Army	Infantry	Yes	P	S					C	12.52
													S	14.39
18	M	Maj	36	USAF	Navigator	Yes	F A	N	No	5.39	P	2.19	S	8
									Yes	19.21			C	13.37
19	M	Maj	33	Army	Engineer	Yes	E	S			P	14.3	C	24.02
20	M	Maj	35	Army	Aviation	Yes	F A	S					C	11.46
21	M	Maj	34	Army	Armor	Yes	P	C						
22	M	Maj	35	Army	AD	Yes	P	N					C	17
23	M	Maj	34	Army	Logistics	No	P	N	Yes	14.11			C	10
24	F	Maj	34	Army	OD	No	I	C	Yes	26.25	E	16.57		

I: Results for Control Group

Nr	Gend	Rank	Age	Service	Branch	Q 1	Q 2	Q 3	Ch Q1	Time	Ch Q2	Time	Ch Q3	Time
1	M	Maj	34	Army	Aviation	No	P	N					S	18
													C	25.33
2	M	Maj	36	Army	FA	No	P	N	Yes				C	
3	M	LtC	41	Army	Armor	No	P	S						
4	M	Maj	36	Army	Infantry	No	I	C	Yes	25.36	P	7.08		
											T M	21.09		
5	M	Maj	34	USAF	CSAR	No	T M	N			F A	2	S	7.38
													C	23.56
6	M	Maj	34	Army	Armor	No	P	N	Yes	26.35	F A	14.07	C	19.32
7	M	Maj	38	Army	MI	No	P	S	Yes	13.2				
8	M	Maj	43	Grd	Aviation	Yes	P	S					C	23.16
9	M	Maj	36	Army	Logistic	No	P	N	Yes	19.34	F A	2.23	S	7.32
											P	19.34	C	19.34
10	M	Maj	35	Army	Engineer	Yes	P	S			F A	2.23		
											P	10		
11	M	Maj	36	Army	MI	Yes	P	C			E	9.07	S	9.07
											F A	22.41	C/ S	15.26
12	F	Maj	34	Army	MP	Yes	F A	S						
13	M	Lcdr	41	Navy	SW	Yes	P	C						
14	M	Maj	35	Army	Infantry	Yes	F A				P	21.21	C	22.27
15	M	Maj	34	Army	Logistic	Yes	P	C					S	7.02
16	M	Maj	34	Army	Armor	No	F A	N					S	18
17	M	Maj	45	Army	MP	Yes	F A	N					S	19.53
18	M	LtC	53	Army	Engineer	No	T M	S	Yes	28.15			C	14.04
19	M	Maj	36	USAF	B-52 H	Yes	P	C			F A	2.01		
20	M	Maj	34	Army	Engineer	Yes	P	S					C	11.57
21	M	Maj	36	Army	Aviation	No	P	C	Yes	20.14				
22	M	Lcdr	37	Navy	NSW	No	P	S					C	20
23	M	Maj	35	Army	SF	No	P	N					C	18.43
24	M	Maj	37	Army	FA	Yes	F A	S					S	18.35
25	M	Maj	35	Army	Armor	Yes	F A	C					S	14.21
26	M	Maj	36	Army	Infantry	No	P	C			F A	15.59	N	2.09
													C	11.23
27	M	Maj	40	Army	Infantry	No	P	C	Yes	25				
28	M	Maj	35	Army	SF	Yes	F A	N			I	4.58		
											P	14.37		
29	M	Maj	39	Army	FA	No	P	N			E	6.11	S	11.2
30	M	Maj	35	Army	Armor	Yes	P	S					C	13.13

J: Logistic Regression Results

Did the groups answer Q1 differently? (Is one group answering correctly more than the other?)

Model summary

Step	-2Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	72.008[a]	.04	.053

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001

Variables in equation

							95.0% C.I. for EXP(B)	
	B	S.E.	Wald	Df	Sig	Exp(B)	Lower	Upper
Step Group_recode (1)	.827	.567	2.126	1	.145	2.286	.752	6.944
1 [a] Constant	-.134	.366	.133	1	.715	.875		

a. Variable(s) entered on step 1: Group_recode

Primed group was 2.286 times more likely to answer “Yes” than the Unprimed group, and 5.3% of the variance was accounted for.

Are the groups answering Q2 differently?

Model summary

Step	-2Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	37.317[a]	.002	.004

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001

Variables in equation

							95.0% C.I. for EXP(B)	
	B	S.E.	Wald	Df	Sig	Exp(B)	Lower	Upper
Step Group_recode (1)	.300	.868	.119	1	.730	1.350	.246	7.401
1 [a] Constant	-2.197	.609	13.035	1	.000	.111		

a. Variable(s) entered on step 1: Group_recode

Primed group 1.35 times more likely to answer incorrectly (envelopment, infiltration or turning movement) than the Unprimed group, but it only accounts for .4% of the variance between the groups.

Is there a difference in answering pattern on Q3?

Model summary

Step	-2Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	67.679 [a]	.012	.017

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than .001

Variables in equation

							95.0% C.I. for EXP(B)	
	B	S.E.	Wald	Df	Sig	Exp(B)	Lower	Upper
Step Group (1)	.460	.580	.629	1	.428	1.583	.508	4.931
1 [a] Constant	.182	.428	.181	1	.670	1.200		

a. Variable(s) entered on step 1: Group

Primed group is 1.583 times more likely to answer “North” than the Unprimed group, accounting for 1.7% of the variance

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GLOSSARY

Accessible population The population from which the researcher can realistically select subjects for a sample, and to which the researcher is entitled to generalize findings.

Cluster random sampling The selection of groups of individuals, called clusters, rather than single individuals. All individuals in a cluster are included in the sample; the clusters are preferably selected randomly from the larger population of clusters.

Confirmation bias A family of effects in which people seem more sensitive to evidence that confirms their beliefs than they are to evidence that challenges their beliefs. Thus, if people are given a choice about what sort of information they would like in order to evaluate their beliefs, they request information that is likely to confirm their beliefs. Likewise, if they are presented with both confirming and disconfirming evidence, they are more likely to pay attention to, to be influenced by, and to remember the confirming evidence, rather than the disconfirming.

Dependent variable A variable affected or expected to be affected by the independent variable; also called criterion or outcome variable.

External validity The degree to which results are generalizable, or applicable, to groups and environments outside the research setting.

Independent variable A variable that affects (or is presumed to affect) the dependant variable under study and is included in the research design so that its affect can be determined; sometimes called the experimental or treatment variable.

Internal validity The degree to which observed differences on the dependent variable are directly related to the independent variable, not to some other (uncontrolled) variable.

Maintenance rehearsal A rote, mechanical process, in which items are continually cycled through working memory, merely by being repeated over and over. Also called "item specific rehearsal," and often contrasted with elaborative rehearsal.

Population The group to which the researcher would like the results of a study to be generalizable; it includes all individuals with certain specified characteristics.

Population generalizability The extent to which the results obtained from a sample are generalizable to a larger group.

Randomized posttest-only control group design An experimental design involving at least two randomly formed groups; one group receives a treatment, and both groups are post tested.

Representativeness The extent to which a sample is identical (in all characteristics) to the intended population.

Sample The group on which information is obtained.

Sampling The process of selecting a number of individuals (a sample) from a population, preferably in such a way that the individuals are representative of the larger group from which they were selected.

Statistically significant The conclusion that results are unlikely to have occurred due to sampling error or chance; an observed correlation or difference probably exists in the population.

Tachistoscope A device that allows the presentation of stimuli for precisely controlled amounts of time, including very brief presentations.

Target population The population to which the researcher, ideally, would like to generalize results.

Threat to internal validity An alternative explanation for research results, that is, that an observed relationship is an artifact of another variable.

Type I error The rejection by the researcher of a null hypothesis that is actually true.

Type II error The failure of a researcher to reject a null hypothesis that is really false.

Validity The degree to which correct inferences can be made based on results from an instrument; depends not only on the instrument itself but also on the instrumentation process and the characteristics of the group studied.

Variable A characteristic that can assume any one of several values, for example, cognitive ability, height, aptitude, teaching method.