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The power of intuition in decision-making under operational stress

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Abstract

The decision-making process represents one of the most interesting subjects in the field of cognitive sciences, as it is a concept that requires a complex multi- and interdisciplinary approach. Modern warfare involves operations in environments characterized by a high degree of uncertainty, presenting multiple challenges, and radical and unexpected changes in the situation, which require a sound knowledge of how human thinking works and how we can develop the cognitive processes involved in formulating a decision. The article proposes a brief analysis of the decision-making process by military leaders in situations that involve significant stressors and demand quick and intuitive decisions. For this purpose, the main theoretical and practical aspects discussed in the specialized literature are presented, with an emphasis on applications in the military field. Additionally, the concept of expert intuition is introduced. Although there have been attempts to study this concept since antiquity, the systematic study of this revolutionary concept began in the middle of the 20th century and continues to arouse lively interest even today, remaining the subject of lively academic disputes.

Keywords:

decision-making process; expert intuition; stress; bias; heuristic; natural decision-making process.

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1. Introduction

1.1 Intuition

Our entire existence can be described as a continuous decision-making process. At every point in our lives, we are forced to make decisions, from the simple ones, such as deciding at what time to go to work, to complex, high-stakes personal or professional decisions that can change the trajectory of our own lives or the lives of others. In these circumstances, several very legitimate philosophical questions arise. How rational/irrational are our decisions? Does genetics push us towards a certain kind of decision? Can experience and/or knowledge help us make better decisions when we are under pressure from strong stressors? Thinkers such as Aristotle, Plato, Leibniz, Kant, and Hegel are just some of the great minds of humanity who have provided answers to these questions through works of inestimable value (Waxman 2019). However, the exploration of the decision-making process, in the form in which it is currently studied, begins with the volumes A Treatise of Human Nature (1739-1740) and The Dissertation on the Passions (1757) by the Scottish philosopher David Hume.

According to the American Psychological Association Dictionary (APA 2024a), decision-making is defined as the cognitive process of choosing between two or more alternatives. We therefore note that this process involves three essential elements: (1) the existence of a goal, (2) the possibility of choosing between several alternatives for achieving the goal, and (3) the cognitive process by which the options for achieving the proposed goal are analyzed.

Cognitive science research has shown that this process can be carried out both consciously, intentionally, voluntarily, and automatically. Daniel Kahneman (2011), in his famous book Thinking, Fast and Slow, describes two different ways of thinking: intuitive and analytical. Thus, according to the author, System 1 is intuitive and emotional, representing fast and automatic thinking, while System 2 is analytical and logical, representing slow thinking and conscious and voluntary mental effort in deliberating between several options.

System 1 is described as automatic, occurring with little effort and in the absence of conscious control. It is a way of thinking that allows the manifestation of acquired skills and the performance of several tasks at the same time. It is largely based on previous experience gained as a result of learning, practice, or familiarity. The main advantages of this type of thinking are that it unfolds quickly because it involves a reduction in the complexity of the situation or a generalization of circumstances, and it is not too energy-intensive.

In contrast, System 2, the analytical system, is often associated with the subjective experience of concentration and free will. This system requires considerable energy consumption to allocate and maintain attentional resources to ongoing mental activities and to access working memory. It is also the mode that is activated in new situations, in which System 1 cannot recognize patterns or generalize, and in situations that do not comply with rules.

System 2 - slow thinking plays an important role in self-control situations by providing the necessary arguments for emotional and behavioral self-regulation to resist temptation (e.g., I do not want to start smoking again because it is bad for my health, and I need to save money). The benefits of System 2 are numerous, among the most important being that by analyzing as much information as possible, the risk of error is reduced, and the chances of making the most appropriate decision automatically increase.

It is important to emphasize that between the two systems of thought, there is a continuous dynamic; they interact, thus making the decision more effective (Peters *et al.* 2006). Both types of thinking are sensitive to internal and external factors, with the possibility of errors.

Thus, if System 1 can generate rapid responses, particularly based on similar experiences, these reasonings are highly context-dependent. At the same time, System 2, which is analytical, can be hijacked by errors inserted from the interaction with System 1, but also by other causes (for example, errors of perception, emotional states, etc.).

Intuition is a non-sequential way of processing information, which includes both cognitive and affective elements and results in direct knowledge without any use of conscious reasoning (Sinclair *et al.* 2002), and is, therefore, one of the core elements of the decision-making process, broadly identifying with System 1.

1.2. The Impact of Stress on the Decision-Making Process

Probably one of the most widely used concepts is stress. Borrowed from physics, the concept was introduced into the academic circuit by the Canadian physician Hans Selye in 1937. Stress has been defined as the physiological or psychological response to an internal or external stressor that interferes with the normal functioning of the individual. Over time, the concept has been refined, and new meanings and elements have been added. Currently, the most widely used theoretical model is that of cognitive appraisal of stress, proposed by Lazarus and Folkman (1984), in which stress is the result of a process of cognitive appraisal of the stimuli to which the individual is exposed.

Cognitive appraisal can be conscious and deliberate or automatic. This triggers the emergence of responses that may be cognitive, emotional, behavioral, or physiological. This process has two phases: the primary appraisal, which consists of assigning meaning and significance to the stimulus—in the case of stress, being negative (threatening)—and the secondary appraisal, which refers to the existence and identification of the resources necessary to cope with the pressure of the problematic stimulus. Secondary appraisal plays an important role in the emotional response of the individual and, implicitly, in the physiological response, with implications for the anticipation of the ability to cope (Lazarus 1993).

Many authors have noted that the cognitive appraisal theory of stress includes several elements presented in the model by Kahneman (2011), stress being the result of information processing by one of the two systems, particularly System 1, when it comes to stressors with adaptive value (situations characterized by uncertainty, time pressure, or in which life or physical and psychological integrity is endangered, etc.) (Yu 2016).

For example, when the stressor is a venomous snake, System 1 automatically kicks in, resulting in avoidance behavior and fear. In the case of a herpetologist, they know through learning and practice that a reptile is only aggressive under certain conditions, resulting in behavior appropriate to the situation and the absence of dysfunctional emotion. From an evolutionary point of view, System 1 is older on the phylogenetic and ontogenetic evolutionary scale, while System 2 is more recent, being the result of the development of the prefrontal lobe (Evans 2003).

System 1 is much more vulnerable to stressors than System 2, which has self-regulating mechanisms. Thus, from an evolutionary perspective, automatic and intuitive thinking is superior to analytical thinking in situations where we are faced with stressors of adaptive value (Da Silva 2023). An important evolutionary advantage is given by the situation where System 1 has acquired new tools through learning and practice, in some situations becoming highly specialized, expert.

1.3. Expert Intuition

Intuition is the ability to act or decide correctly without deliberately and consciously choosing between alternatives, following a particular rule or routine, and possibly automatically (Hogarth 2001; Kahneman & Klein 2009; Harteis & Billett 2013). Numerous situations have been documented where spur-of-the-moment decisions have averted air disasters, fire casualties, or saved lives in emergency rooms. Klein et al. (2010) note that it takes 23 years of experience for a firefighter to make such decisions; in the case of medical personnel or military aviation, this complies with the rule of over 10,000 hours, depending on the particularities of the situations (Nalliah 2016).

Regarding the study of intuition, particularly expert intuition, there are two major strands of research in the academic world. One that is based on the theoretical model of the decision-making process as a natural process - *Naturalistic Decision Making (NDM)* - whose exponent is the American psychologist, Gary Klein. The other is the heuristic and bias model (HB), promoted by the Israeli Nobel Prize laureate Daniel Kahneman (1934-2024). One of the finest examples of collaboration between the two authors, despite their different theoretical positions, is the joint article published in 2009 in American Psychologist, "*Conditions for Intuitive Expertise: A Failure to Disagree*".

1.3.1. Naturalistic Decision Making (NDM)

Since the first scientific approaches in the middle of the 20th century, initiated by the Dutch scientist Adrianus Dingeman (Adriaan) De Groot, the subject of expert intuition has generated special interest in the scientific world. In the article Thought and Choice in Chess, De Groot (1965) shows that chess grandmasters can identify the best move accurately, quickly, and without any special voluntary effort, while mediocre players only occasionally succeed. Over the next decade, research was continued by other scientists. Chase and Simon (1973) discovered that high-performing chess players can easily recognize patterns on the chessboard in a short time. The authors note that their performance is the result of approximately 50,000 to 100,000 hours of practice.

This research represents a milestone in the study of expert intuition from the perspective of this paradigm. As a working definition, intuition is a process of recognizing patterns that are stored in long-term memory (Gobet and Herbert 1996). In specialized literature, several theoretical models are identified in the NDM paradigm (Lipshitz 1993). The most significant ones will be briefly described below.

1.3.1.1. Recognition Primed Decision (RPD)

Klein et al. conducted a study in 1986 on how firefighters make decisions. Following this approach, they concluded that firefighters make decisions automatically, without comparing several possibilities, calling this cognitive strategy recognition-primed decision. It soon became one of the core elements of Klein's subsequent research. Similar research has been carried out in other areas of activity such as the military, medicine, management, etc. A tragic event took place in 1988 (see Ch. 2), as a result of which the US Army financed research in the field, in which a significant number of specialists participated, and new information was brought about decision-making and the validity of this construct.

This model is based on two central cognitive processes: the assessment of the situation and its mental simulation. The two processes run quickly and complement/correct each other. The assessment of the situation consists of four stages: setting achievable goals that are consistent with the situation, selecting highly relevant information in the given context, formulating realistic expectations with a regulatory role, and identifying the optimal course of action. Mental simulation is an analysis of courses and chances of success (Klein 2015).

The RPD model differs from classic models of decision-making. Thus, the core elements in this model focus on leveraging previous experience in new similar situations, emphasizing the evaluation of circumstances, the need for action prevailing, the person focusing on a serial evaluation to save time, and aiming to maximize the chosen course of action rather than analyzing the strengths and weaknesses of different options. Klein also mentions that there are issues needing further research, such as situations involving mixed decisions (both analytical and intuitive), time constraints, high stress, or task type (perceptual or abstract).

1.3.1.2. Cognitive Continuum Model

The cognitive continuum model is inspired by medical practice and presents the decision-making process according to both the type of thinking (intuitive to analytical) and the type of task (low structured to highly structured). Although not all 6 modes are very clearly defined, for mode 1 (intuition), mode 4 (quasi-experiencer), and mode 6 (analytical), we find detailed descriptions. Mode 1 (intuitive and low structured task) is fast and automatic, while in mode 4 both intuitive and analytical elements are equally present. Mode 6 (analytical thinking, structured task) is slow, conscious, and consistent (Hamm 1988). Hammond (1988) details the analytic mode as characterized by high cognitive and conscious control, low information processing speed, and a well-defined method, while the intuitive mode is the opposite: low cognitive control, unconscious, high processing speed, and the absence of a method. Research carried out in the medical field has demonstrated its validity, having the advantage that it can also provide data in cases of interdisciplinary decisions or involving the participation of several people (Cader, Campbell and Watson 2005).

1.3.1.3. The Search for Dominance Structure Model

The dominance structure theoretical model by Montgomery (1983) describes the stages of the cognitive decision-making process, from this point of view being quite similar to the model proposed by Klein. In this theoretical model, the cognitive process essentially consists of defining a dominance structure, with some sets of defining attributes dominant over the others. The process involves going through four distinct stages: pre-editing, finding a promising alternative, dominance testing, and dominance structuring (Montgomery 2012).

Pre-editing is the first phase of the process and involves simplifying the problem by choosing those attributes and alternatives that can have an impact on the decision. The second stage of the process is identifying a promising alternative. In this stage, the choice of one of the alternatives takes place, based on a specific attribute, forming a preference for it. In the penultimate stage, the test of dominance takes place, the test of choice. If the choice turns out to be valid, the process ends; if it does not turn out to be the best option, the dominance structuring stage follows. In this phase, the identified neutralization or counterbalancing is attempted. In case of success, the decision is made; otherwise, the continuation of the process is analyzed by resuming the stages starting with step 2, or it is abandoned.

Another important element of this theory is represented by the decision rules. According to Montgomery (1983), all rules assume that a decision situation consists of several choice alternatives that can be described in terms of subjectively defined dimensions or attributes. The model is not without criticism for the fact that it reduces the decision-making process to a choice between several options, the choice being equivalent to the resolution of a conflict, and that the whole process is reduced to mental structures and processes (Klein 1993).

1.4. Cognitive Biases and Heuristics

Another scientific perspective present in the study of the decision-making process involves theoretical models that focus on important elements of any cognitive approach: bias and heuristics. As this is an extremely broad field and known both to the academic environment and to the general public, I will only give a brief introduction to the two concepts below.

In the APA online dictionary (APA 2024b), heuristics are defined as cognition, an experience-based strategy for solving a problem or making a decision that often provides an effective means of finding an answer but cannot guarantee a correct outcome. In contrast, an algorithm guarantees a solution but can be much less efficient. By algorithm, we mean a well-defined procedure or set of rules used to solve a problem, make a decision, or perform a task. The two concepts have a common point (making a decision/solving a problem), but they differ in that, in the case of the algorithm, the stages are very well defined, and the result is guaranteed.

With the cognitive revolution of the 1950s, the first systematic approaches to the study of thinking and the mental processes involved in problem-solving emerged (Miller 2003). In the early 1970s, however, Kahneman and Tversky published a series of scientific papers describing and analyzing heuristic processes and the factors that influence them when errors occur. In their famous article "Judgment under Uncertainty: Heuristics and Biases," published in 1974, the authors identify three major heuristic strategies: (1) representativeness; (2) availability; and (3) adjustment and anchoring.

Representativeness refers to the extent to which a cognitive processing outcome reflects the features of the event that generated it and is similar to the category to which it belongs. The two researchers highlight several factors related to representativeness: insensitivity to prior probabilities; insensitivity to sample size; misperception of probability; insensitivity to predictability; illusion of validity; and misunderstanding of regression.

Availability is a type of heuristic in which a person evaluates the frequency of classes, or the probability of events based on their accessibility, i.e., the ease with which instances or occurrences can be brought to mind (Kahneman 2011). Although useful in assessing frequency or probability, it can be influenced by factors such as the person's recall/familiarity with the class of objects/phenomena they are interacting with, search efficiency, imaginative ability, and illusory correlation.

Adjustment and anchoring are the processes by which, starting from an initial value (anchor), a final result is reached through successive changes. The initial value or starting point may be given by the problem formulation or maybe the result of a partial calculation. The two authors note that there are situations in which errors may occur, including inadequate adaptation, errors in the evaluation of conjunctive and disjunctive events, and errors in the evaluation of subjective distributions.
Based on these three heuristics, others have subsequently been identified, which represent particular situations of those described: simulation (Kahneman and

Tversky 1981), familiarity (Park and Parker 1981), peak-end rule (Kahneman and Tversky 1981), etc.

Heuristics can be influenced by several factors, thus producing dysfunctions. Kahneman and Tversky (1981) refer to these errors as cognitive biases, which they define as systematic and unconscious errors in thinking that occur when people process and interpret information in the environment, influencing decisions and judgments. They distort individual perceptions and produce rationally limited (Kahneman 2011) or irrational decisions (Garety *et al.* 2007). Other authors define biases as situations where the cognitive system produces systematically distorted representations in relation to a criterion (accuracy, logic, quality, speed of processing, etc.) (Haselton, Nettle and Murray 2016).

In addition, we find in the literature several lines of research on biases: heuristic biases, as artifacts (errors resulting from the architecture of our cognitive system) (Gigerenzer and Sedlmeier 1997), and biases of management errors (referring to the fact that some biases have evolved into cognitive strategies in situations where the cost of error is not constant) (Haselton and Buss 2000). Currently, a set of 24 basic cognitive biases has been quantified, each with subcategories, totaling approximately 180.

1.4. NDM Model versus HB Model

Both theoretical models have undeniable value in the cognitive sciences. However, they have both strengths and directions that require further study. The NDM model aims to investigate the decision-making process under natural conditions characterized by complexity and pressure, where experience is important. At the same time, it is sensitive to the multitude of variables that may be present in the environment. While for fields such as firefighting, medicine, the military, aviation, or chess, which are considered high-validity environments, the model is functional, in others such as intelligence analysis or politics, the data is inconclusive (Kahneman and Klein 2009).

The HB Model, whose data were obtained particularly from controlled environments where the variables studied were isolated, provides clear information on how heuristic processes work and their biases. The authors agree that expert intuition is predominantly the result of the operation of System 1 and less of System 2. Proponents of the NDM have focused their efforts on how intuitive judgments arise and what conditions must be met, while those of the heuristic approach focus on the outcomes that arise from simplifying heuristics, rather than from accumulating expertise, and which are less accurate and prone to bias.

Research in cognitive sciences and other fields with a central interest in how we make decisions or solve problems has focused on the applied side over the last three decades. The revolution in algorithms in the early 1990s (Gonzales 2024) has continued with the use of breakthroughs in artificial intelligence (machine learning, natural language processing, decomposition of problems, or optimization of algorithms) (Hjeij and Vilks 2023).

2. Expert Intuition and Military Decision-Making

Advances in the field of cognitive science have also influenced the approach to the military environment when it comes to decision-making, especially when it involves decisions under the pressure of hard-to-quantify consequences. The military organization's interest in decision-making research is growing as a result of events in the late 1980s and early 1990s.

One example where an officer's intuition made a difference is that of the British destroyer HMS Gloucester during the Gulf War (1991). During a routine mission to support US warships, the ship's radar intercepted a signal that appeared to be from an American aircraft. In the few dozen seconds available, the British officer decided to fire the target, which turned out to be an Iraqi Silkworm missile (Pokrant 1999). In his book Source of Power, Klein (2017) recounts the dialogue with Lieutenant Commander Michael Riley about this event. The officer recounted that in the 90 seconds he had, he watched the radar carefully for 40 seconds, and what he observed confirmed his intuition from the very first moment he saw the target on the radar. Although several factors were taken into account, altitude was the decisive key. The officer knew that missiles fly at a low altitude of 1,000 feet, whereas an airplane flies at 2,000-3,000 feet.

A less fortunate event occurred in 1988 when the US battleship USS Vincennes in the Persian Gulf shot down an Iranian Airbus airliner by a serious mistake. More than 290 people lost their lives as a result of this incident (Friedman 1989). The battleship had been involved in another incident shortly before, this time with a happy ending. In this case, two Iranian F-4 fighter jets had taken action against the US Navy. The commander putting himself in the role of the Iranian pilots, sensed that the way in which the two planes had acted was not that of an attack and used electronic warfare means to remove them.

But things did not go so well on July 3, when the USS Vincennes shot down Iran Air flight 655. The ship was engaged in executing naval missions in the area when a signal resembling an Iranian Air Force F-14 aircraft appeared on its radar. Unfortunately, it was a civilian flight with passengers on board. After repeated attempts to contact the aircraft, 3 minutes and 9 seconds after the radar signal appeared, the Iranian flight was shot down. In this case, as well, the commander used the same cognitive strategy (role-playing), by engaging in mental simulation (Klein 2017). This time there were also several factors out of the commander's control (received information, confusion over the use of the identification system, and the AEGIS system), all compounded by the stress and pressure of making a decision, which ultimately led to this tragedy.
Following this event, a committee of inquiry headed by Admiral William M.

Fogarty (1988) was set up. As a recommendation, the US Army started a research program for the study of the decision called *The Tactical Decision Making Under Stress (TADMUS),* which has been running for a long period (since 1999). The main objective was to identify methods and techniques for tactical decisions in conflict situations. These were operationalized in several research directions: define and measure; stress effects; development of the support tools; development of the principles for training and simulation; improving human-machine interface as well as integrated training (Riffenburgh 1991). The TADMUS program represented an important progress in military decision-making process studies. For example, *The Decision-Making Evaluation Facility for Tactical Teams* - a portable testing system for team tactical decision-making assessment (Hutchins and Duffy 1993) and The Heuristics 5 Steps Method (Cohen *et al.* 1998) were implemented.

Interest in decision-making existed even before the USS Vincennes incident. Kahneman and Tversky studied the implications of biases and heuristics in the military field, with some of their conclusions being published in *Science* in 1974 (Mustață and Bogzeanu 2017). However, improving decision-making in a military organizational context is an ongoing concern, and new studies appear periodically. One such work is Cognitive Biases in Military Decision Making by American officer Michael Janssen (2007). It formulates five recommendations for avoiding cognitive biases that can influence the stages of the military decision-making process (receiving the mission, analyzing the mission, developing, analyzing, comparing, and approving courses of action, as well as issuing action orders): (1) research on biases that may influence the decision, (2) continuous training, (3) updating procedures and introducing new methods to avoid errors (for example, having a sparring partner for the commander), (4) realistic training and rapid feedback, and (5) organizational policies. Similar studies emphasizing the importance of intuitive decisions have also been conducted by other authors in other militaries (Knighton 2004; Jing Kai 2016).

At the beginning of the 2000s, the concept of fast and frugal heuristics was introduced. This designates a type of heuristic characterized by low informational processing, lack of information, and time pressure (Gigerenzer and Goldstein 1996). This concept is quite similar to expert intuition, the difference being the degree of expertise. Banks *et al.* (2022) conducted research involving platoon commanders and military cadets in the British Army. The main goal was to optimize the decision-making process. The authors conclude that the development of this type of heuristic can help the emergence of expert intuition and can support less experienced personnel.

3. The Relationship Between Operational Stress and Expert Intuition

Operational stress is a newly introduced concept in military psychology. It is defined as *changes in physical functioning, cognitive performance, or the appearance of* *maladaptive behaviors resulting from direct or indirect participation in land, naval, or air military operations, during peacetime, or wartime* (US Marine Corps, 2010, 1-3). Numerous operational stressors have been analyzed in the specialized literature. Van den Berge et al. (2014) describe three major categories of operational stressors: performance (time pressure, quality, innovation, etc.), organizational climate, and characteristics of the operational environment (meteorological factors, lack of sleep, privacy, hygiene conditions, etc.).

In a research paper involving military radar operators, Jue Qu et al. (2022) analyzed the relationship between operational stress and decision-making. They conclude that the expert group performed superiorly when the number of targets increased. The military was able to quickly combine the information and extract the relevant ones, which confirms the validity of the model proposed by Klein (2017). It should be noted that the authors emphasize the importance of an intuitive design of the radar interface, which is a mediating factor.

Organizational climate plays an important role in how we think, act, or behave, influencing decision-making. Klein (2007) proposes a method of risk analysis that he calls *Premortem*, in which we can use the expert intuition of team members, to mitigate the effects of operational stress. Briefly, this consists of going through five steps: preparation, failure image, failure cause generation, list consolidation, and risk prioritization to analyze courses of action. The method has been successfully used by the NATO armed forces (NATO 2017).
Lack of sleep, temperature, or physical exhaustion negatively influences information processing by reducing executive functions, making it difficult to access memory, or causing emotional hyperactivation (Petrofsky, et al. 2021). It should be noted that the use of psychoactive substances to replace lack of sleep did not reduce risk behaviors, impulsive actions, or erroneous decisions (Mantua, et al. 2021).

Expert intuition is an important component of resilience in terms of maladaptive emotional or behavioral responses to operational stress. Expertise influences reappraisal and suppression, cognitive mechanisms involved in emotional and behavioral regulation (Radtke, et al. 2020). In other words, the fact that experts make fast, automatic, and correct decisions when faced with an extreme situation in the operational environment does not lead to the emergence of counterproductive responses (Lyneham, Parkinson and Denholm 2008). Bonanno (2005) notes that experts possess a high level of resilience, reasoning that a prerequisite of expertise is the formation and development of adaptive coping mechanisms.

4. Can Expert Intuition Be Educated?

Although it seems like a simple question, the answer is not easy. Based on practice and learning, intuition can be developed, the key being when and how. Regardless

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of the psychological approach, learning theories have three common pillars: the prerequisite cognitive structures (attention, memory, etc.), environment, and motivation.

The first condition for intuition is the existence of information from a specific field. In the instinct-intuition dispute, Spelke (1994) argues for the existence of an initial intuition (exemplifying the situation of children of 3-4 months who recognize a stimulus as an object or a being, which involves the rapid analysis of some criteria without voluntary effort), later developing other forms of intuition. Innate (instinctive) reactions are limited in number, important for survival, and do not change significantly throughout life.

Hogarth (2001) notes that the development of intuition is influenced by learning and experiences. He describes two stages: (1) forming mental connections between things that happen together, and (2) strengthening them. Thus, when a soldier studies the weaponry in stock, he learns the parts, features, and how to use them through memorization and interaction. The information is reinforced and new connections are added when the soldier participates in field exercises. Their depth and quality are moderated both by psychological factors (motivation, mood, emotional stability, etc.) and by the frequency of situations that facilitate implicit learning. This type of learning refers to the ability to understand the functioning of phenomena automatically, without being able to verbalize it (Curran and Schacter 2001).

The following factors are important for the development and education of intuition (Hogarth 2001):

- **Creating awareness**, through which the person intentionally exposes themselves to as many learning situations as possible and processes the experience at a conscious level, trying to optimize behaviors. For example, a military person can choose to train for borderline or less likely situations by accessing different forms of training (e.g., a climbing course, even if he/she is a radio operator). Awareness helps avoid bias.
- **The acquisition of new competencies and the development of skills**. In this case, the environment also plays an important role through the implicit learning mechanisms described previously (e.g., an officer from a combat unit carrying out a short internship in a similar function in a support unit).
- **Practice**, which, when it exceeds a certain number of repetitions or a period of time, can lead to expert intuition (e.g., a pilot who repeats the execution of a difficult maneuver through simulation and flight).

Another element that contributes to educating intuition is **continuous feedback** (Kahneman and Klein 2009). In this respect, Klein (2017) recommends the *Premortem Method*, which can also be used to learn new skills and competencies, create a group identity, and foster metacognition.

All organizations are interested in capitalizing on those people who can contribute to making the best decisions. Using the method of cognitive task analysis, Klein (2017) proposes the following steps for harnessing expertise: identification of the source of expertise; evaluation of the quality of expertise; knowledge extraction (methods, techniques, algorithms, or heuristics used by the expert); knowledge systematization (logical schemes, diagrams, simulations); application of knowledge (policies, procedures, regulations).
In conclusion, expert intuition is strongly conditioned by learning and context, which can speed up or slow down its development. There is a rich scientific literature in the field of optimizing learning or facilitating the good functioning of the cognitive processes involved.

Conclusions

Cognitive sciences represent one of the most dynamic fields of human knowledge, being in continuous progress. This article is a brief introduction to what it means to decide in situations characterized by stress, uncertainty, and time pressure, especially from the perspective of intuitive decisions. As we have shown in the case of the USS Vincennes, in such conditions, there is a fine and difficult-to-define line between the right decision and an error.

Does experience matter? The answer is YES, but...
It is obvious that expertise is important, to a greater or lesser extent, depending on the characteristics of the environment (predictable or unpredictable). However, this should not be considered absolute, as it is dependent on perceptual factors and personality. Avoiding perceptual errors requires that the environment, as far as possible, be designed to minimize these limitations or that individuals learn skills for effectively scanning the environment (Graham, Evitts and Thomas-MacLean 2008). Although knowledge transfer can be a good shortcut in terms of time, it cannot replace learning and practice. One line of action is the optimization of learning. One suggestion could be to use simple psychometric tools to determine the optimal number of repetitions or to understand learning styles simultaneously with modeling the environment.

Can we develop or enhance expert intuition? The answer is YES.
First used in cybernetics, ***the nudge*** concept was introduced to the practice of behavioral and cognitive sciences by Thaler and Sunstein (2008), in their book *Nudge: Improving Decisions About Health, Wealth, and Happiness*. With multiple practical applications, a nudge is any element of the architecture of a choice that can predictably change behavior, without forbidding any other option and without a reward. For example, a periodic reminder for a medical visit has contributed to the health of Canadian Army personnel (Sylvester *et al.* 2022). For a nudge intervention to work, it needs to be easy to apply, attractive, timely, and have social support (Mustață and Ionașcu 2018).

We can facilitate the development and enhancement of expert intuition with the help of nudge principles. For example, one such solution is to run training sequences continuously on standby desktops or monitors located in halls or common spaces in units to increase the level of training and ensure rapid assimilation of information. According to studies, the optimal duration of an educational clip is 3-6 minutes (Guo 2013). Another example is the presence of informative materials in relaxation areas (classic relaxation-information conditioning). Additionally, the presence of cognitive anchors, such as photos of different types of IEDs at checkpoints in operation areas, helps quick decisions. Through repeated exposure, they become automatic responses, thus creating a shortcut for the rapid accumulation of information or for updating it, facilitating expert intuition.

The paradigm shift triggered by artificial intelligence will certainly bring new challenges to the study of cognitive decision-making processes. In my opinion, the new challenges for the military organization will come both from the field of moral decisions from the perspective of cyber-ethics and from what it means to use intelligent interfaces and merge the processes of interaction between mental and computer processes.

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