Knowing the Terrain: Explicit and Implicit Measures of the Population

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Abstract

Common question asked by military planners include: what are people actually reporting when they self-report? Can self-report data be trusted? How should self-reported data be compared with findings from the Intelligence Community? What methods are available for understanding strategic populations? This paper provides a review of explicit and implicit methods to measure peoples' thoughts. Explicit methods are well suited for measuring knowledge, attitudes, and beliefs, especially when questions are objective and not introspective, overly personal, or culturally taboo. Implicit methods provide a strong alternative to explicit methods in these circumstances. Advances in portable neural imaging make implicit methods a viable alternative for military planners. Explicit and implicit methods provide more scientifically valid measures of a population's cognition than common alternatives within the Intelligence Community.

Introduction

Modern warfare is experiencing a profound and significant change, characterized by the power, speed, volume, digitization and low cost of information. This information affects people ranging from friendly, neutral, to adversary populations, comprising both state and non-state actors. The resulting strategic environment offers a space where political warfare is of increasing importance. According to General Votel et al. (2016), "political warfare is played out in that space between diplomacy and open warfare, where traditional statecraft is inadequate or ineffective and large-scale conventional military options are not suitable or deemed inappropriate for a variety of reasons." Military operations in this peace-conflict continuum are often referred to as "Gray Zone" operations. Votel et al. (2016) further state that these operations are "population-centric engagement that seeks to influence, to persuade, even to co-opt." Given the focus of these efforts that dominate current military operations and those of the foreseeable future, understanding population-centric knowledge, attitudes, beliefs, intentions, and behaviors (KABIB) is of increasing importance.

Political warfare and gray zone operations should rely on persuasion. Persuasion is the intentional, successful change of mental state, where people have free will. Coercion and use of force eliminates the perception of free will, which negates the effect of persuasion, which ensures effective long-term change. Gray Zone operations must target the population's KABIB variables. These variables must be measured using an appropriate, valid, reliable, and scientific method.

The modern military commander has more tools and capabilities to understand and monitor the operational environment than ever before. Intelligence and strategic understanding has transitioned from a time of information scarcity, where effort was needed to acquire data, to a time of information superabundance, where effort is needed to discard less relevant data. Commanders must therefore use the right data to answer their information requirements. For population-centric operations, which are increasingly common, commanders must measure KABIB attributes of various populations.

There are two general approaches for measuring population KABIB attributes, explicit and implicit. Explicit methods directly ask the respondent for their judgment of an attitude object. These methods measure conscious, intentional, easy-to-report features and usually consist of direct questions, surveys, or polls. Implicit methods measure unconscious, involuntary, and often unknown features and usually consist of physiological or behavioral observation and measurement. This paper will discuss some of the strengths and limitations of explicit measures of KABIB and when their use is appropriate. Strengths and limitations of implicit measures are also discussed, with a particular emphasis on recent advances in neuroscience.

Explicit Population Measures

Explicit measurements of population are commonly used in support of diplomatic and military operations. Methods may range from general population surveys commissioned by the Department of State or tactically developed surveys to support measures of effectiveness in a military information support operations (MISO) campaign or series. Civil affairs forces will poll indigenous populations to better address civil-military operations and concerns. Human terrain teams were used throughout Afghanistan and Iraq, providing a more scientific and anthropological approach. Still other units have commissioned defense contractors to conduct atmospherics, respondent driven sampling of elite and hard to reach populations, and even open source research on the internet. A common question raised is the veracity, or trustworthiness of explicit population measures. The key shortcoming is that the explicit measure only provides an estimate of the respondent's attitude. It fails to provide insight into the beliefs that may lie behind the attitude (O'Keefe, 2016).

While many may question the validity of data that is self-reported by human subjects, there is a strong track record of success. Perhaps the strongest support of explicit, self-reported data is that it reports what no one else knows (Baldwin, 2000). For example, if a commander is interested in the attitude (affect or liking) among villagers toward the presence of military forces in their town, these data are not recorded in some online archive. The data resides within the hearts and minds of the villagers, so you must go to the villagers to acquire the data.

There is perhaps a greater danger in relying on observed behavior to implicitly measure attitude. There are many factors that contribute to behavior change and attitude is only one. We may, for example, observe a reduction in tobacco smoking by young adults either through a reduction in cigarette sales or physical observation at local dining establishments. Attributing attitudinal cause, however, is more difficult. Is the observed reduction due to new laws prohibiting smoking inside? Is it due to more effective warning labels on tobacco products, or the effectiveness of public service announcements? Perhaps it is due to the increased use and popular acceptance of vaping or marijuana use. The most effective measure of attitude towards tobacco in this case is likely an

opinion poll. Understanding the source of behavior change is important for sustaining and exploiting gains in our notional smoking cessation example.

Self-reported data can be highly accurate. Objective evidence of the accuracy of explicit measures is found in several application areas. Okura et al. (2004) found greater than 90% accuracy for self-reported data when people were reporting medical history. In their study, they compared patient reports of major medical events with the medical records held by their health care provider. Del Boca & Darkes (2003) found reliable self-report for alcohol consumption. There exists a large body of research that supports the validity of self-report data for measuring delinquency and crime statistics (Hindelang et al., 1981; Sampson, 1985; Wyner, 1981; Hardt and Petersen-Hardt, 1977; Huizinga and Elliott, 1983).

There are many critics of explicit measurement of attitude (Allport, 1927; Dunning et al., 2005; Hindelang et al., 1979; Tourangeau & Smith, 1996; Wilson & Schooler, 1991; Nisbett & Wilson, 1977). Data collected from human subjects and archival data measure different domains, leading to discrepancy between the two sources. It is not clear that archival data is uniformly superior. Errors may exist in how data was entered, bias in collection, among other threats to validity. Some errors in self-report data have been attributed to cognitive limitations or the measurement of sensitive issues (Hindelang et al., 1979). Tourangeau and Smith (1996) argue that self-report data is not accurate for measuring the number of sexual partners or encounters in which subject have engaged. They suggest that the personal and sensitive nature of sexual relations may affect how truthful respondents are in reporting their data.

Explicit, self-reported measurement is more effective when questions ask concrete objective facts, such as the number of hospitalizations or incarcerations, subject age and marital status, or which political candidate they voted for in the last election. Questions requiring a subject to exercise introspection are less effective (Wilson, 2002). Accuracy can also be affected by high automaticity (Mils & Hogan, 1978; Paulhus & Levitt, 1986). Other factors include anchoring effects, primacy and recency effects, and time pressure. Culturally taboo questions will also negatively affect the reliability of data.

Subjects may have varied motives when participating in studies or surveys. Their responses may be affected due to their self-perception (Robins & John, 1997). They may strive for consistent reporting, thereby obfuscating small or recent changes in attitude. Explicit instruments that measure performance (Johnson, 2004) often have bias. Many times, subject motives in non-response and the subsequent interpretation of meaning is biased (Tourangeau, 2004). Self reporting in the context of face-to-face interviews generate additional problems such as the effects of self-consciousness, rapport, transference, and modeling. Focus groups further add pressures of social conformity (Asch, 1956; McCulloh, 2013). In most cases, the respondents will actually be unaware of their own bias and pressure to conform.

The design of explicit measurement instruments requires technical expertise in both measurement theory and cognitive psychology. Often times multiple items are used to assess an attitudinal construct and mathematical measures of internal consistency are used to verify accuracy and increase reliability. Poorly constructed composite measures, however, may obfuscate the real intent of questions. Indirect techniques use questions that do not directly address the attitude of

interest, but rather measure the way in which a subject responds. For example, the Narcissistic Personality Inventory (NPI) (Raskin & Hall, 1981) uses questions about performance and other items to assess how subjects rate themselves relative to others. This approach indirectly measures their level of narcissism. Open ended questions can often reveal greater insight into attitudes and behaviors, but they must be hand-coded, which can lead to other forms of bias.

Responses also vary across different cultures and respondents may not interpret self-report questions as intended (Hamamura et al., 2006). Chen et al., (1995) demonstrated a moderate bias and ambivalence in survey response. When conducting cross-cultural survey research, it is important to ensure accurate linguistic and cultural translation. For example, an instrument written in English must be translated into the target language and then back-translated by an independent interpreter to ascertain whether the back-translated and original instrument are consistent. Additional cognitive testing must be conducted in the target language to ensure that constructs hold similar meaning for the target population. Composite scales must be verified for internal consistency.

Explicit measures offer a powerful tool for understanding KABIB features within a population and they are critically important for strategic understanding. As military operations become increasingly population-centric, their effectiveness will highly depend upon the successful use of these methods. Measurement is a technical science, however, and should not be left to amateurs to develop and conduct. There are inherent strengths and limitations to any method and those overseeing population-centric measurement must be aware of these strengths and limitations in order to properly employ measurement instruments and make effective resource and risk management decisions.

Implicit Population Measures

Implicit measures of population estimate features that may be unconscious, sensitive, or in situations where explicit measures are problematic, such as requiring deep introspection or where a responder is unaware of their internal workings or is embarrassed by their beliefs. "Implicit measures are likely to be most attractive in circumstances in which one fears respondents may, for whatever reason, distort their true attitudes. (O'Keefe, 2016 p.9). When implicit measures are being recorded, the respondent should not know what is being assessed. The measurement tools use indirect methods. Most of these methods rely on behavioral indicators, biometrics (sweat, heartbeat), or neuroscience approaches (brain activity). The most common approaches are perhaps eye tracking and pupilometry. Eye trackers can locate what specific features of content or stimulus that increase attention. When these stimuli are carefully designed, they provide insight into unconscious elements of attention. Pupilometry works with many eye trackers and provides insight into emotional responses to stimulus. Increasingly neural imaging systems can measure brain activity in various regions associated with different types of cognitive response. These methods provide major advances in both our understanding of human attitude and cognition as well as the ability to measure human response at the cognitive level. These methods form the core measurement tools of neural marketing companies that continually emerge.

There exist a wide range of neural measurement systems. A complete review of these systems is well beyond the scope of this paper. It is worth mentioning three potential systems, however, to

explore tradeoffs in capability. Electroencephalography (EEG) measures electrical signals in the brain. The EEG has excellent temporal resolution, in that it detects brain activity within milliseconds of stimulus exposure, but it does not offer much information regarding which brain regions are active or what cognitive processes may be involved. It is therefore difficult to assess whether a subject is experiencing an emotional or rational response, for example. This limitation is often mitigated by combining it with other biometric tools such as eye trackers, heart rate monitors and other tools. Together EEG, eye-tracking, and biometrics provide a powerful system for implicit measurement of people.

A functional magnetic resonance imaging (fMRI) system measures brain activity based the electromagnetic properties of blood flow in the brain. When brain regions become active, they release chemicals known as neurotransmitters. These chemicals must be replaced for future potential activation. This can be observed by measuring the increased blood flow to brain regions that were recently active. This type of signal is referred to as blood-oxygen level dependent (BOLD) signals. While BOLD signals offer improved spatial resolution over EEG, they offer poor temporal resolution. This means that fMRI systems can locate specific brain regions involved in certain types of human cognition, but the observed signal may be delayed several seconds from the stimulus presentation. fMRI is a powerful tool that allows neuroscientists to understand how the brain processes information and interacts with other cognitive functions to affect attitude and behavior.

An unfortunate limitation of the fMRI is its large size and expense. fMRI systems lack portability and often affect ecological validity. Ecological validity refers to potential measurement bias occurring because the environment for experimentation differs so drastically from normal conditions under which people might experience stimuli. Functional near infrared spectroscopy (fNIRS) offers an improvement over the size, cost, and ecological validity issues. fNIRS measures BOLD signals based on optical properties instead of electromagnetic properties. An fNIRS system is often 5% of the cost of fMRI and newly miniaturized systems can fit in a coat pocket. The spatial resolution of fNIRS is not as good as fMRI and many inner brain regions, often associated with emotional response are inaccessible. fNIRS can, however, measure several key accessible regions with greater ecological validity.

There are disadvantages for using neural imaging systems for assessing implicit measures of KABIB features. This process is referred to as “reverse inference” (Poldrack, 2006). In traditional inference of brain activity it may be assumed that a given stimulus only invokes a single neural process. Thus, observation of brain activity in a particular brain region is assumed to signal a psychological process in response to that stimulus. The problem is that a stimulus might initiate multiple cognitive processes that interact in unusual, complex ways. Therefore, activation observed in a brain region associated with one particular cognitive process cannot prove that the cognitive process is active. That same brain region being observed may be used in a different process entirely.

A classic example of reverse inference was reported in the New York Times during the 2008 U.S. election season. Iacoboni et al. (2007) measured the neural response of subjects viewing political campaign speeches. They identify brain activity in regions associated with the limbic system, which is linked to emotion and affect. They argued that the brain activity allowed them to infer

affective feelings that subjects held of candidates in the campaign messages. Aron et al. (2007) criticized the findings in the New York Times arguing that the Iacoboni findings were not peer reviewed and disagreed with the assertion that the brain activity could predict political party affinity on the grounds of reverse inference. Iacoboni did, in fact publish his findings (Kaplan et al, 2007), however, this public debate highlights potential criticisms of neural imaging application to implicit measurement of KABIB features.

There have been many scientific studies since the Iacoboni-Aron debate that support the use of neural imaging methods to implicitly measure neural processes associated with influence and persuasion (Berns & Moore, 2010; Falk, Berkman, & Lieberman, 2012; Falk, Berkman, Whalen, & Lieberman, 2011). A key factor that supports these findings is the inclusion of additional behavioral or physiological data to increase measurement validity, scientific validity, and external validity. Neural imaging has been demonstrated as an effective implicit measure predicting music purchase (Berns & Moore, 2010) and smoking cessation (Falk et al., 2011, 2012). The use of large and costly fMRI systems, however, continue to limit their wider application for measuring populations.

Recent advances in neural imaging technologies are opening new opportunities for practical, applied neural imaging in support of implicit population measurement. fNIRS provides a low cost, highly portable, and easy to use technology for measuring key brain regions associated with influence and persuasion (McCulloh, 2016; 2017). Matthew Lieberman has been able to replicate several fMRI studies in his lab at UCLA under a research grant provided by the U.S. Air Forces Office of Scientific Research (AFOSR) Trust and Influence program managed by Benjamin Knott. Recent work is currently being conducted in Amman, Jordan to evaluate the cross-cultural suitability of the technology. As this work continues, the possibility of military units using this or similar technology to measure population-centric variables becomes a reality.

Conclusion

As military conflicts are increasingly fought in the Gray Zone, population-centric warfare will become even more important than it is already. The Department of Defense must develop and maintain the capability to understand key KABIB attributes of strategic populations. These same methods must be applied to measuring the effectiveness of US operations. The U.S. has a critical gap in the necessary skills, technology, and capacity to measure population-centric variables. Military commanders often lack the experience with explicit and implicit measurement tools to understand mission critical issues or hold confidence in the findings presented by their staff.

This paper reviews the strengths and limitations of various approaches to explicit and implicit measurement of a population's KABIB variables. Direct surveys are valid and provide an important tool for understanding the populations. They offer a more direct measure to understand indigenous populations than institutionalized alternatives within the intelligence community. There are situations, however, when explicit measures may face threats to validity. These situations may include sensitive topics such as religion or support to extremism. They may involve more difficult cognitive constructs such as narcissism, anomie, and locus of control.

Threats to validity can be mitigated with multiple sources of data, multiple approaches to measurement, and with investment in qualified experts to design, conduct, and analyze research. Implicit measures provide a compelling alternative to explicit measures for understanding difficult to measure variables such as attitude and behavioral intention. Advances in neuroscience technology make implicit methods increasingly accessible to military practitioners. Traditional intelligence also maintains a role in providing critical data to support understanding.

Commanders and their staff must utilize a mixture of data sources, measurement techniques, and analytic methodologies to meet modern challenges. They must invest in training and education for themselves and their staffs in order to properly consider the vast amount of data that is available. Certainly, they should never summarily reject measures, because they feel the method is universally flawed or because they do not understand how to properly use and interpret the data. If the US is to maintain dominance in the future, they must ensure planners are familiar with the proper employment of explicit and implicit measures in population-centric warfare.

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