# Nontechnical Skills

## A Development Hierarchy for Military Teams

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## Abstract

Military operational contexts are highly dynamic, implying that military personnel should develop technical and nontechnical skills for performing tasks and missions. Nontechnical skills (NTS), as they promote reassuring performance, are preponderant for military teams. Therefore, it is essential to examine the relevance of NTS in this context and identify the main NTS to be developed. We performed an integrative literature review on nontechnical skills to identify the most important in military context. We determined that situational awareness, decision-making, communication, teamwork, and team leadership are the most important values for military teams. We propose a hierarchical skills development scheme for nontechnical skills fundamental for the military context.

*They are not new or mysterious skills but are essentially what the best practitioners do in order to achieve consistently high performance and what the rest of us do "on a good day."* (Flin et al., 2013, p. 3)

Membership in the Armed Forces implies that individual performance is taken to an extreme level, with a continual improvement of skills, to achieve the necessary perfection for actual missions while training for operating different weapons systems and learning new tactics and new emergency procedures (Murphy & Duke, 2014). This continual improvement allows developing adaptable responses to the high dynamism of military operational contexts (Swezey et al., 1998).

Safe military operations are fundamental and require high levels of skills (Bertram et al., 2015). It is important to minimize errors, which are the root cause for incidents and accidents, and are often the difference between life and death (Espevik et al., 2011;

Nickens et al., 2009). Safe military operations rely on an extensive set of knowledge (implicit and explicit) and individual skills, both determinants for the mission's success.

Given this, this article intends to address the relevance of nontechnical skills (NTS) development for military team training, as NTS may contribute to high levels of performance (Salas & Cannon-Bowers, 2011), and to the reduction of human error (Flin et al., 2013). Our discussion examines the relationship between training and skills development, proposing a hierarchical skills development scheme for NTS while also considering the relevance that the implementation of an NTS training program can have for military teams (Cavaleiro et al., 2020).

## Research Questions/Objectives

Upon examining literature sources on military team training and NTS to identify an NTS development hierarchy, the main questions addressed for our review: (1) Which NTS are used in high-dynamic environments such as the military context? (2) Are NTS pivotal for military team performance? (3) How can NTS be developed in military team training? Skills development is a mature topic in many research areas. For aeronautics, NTS are well defined through the Crew Research Management framework (Salas et al., 2006), but there is a lack of research in other military fields, though importance of NTS for navy officers and other warship crew members has been recognized (Conceição et al., 2019; Sellberg, 2017). It is vital to perform an integrative literature review, considering its value for contributing new insights about NTS in the military context. This article presents a literature review to extend the NTS theoretical framework. First, we describe the methodology used for the integrative literature review on NTS development. Second, we present our findings, considering the main NTS used in high-dynamic environments such as the military context, the role of NTS in military team performance, and proposal of a NTS development scheme in military team training. Third, we reflect about the relevance of NTS for individual and team performance in the military context.

## Theoretical Framework

### *Skills/Competence*

Kerry (2013) reviews the research of many authors to define skills based on four main contributors. He starts with the critical incident technique developed by Flanagan (1954) in the U.S. Air Force, the competence model of McClelland (1973), and ends with the model by Spencer and Spencer (1993), while integrating the ear-

lier models developed with the military. More recently, Boyatzis (2008) notes that emotional, social, and cognitive skills are pivotal for professional performance, in addition to management skills (Chouhan & Srivastava, 2014).

## *Military Context*

The military context functions through a well-defined and well-established hierarchy (Hontvedt & Arnseth, 2013). The hierarchy relies on command functions performed by military leaders based on their leadership and management skills (Arbuthnot & Flin, 2017), decision-making, and risk assessment (Arbuthnot, 2017). The military context is characterized by high time constraints, high risk-to-life situations, and high levels of stress (Sarna, 2017). NTS development has become more relevant to overcome constraints associated with training and human resources management in the military (Kerry, 2013).

## *Sampling Frame and Data Evaluation for Literature Review*

An integrative literature review on NTS was performed. The authors synthesized relevant information from sources about NTS development. This information can be used for the construction of a theoretical model or framework, such as our proposed conceptual model on NTS development for military teams (Snyder, 2019).

First, we have selected literature sources using the combination of the following keywords: nontechnical skills, armed forces, team training, military team training, and skills development in Google Academic. We have used Google Academic for systematic searches performed from June to July 2019 and April 2020. The results were not limited by dates of article publication. We have considered the following inclusion criteria: studies conducted with teams operating in dynamic environments focusing on NTS development and related to maritime safety and human factors; studies published in English only in peer-reviewed journals. We have excluded studies concerning NTS with no impact on team training or skills development. With this step, we included from mature to new topics on NTS and compared the evidence on NTS development from different research fields over time. The search resulted in the identification of 527 studies. The authors read each piece of literature to identify the main ideas and themes emerging from each article, resulting in the selection of 234 studies. Then, to obtain more updated information, we have restricted the review period to the last five years, using the main themes emerging from the first step of the integrative literature review. We have also included terms relating to NTS adapted from the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (2012): situational awareness, decision-making,

communication, teamwork, and leadership. That strategy reduced the articles to 25 studies used in the review. The primary evidence emerging from the literature sources was summarized, synthesized, analyzed, interpreted, and aligned to the three research questions. Our interpretations analyze the significance of NTS for military teams and relate the analysis to the literature sources. We also checked for the inclusion of additional evidence from the selected studies from the referenced literature. The table presents the overview of reviewed studies.

## Findings

### *Theme 1: What Are the Main NTS Used in High-Dynamic Environments Such As the Military Context?*

The term competence can be defined as an integration of individual knowledge, skills, and attitudes used to perform a specific task (Aguado et al., 2014). To understand the evolution of the term competence, we will explain each of the competence models in more detail, focusing on the critical incident technique (Flanagan, 1954),

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**Table**
*Main Findings on NTS Development for Military Teams*

| Reference | Aim | Findings |
|---|---|---|
| Conceição et al. (2017) | Development of behavioral marker system for rating cadet's NTS. | Five skills were identified: situational awareness, communication, decision-making, teamwork, and leadership. |
| Kerry (2013) | Framework on competency in the military. | Competencies for military teams include leader and individual skills, as well as knowledge (tacit and explicit); NTS are high level skills, including leadership and decision-making. |
| Nguyen et al. (2015) | Examination of simulation-based training on NTS performance. | NTS include cognitive and social skills and personal resources enabling a safer and efficient task performance. |
| Håvold et al. (2015) | Examination of simulation-based training effectiveness. | NTS referred to as tools for mitigating human error. |
| Hardison et al. (2015) | Transfer of skills taught to the military to civilian workplaces. | NTS are the most important skills for military personnel performance. |
| Tvedt et al. (2018) | Evaluation of Bridge Resource Management effectiveness for training commercial shipping fleet. | Low situational awareness can lead to a higher probability of accidents. |
| Sellberg (2017) | Systematic review of use of simulators in maritime education and training. | NTS are pivotal for military personnel performance and may be developed using simulation-based training. Situational awareness, decision-making, teamwork, and leadership referred to as the most important for military personnel operating in maritime environment. |
| Sellberg et al. (2018) | Examination of role of instructors and competencies assessment in simulation-based learning environments. | Brief and debrief techniques used for communication can improve organizational and team learning. |
| Delugach et al. (2016) | Examination of knowledge capture for acquisition of team mental models. | Good communication channels are essential for team elements' coordination. |
| Rico et al. (2017) | Development of a predictive model for understanding the contribution of motivation to team performance in interdependent systems. | Teamwork is determinant for the functioning of organizations. |
| Saeed et al. (2019) | Identification of essential NTS for merchant marine deck officers. | Overcoming problems associated with communication and teamwork allows the achievement of established safety levels, both for individuals as well as teams. |

**Table**
*Main Findings on NTS Development for Military Teams (continued)*

| | | |
|---|---|---|
| Wahl (2019) | Examination of simulator fidelity in simulation-based training used for collaborative learning activities. | Incident command skills, such as leadership, team efficiency, and safer operations are achieved through simulation-based training. |
| Röttger et al. (2013) | Adaptation of Crew Resource Management Attitudes Questionnaire (CMAQ) to maritime domain. | NTS are essential for teams functioning in extreme conditions. |
| Ogle et al. (2019) | Evaluation of knowledge, skills, and abilities (KSA) in personnel assigned to operational military units. | NTS development allows continuous development of military teams. |

competence model of McClelland (1973), competence model of Spencer and Spencer (1993), and Boyatzis' model (2008).

Flanagan (1954) intended for the critical incident technique to provide an easier way to create psychological principles and solutions for practical problems based on direct observations of human behavior. This technique uses many different instruments, such as interviews. These instruments are used to evaluate individual proficiency directly related to specific tasks, translated into behaviors (Flanagan, 1954). This technique was designed to understand the relationship between a particular action and the intention underlying that behavior (Boyatzis, 2008).

McClelland (1973) introduced a new approach to performance: individual competence is the origin for differentiating performance (Boyatzis, 2008). According to McClelland (1993), personal competencies are more relevant than intelligence and are determinant to execute tasks. Boyatzis complemented McClelland's model, mentioning that only a limited set of competencies would be a descriptor for work success (Alliger et al., 2007). McClelland developed the behavioral event interview based on Flanagan's critical incident technique (1954), defining high and low performance levels (Marrelli, 1998).

The competence model, developed by Spencer and Spencer (1993), includes eleven management competencies, such as analytic thinking, initiative, self-confidence, team leadership, teamwork (Dainty et al., 2004), and individual reward (Spencer & Spencer, 1993).

Lastly, Boyatzis (2008) argues that we could look at competence as an ability, based on different behaviors called intentions, organized around a subjacent construct and appropriate for many different situations. Boyatzis (2008) considered cognitive competencies (e.g., pattern recognition), emotional competencies (e.g., self-consciousness, self-control), and social competencies (e.g., interpersonal relationship ability) essential for individuals in professional domains. Competen-

cies include different individual characteristics used for performing a complete task (Brightwell & Grant, 2013; Marrelli, 1998). But how can an individual develop competencies in a military context?

Competencies include different levels: individual, work, team, unit, mission essential, mission-specific, force, and core (Kerry, 2013). For military groups, competencies can be analyzed through the Command Team Effectiveness Model, integrating operational conditions, processes involved, and team action outputs, based on learning cycles, states, and process adjustments (Essens et al., 2005). Operational conditions for military teams require leadership skills, knowledge (tacit and explicit), individual skills, attitudes, as well as task-focused and team-focused behaviors (Kerry, 2013). We consider that technical skills and NTS, included in work competencies, are essential (Kerry, 2013). Technical skills can be more specific and related to one task. NTS are high level skills that include leadership, decision-making, information management, and other skills (Kerry, 2013).

More specifically, when referring to cognitive and psychomotor abilities to perform a task, we use technical skills (Nestel et al., 2011). Individuals use technical skills to ride a bicycle, operate a weapon system, or maneuver a warship. Conversely, NTS corresponds to cognitive and social skills and personal resources, enabling a safer and efficient task performance while complementing technical skills (Flin et al., 2013; Nguyen et al., 2015). These are the essential skills to avoid or detect a human error in time to implement the necessary alterations and to avoid an adverse event, thereby mitigating human error (Conceição et al., 2017; Håvold et al., 2015) that can affect individuals and materials drastically (Flin et al., 2013). The five NTS pivotal for operating in high-dynamic environments are situational awareness, decision-making, communication, teamwork, and team leadership (Flin & Maran, 2015). In the military context, these skills are equally referred to as the most important for military personnel when considering how NTS affect performance (Alliger et al., 2007; Hardison et al., 2015; O'Connor, 2011; Röttger et al., 2013; Salas et al., 2006; Sellberg, 2017). Considering the five NTS pivotal for operating in high-dynamic environments, it is now relevant to define each one individually.

Situational awareness is comprised of three steps: perception of environmental elements, comprehension of their significance in a restricted space and time, and projection in future events (Endsley, 1995b). This skill relies on three essential elements: gathering information, interpretation of data, and anticipation of future events (Flin et al., 2013). Each military team must understand how the battlefield is functioning and how to execute the assigned mission (Endsley & Robertson, 2000; Flin et al., 2013; Saner et al., 2009). Situational awareness is precursory to decision-making, based on previous experience and training of the military team (Endsley, 1995a). This cognitive skill is affected by the same constraints that affect mental ability (e.g., fatigue, stress, distractions, interruptions, and overstimulation) (Flin et al., 2013). Situational awareness is positively associated with concentration and individual capacity

to focus (Flin et al., 2013). When low situational awareness levels exist, accidents have a higher probability of occurring (Tvedt et al., 2018).

Decision-making is the necessary process to accomplish a judgment or select a response option, allowing one to solve a problem fulfilling the situation necessities (Flin et al., 2013). The decision-making process occurs through the evaluation of a case (corresponding to situational awareness), problem definition, evaluation of one or more response options, selection and implementation of a response option, and analysis of the results (Flin et al., 2013). It is fundamental for the operational level (Thunholm, 2004). Military teams, without this skill, cannot collect the necessary information and quickly make decisions (Flin et al., 2013) about the actions required to accomplish the mission. Decision-making can be affected by different factors, such as technical proficiency, experience, situation familiarity, stress, fatigue, noise, distractions, and interruptions (Flin et al., 2013).

Communication is an information exchange between individuals, through which feedback, ideas, or feeling can flow (Flin et al., 2013). It relies on four elements: transmission of concise and precise information, context and intention included during information exchange, information reception, and identification of communication barriers (Flin et al., 2013). Straightforward and pragmatic communication is determined by organizational norms and training (Flin et al., 2013). Briefing is a typical communication process performed in the military context, essential for any training or mission. In this communication process, the military personnel can understand their objectives (Flin et al., 2013). Military teams using briefing and debriefing can analyze their training or mission through individual, team, and organizational learning lenses (Sellberg et al., 2018). The factors affecting communication can be the source of incidents and accidents, such as defects in communication systems, failures in message transmission and reception, emotional and rational interference, motivation, and individual expectations during the communication process (Flin et al., 2013). When a high volume of communications is necessary, such as in the military context, exemplary processing of information and proper communication channels (Whelan & Teigland, 2013), as well as the coordination between team elements (Delugach et al., 2016) is paramount.

Teamwork is crucial for any organization, acting as a bonding agent (Bates et al., 2013; Flin et al., 2013; Rico et al., 2017). Teamwork skills are attitudes and behavioral interactions that team elements must develop before working as a cohesive and effective team (Flin et al., 2013). Teamwork arises from four aspects: supporting others, conflict resolution, information exchange, and activities coordination (Flin et al., 2013). These aspects are pivotal in the military context (Salas et al., 1995; Shuffer et al., 2012). As with any other NTS, teamwork can have some associated problems. An imprecise definition of rules, the absence of explicit coordination between team elements, and communication failures can affect cooperation (Flin et al., 2013). The improvement of coordination solves teamwork-related prob-

lems and creates the necessary individual and team performance and safety levels (Saeed et al., 2019).

Team leadership arises when coordination and direction between team elements occur (Flin et al., 2013). The main aspects of team supervision are authority, pattern support, planning, prioritization, workload, and resources management (Flin et al., 2013). In a military context, leadership is exercised through command, corresponding to the authority conferred to a military commanding officer to direct, coordinate, and control military forces. The leader's decision is supported by a secure climate arising from team elements sharing information between them (Ornato & Peberdy, 2014; Smolek et al., 1999; Vogel-Walcutt et al., 2013). Military team leaders need adaptable incident command skills (Arbuthnot, 2017) that lead to safer operations, and improved team efficiency (Wahl, 2019).

With this, we conclude that the answer to our first research question is that the main NTS used in high-dynamic environments, such as the military contexts, are situational awareness, decision-making, communication, teamwork, and team leadership. Considering the main NTS used in high-dynamic environments, how can these skills affect military team performance?

## *Theme 2: Is This the Holy Grail of Military Teams' Performance?*

Previously, we presented the definition for NTS and its use. In military context for the NTS development hierarchy, as well as for the functions that characterized each level of the pyramid, we verify that each hierarchical level of a military organization uses NTS differently. While lower hierarchical levels will execute tasks and missions, mainly using technical skills, intermediate and upper hierarchical levels will be much more specialized and will widely perform using NTS (Kerry, 2013).

Military personnel train and prepare to perform in an operational environment, using both individual and team skills (Bennett et al., 2013). Training is fundamental for military context (Noe et al., 2014), allowing individuals to develop the necessary skills (Kerry, 2013). Integrating simulated training with actual missions contributes to acquiring and developing mission-essential competencies, which can only occur after developing support competencies such as NTS (Bennett et al., 2013).

Mission-essential competencies allow military teams to function in the real world. At the same time, it is necessary to build a bridge between mission-essential competencies and the knowledge and skills acquired through training. This bridge corresponds to NTS development, and we may think of them as the holy grail of military team performance. These are support skills (Bennett et al., 2013) and include situational awareness, internal and external teamwork, and team leadership (Alliger et al., 2007). NTS allow individuals to interrelate, achieve better performance results, and act safely and efficiently (Salas & Cannon-Bowers, 2001). NTS serve as the glue

for individuals and teams, functioning in extreme conditions (Hedlund & Österbeg, 2011; Röttger et al., 2016). Linking knowledge, skills, and essential mission competencies will be the basis for the NTS development hierarchy proposed above. It is fundamental to apply it, both in training and natural conditions, always looking for the continual development of military teams (Conceição et al., 2017; Driskell et al., 2018; Freeman & Zachary, 2018; Mansikka et al., 2017; Ogle et al., 2019).

These findings show that NTS allows individuals to achieve improved performance and higher levels of safety and efficiency, answering research question two: Are NTS pivotal for military team performance?

Considering the effect that NTS can have on military team performance, how can NTS be developed on these teams?

## *Theme 3: A Proposed Developmental Hierarchy*

NTS development can occur through an evolutive pyramid, fundamental for individual and team performance. Understanding how teams can function, be successful, or fail is critical for achieving better performance (Freitas & Leonard, 2011), particularly for military groups operating in a wide variety of conditions (Bertram et al., 2015). But in which way does each NTS relate to and contribute to a skills hierarchy?

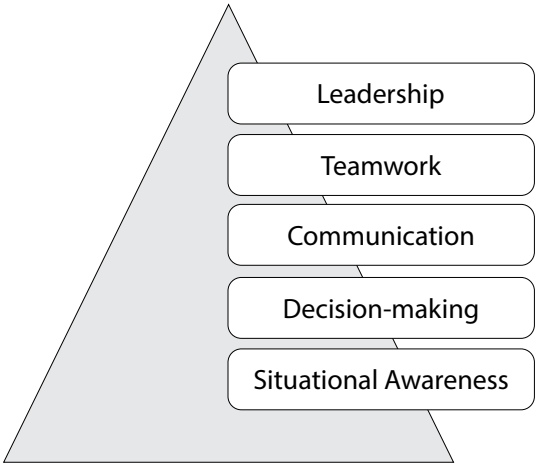
The correct analysis of the scenario where the team is operating is critical for decision-making, guaranteeing that every important element is identified (Gugliotta et al., 2017). It is fundamental to ensure two types of situational awareness for the team decision-making process: individual situational awareness and shared situational awareness (Flin et al., 2013). With this, we can argue that decision-making and situational awareness are profoundly interconnected (Endlsey & Selcon, 1997; Stubbings et al., 2012).

Teamwork relates to communication and decision-making. If communication does not exist, a team cannot function (Flin et al., 2013) or guarantee the success of an objective through obtaining a decision resulting from a process undertaken by interdependent elements (Orasanu & Salas, 1993).

Maslow (1943) proposed a motivational theory based on a five-level needs hierarchy, which was expanded to an eight-level hierarchy with further research (Maslow, 1970). Maslow's hierarchy of needs (1943) can be applied to education and learning, though we propose that would not be possible to pass to an upper level of the pyramid if all the needs from the lower levels were not fully satisfied (Hamel et al., 2003). Maslow's needs hierarchy (1943) can explain the NTS development; the following NTS can only be acquired after the full acquisition of the previous one. However, we have also to acknowledge Maslow's later work when he considered that this hierarchy is not rigid (Maslow, 1987). As military teams function in high-dynamic environments, individuals may adapt their NTS devel-

**Figure**

*NTS Development Hierarchy for Military Teams*




opment scheme to external conditions in order to achieve maximum performance. We propose a development hierarchy of NTS for military context, as presented in the figure.

According to this approach, situational awareness is the basis of the pyramid. If we do not understand where we are, it is impossible to work as a team, communicate, make decisions, or lead. If the team can develop a complete view of where the team is, then it is possible to identify the potential problems and their potential solutions through an appropriate decision-making process without accidents (Stubbings et al., 2012). It is possible to communicate if the necessary information is passed to other team elements resulting from the decision. The existence of updated data is fundamental in the military context (Louvieris et al., 2010), and communication plays an essential role in creating a web for sustaining teamwork. Lastly, the team leader will be responsible for aggregating knowledge, skills, and attitudes fundamental for achieving collaboration and accomplishing the assigned mission.

Military training programs can apply this NTS hierarchy, allowing military personnel to develop those skills and overcome all the factors that might influence the acquisition of each skill (Kehoe, 2013). This development hierarchy may provide the necessary and appropriate cognitive and behavioral modifications essential for skills development (Grossman & Salas, 2011). The education and training of military personnel can occur by applying the NTS hierarchy, contributing to fulfilling organizational needs (Wallace, 2013).

With this, we conclude that NTS can be developed through a hierarchical skills development scheme using military team training. This is the answer to research question three: How can NTS be developed in military team training?

An integrative literature review would not be complete without discussing its main implications for knowledge and considering future research recommendations. We have assumed that NTS development is a fundamental key for teams' evolution, maximizing individual and team performance. The NTS development hierarchy needs empirical validation to verify the proposed hierarchical and interrelated acquisition of situational awareness, decision-making, communication, teamwork, and leadership. For future research, we recommend designing NTS training programs specifically designed for military context, including individual and team development of NTS and its evaluation, through simulation-based training and training in real scenarios. The NTS hierarchy would be refined by evidence emerging from these programs and extend the findings on skills development of military teams.

## Discussion

Our findings have focused on the importance of five main NTS for military team training and human error mitigation. It is critical to conceptualize its impact on adult learning. The learning character of military organizations can be enhanced through critical thinking, improving military education/ training, and assessing new development opportunities (Berg, 2020). Improving NTS levels of military personnel is essential for ensuring a better understanding of processes and effects (Khachadoorian et al., 2020) of individual actions on team processes and mission goals. At the same time, building strong linkages between explicit and tacit knowledge through NTS development will "improve the military's agility, adaptability, and speed of responding to any challenges presented by adversaries" (Babin & Garven, 2019, p. 3). NTS development and tacit knowledge are linked. First, this linkage arises from training and life experiences, contributing to mental agility and response to crises (U.S. Department of the Army, 2015). Second, the major role that NTS perform as cognitive and social skills and personal resources conducing to safer performance can also be associated with tacit knowledge (Flin et al., 2013).

Military leaders with well-established command functions, strong hierarchical and rule-based relations (Arbuthnot & Flin, 2017; Denning & Higgins, 2019), and high dependence on the availability of data and resources (Driskell et al., 2018) are the foundations of the military context. Military organizations have dedicated time to define continual education and training requirements that military personnel should complete to fulfill their functions (Khachadoorian et al., 2020). Any military operation that has clearly defined mission goals and team members to acquire the necessary skills for achieving that goal is pivotal to mission accomplishment (Goodwin et al., 2018). Team training using high-fidelity scenarios allows team members to acquire necessary skills (Grand & Kozlowski, 2013; McEwan et al., 2017).

Military operations are associated with dangerous life situations as well as with constraints concerning time and resources' availability (Sarna, 2017). It is crucial to share tacit and explicit knowledge and provide the necessary training for individuals and teams (Bertram et al., 2015; Kerry, 2013). In theme 1, we have considered that NTS, along with technical skills, may arise as the necessary tools for military organizations to overcome some human factor limitations by reducing the error chain (Håvold et al., 2015). With this theme, we have answered research question one: Which NTS are used in high-dynamic environments such as the military context? For teams operating in highly dynamic conditions, such as military teams, it is necessary to identify how to train those teams, ensuring an effective learning path and preventing skill decay. Simultaneous development of technical and NTS is the way to achieve safer operations, and improve team efficiency (Wahl, 2019). Simultaneously, preventing skill decay and enhancing team performance through the hierarchy of NTS development will allow military personnel to evolve from novices to experts on their functions, guaranteeing a continuum between explicit and tacit knowledge (Babin & Garven, 2019). We believe this is the future for military education and learning, thus leading to our conceptualization of NTS as the holy grail of military team performance, as proposed previously in theme 2. Here, we have discussed the importance of NTS to military team performance, and where we answered research question two: Are NTS pivotal for military team performance?

We believe that focusing team training processes on NTS development is pivotal for improving learning and training experiences. Through the development of a hierarchy of NTS, we believe that team training will better meet the present-day needs of military organizations, fulfilling a "multidimensional frame, blending formal, nonformal, and informal experiences that transcend time, space, medium, and format" (Bannan et al., 2020, p. 68). NTS development for individuals and teams contribute to reducing risks and accidents, as well as mitigate human error (Cavaleiro et al., 2020). Human error mitigation is possible by applying simultaneous technical and NTS development. This type of skills development is based on learning strategies (e.g., diversity in learning experiences, learning opportunities that go beyond instruction/training sessions design, cognitive load strategies, and connectivism-based strategies), and enhances learners' development through instructors' guidance (Bannan et al., 2020). We also propose that simultaneous technical and NTS training will delay skill decay, reducing the number of training sessions and improving team performance using implicit and explicit knowledge. There is a continuum between these two types of knowledge, allowing individuals to evolve from novice to expert stage in their functions (Babin & Garven, 2019). It is essential to "recognize the importance of assessing the knowledge over time and identifying the requirements that are needed to establish when an individual has become an expert" (Babin & Garven, 2019, p. 7). Technical skills and NTS are fundamental for achieving the necessary doctrine requirements for training and education. We assumed the complete acquisition of one NTS to enable the development of the next

one in the NTS development hierarchy, improving the process of knowledge acquisition. This process is like the evolution from novice to expert: a beginner cannot move forward without enhancing his or her explicit knowledge (Babin & Garven, 2019), and his/her NTS of decision-making and communication. The expert has the experience, the implicit knowledge to solve problems (Babin & Garven, 2019), and the acquisition of the five NTS of our hierarchy. When an individual has an excellent situational awareness level, has acquired the decision-making process, and has developed good communication skills (Babin & Garven, 2019), it is possible to go further on the NTS development hierarchy. He/she has achieved the necessary implicit knowledge to become a team leader, with leadership as the top skill for NTS development pyramid. With theme 3, we have proposed a NTS development hierarchy, interrelating the six main NTS mentioned in the theme 1, and answering research question three: How can NTS be developed in military team training?

## Conclusions

Technical and NTS development is pivotal for the success of military teams. We have advanced the theoretical framework on NTS development adapted to military teams using an integrative literature review. We argue that training should incorporate this development hierarchy to achieve safer performance conditions and timely identification of human error. Higher performance and better cohesion, fundamental for operating during peace and wartime, can be achieved by including NTS in training programs of military teams.

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