Dealing with High-Risk Police Activities and Enhancing Safety and Resilience: Qualitative Insights into Austrian Police Operations from a Risk Perception and Group Dynamic Perspective

Renate Renner *, Vladimir Cvetković, Nicola Lieftenegger

Posted Date: 25 February 2025

doi: 10.20944/preprints202502.1967.v1

Keywords: risk; safety; resilience; police operations; qualitative research; socio-psychological; groupdynamic; risk-perception; Austria

 doi:10.20944/preprints202502.1967.v1

Article

Dealing with High-Risk Police Activities and Enhancing Safety and Resilience: Qualitative Insights into Austrian Police Operations from a Risk Perception and Group Dynamic Perspective

Renate Renner [1,2,*], Vladimir M. Cvetković [1,2,3] and Nicola Lieftenegger [4]

[1] Safety and Disaster Studies, Chair of Thermal Processing Technology, Department of Environmental and Energy Process Engineering, Montanuniversitaet, Leoben, Austria
[2] Department of Disaster Management and Environmental Security, Faculty of Security Studies, University of Belgrade, Gospodara Vucica 50, 11040 Belgrade, Serbia
[3] Scientific-Professional Society for Disaster Risk Management, Dimitrija Tucovića 121, 11040 Belgrade, Serbia
[4] Regional Police Directorate, Carinthia, Austria
* Correspondence: renate.renner@unileoben.ac.at

Abstract: Special police units, such as Austria's EKO Cobra, are uniquely trained to manage high-risk operations, including terrorism, amok situations, and hostage crises. This study delves into the operational risks and the critical role of group dynamics in fostering safety and enhancing resilience, emphasizing the interconnectedness of risk perception, training, and operational practices. Based on problem-centred interviews with current and former EKO Cobra membersthe research identifies key risk factors such as overconfidence, insufficient training, inadequate equipment, and the challenges posed by high-stakes scenarios. Using a structured yet flexible approach, the study integrates a group dynamics model as a theoretical framework and analyzes the data semi-inductively semi-deductivelyby applying a a qualitative research approach. The study examines risk categorization in ad-hoc operations, the interplay between risk perception and training, and actionable strategies to enhance safety and preparedness through tailored training programs. The findings underscore the transformative impact of intensive scenario-based and high-stress training exercises, which significantly improve situational awareness, automate critical actions, and reinforce teamwork. Group dynamics, including cohesion and effective communication, emerge as pivotal factors in mitigating risks and ensuring operational success. Crucially, this research highlights the broader sustainability dimensions in law enforcement, advocating for continuous, specialized training that is adaptive to emerging challenges. By linking theoretical frameworks with practical, actionable insights, the study proposes a holistic training approach that promotes resilience and long-term sustainability in police operations. These findings are relevant to elite units like EKO Cobra and provide valuable guidance for broader police frameworks, contributing to become safer, more effective and resilient.

Keywords: risk; safety; resilience; police operations; qualitative research; socio-psychological; group-dynamic; risk-perception; Austria

1. Introduction

The duties of police officers encompass a wide range of dynamic and often unpublished problem situations. A significant challenge lies in the difficulty the police face in acknowledging errors or misconduct, which leads to reluctance to openly admit these facts. In this context, police interest groups advocate for the establishment of control mechanisms for error management [1]. According to Feltes [2], errors are unavoidable and widespread in everyday police work, and flawless

 doi:10.20944/preprints202502.1967.v1

performance seems unrealistic. High-risk situations include, among others, the suspicion of the use of firearms or explosives, situations with a high propensity for violence from the suspect (based on specific facts), organized crime cases, airplane hijackings, serious violent crimes, and various hostage situations [3–10], or other man-made emergencies [11]. The demands on members of this special unit are extraordinarily high. Discipline, endurance, resilience, and strong nerves are essential both during recruitment and in daily service. An application is only possible after two years of service as a regular police officer. Requirements include an impeccable disciplinary record and excellent physical and mental fitness [12–17]. It is important to emphasize that not every police operation can be classified as a 'standard operation' from the outset. Instead, operations may evolve into special or extraordinary operational situations due to specific circumstances. These types of operations are characterized by the need for teams to make decisions under significant time pressure, where operational and leadership uncertainties must be minimized, as these often have serious consequences.

To minimize such risks, specialized units such as EKO Cobra/DSE (Directorate for Special Units) (Figure 1 and 2) are deployed in highly critical situations. According to the regulation of the Austrian Ministry of the Interior regarding the special units of the Directorate General for Public Security (BGBl II 207/1998 as amended by BGBl. II No. 287/2012), EKO Cobra/DSE serves as an operational anti-terror and intervention unit that can be requested in specific cases and assigned relevant tasks. The expertise and intensive training of this unit are crucial in maximizing the survivability of officers in high-risk scenarios and ensuring the safety of all involved. As Austria's most prominent special police unit, it operates under Section 22(1)(2) of the Security Police Act (SPG) and is directly subordinated to the Directorate General for Public Security. Its primary mission is to terminate dangerous attacks under particularly high-risk circumstances, as outlined in Section 16(2)(2) SPG [18,19].

Figure 1. EKO Cobra training scenario. Tactical approach at the wall. Photo by the directorate.

for special units (DSE EKO Cobra).

Police officers are legally obligated under the SPG, the Code of Criminal Procedure (StPO), the RLV, the Civil Servants Act (BDG), the Weapons Act (WaffGG), and constitutional provisions to end dangerous attacks and fulfil the first general duty to assist. These legal foundations form the basis for officers' actions in the field and stipulate that assailants must be located, isolated, and neutralized as quickly as possible. To meet these demands, specific teams are formed based on the situation, such as contact, rescue, and evacuation teams, each assigned clear responsibilities for rescuing individuals

 doi:10.20944/preprints202502.1967.v1

[18]. During operational training (ET), officers are instructed on the legal foundations governing police interventions. Specifically, § 3 RLV differentiates between non-intervention and intervention measures, meaning that official actions usually begin with verbal instructions and self-protection measures and may escalate to life-threatening situations requiring the use of firearms [20]. The RLV also regulates the self-protection measures for OdöSd officers. According to § 3 RLV, although they are obligated to protect themselves, they do not possess special powers in this context. Their duty is to avoid potential threats to their safety. They are not required to intervene to protect others' legal interests if doing so would significantly endanger their physical safety, and the threat to the legal interest is relatively minor [20]. Furthermore, § 1(3) RLV obliges police officers to intervene even outside of their duty if necessary to prevent an imminent threat to life, health, freedom of individuals, or property in significant amounts, provided it is proportionate and reasonable [19].

Figure 2. EKO Cobra training scenario in the forest with an armoured vehicle. Photo by the.

directorate for special units (DSE EKO Cobra).

The legal framework and service obligations of police officers form the foundation for safe and effective operations. Regulations on self-protection and service conduct are crucial for the proper execution of official duties and for ensuring personal safety. To meet the complex requirements and operate safely within the tension between risk and security, thorough education and continuous training are indispensable. In general, police officers are required to follow the instructions of their superiors or commanding authorities. Typical service orders include directives from the BM.I, orders from state police directorates (LPD), and commander orders, as well as training instructions. Deviations from this duty to obey are only permitted if the instructions were issued by an unauthorized body or would violate criminal laws. If officers have other concerns, they must inform their superiors [21].

Training is essential for handling all types of police operations, whether in special situations, operational scenarios, or risk conditions. The nature of danger is defined by the type of threat, its controllability, the development of the situation, and the time factor [22]. Police interventions are often unpredictable and difficult to assess. Therefore, an automated response to an event or attack is the most effective way to counter threats. For police officers, situationally appropriate training at regular intervals with specific content is crucial for safely and effectively managing dangerous situations in everyday police work. ET is a central component of basic police training, forming the foundation for all future police actions. In this highly specialized area, officers are prepared to understand and responsibly apply their authority to use force and firearms. Training content includes

 doi:10.20944/preprints202502.1967.v1

a wide range of topics, such as shooting and weapon techniques, operational tactics, interactive training, and handling special situations. This comprehensive preparation enables officers to act competently and responsibly in critical situations.

Within the Austrian police, there is a differentiation between special units and regular police forces. Special units are trained at a high physical and tactical level for specific operational situations. In contrast, regular police officers are active in “normal operations”, and their training content only partially overlaps with that of the special units, but the latter, in particular, has an incomparably higher training intensity. These differences arise primarily from the legal responsibilities of the police (based on the Security Police Act, the Code of Criminal Procedure, the Administrative Penal Code, etc.) and evolving sociopolitical demands. Also, the selection and recruitment process for police officers in Austria is designed to identify suitable candidates for executive service. It spans two days and includes psychological aptitude tests, clinical-psychiatric procedures (computer testing), a police medical examination, and an interview with experienced officers. Emphasis is placed on criteria such as perception, social skills, risk-taking, and resilience, which are essential for safe action in ad-hoc operations [23,24].

The purpose of this process is to assess the candidates’ suitability for the police profession and gain insights into their psychological profile, which is particularly relevant for potential future special deployments. The subsequent basic police training continues this focus, following a curriculum set by the Austrian Federal Police Academy (SIAK) based on a competency profile. This profile is inspired by John Erpenbeck and Volker Heyse’s definition of education as "the ability to act autonomously, in value-conform and rule-conform ways, in complex situations" [25]. The training comprises three core competency areas [25]: a) police knowledge; b) personality traits; and c) social-communication competencies. Particular emphasis is placed on two key competencies: situational action and the ability to perceive and reflect.

Based on that, this paper focuses on investigating safety-relevant influencing factors and the role of group dynamics during special operational situations of the Austrian police. A central challenge in operational scenarios, particularly in extraordinary situations, is the often unpredictable nature of the situation, accompanied by a high level of uncertainty. Risks are frequently not adequately recognized or assessed. This can have various causes, including a lack of operational experience, insufficient information about the situation, uncertainty about the number and training level of the individuals involved, and doubts about one's abilities. The present work aims to analyze these complex relationships and gain insights that can contribute to improving operational safety in critical situations.

This study aims to examine how group dynamics and risk perception influence the effectiveness and safety of special police unit operations. By assessing operational risks and the role of training, the research seeks to pinpoint both vulnerabilities and strengths that shape decision-making in high-risk environments. To achieve this, problem-centered interviews were conducted with current and former members of EKO Cobra, providing firsthand insights into how risk awareness, training intensity, and team cohesion impact operational performance. Moreover, the study explores the relationship between structured training programs and the ability to adapt in real-time during unpredictable situations.

Literature Review

High-risk police activities carry numerous challenges and risks related to occupational stress, mental health, and interagency collaboration. Consequently, many studies investigate the effectiveness of approaches to protect officers facing high levels of stress. Due to significant stress, police officers are exposed to direct negative impacts on their mental health. Specifically, Kapusta, *et al.* [26] found that suicide rates among Austrian police officers correspond to the suicide rate in the general population. Nevertheless, they emphasize the urgent need to design and implement mental health interventions that consider the unique stressors of police work. Furthermore, the study highlights that the use of firearms in suicides among police officers remains prevalent.

 doi:10.20944/preprints202502.1967.v1

In this context, numerous workshops have been organized in Lower Austria to increase police awareness of various mental health issues. These workshops enhance the capacity to manage mental health challenges among police officers as well as in their relations with the public [27]. This creates a supportive work environment that reduces the negative consequences on mental health. After high-risk interventions that cause significant stress, it is essential to provide support for such police officers. For this reason, Hesketh and Tehrani [28] emphasize that strengthening the psychological resilience of police officers depends on structured trauma risk management and post-trauma interventions for first responders.

The perception of various risks during police work, as well as training methods, are significant elements for improving the safety of police personnel. It is impossible to organize an adequate police response without effective identification and categorization of risks. Based on categorization, priorities will be set for hazards, and the organization itself will follow. For this reason, Morgan, *et al.* [29] recommend classifying risks based on initiating events or environmental factors.

Of course, risk perception, which includes emotional (affective) and rational aspects, plays an unequivocal and significant role in the process of hazard assessment. Therefore, affective reactions and rational assessments influence safety-related decision-making [30]. Based on this, it is possible to design and implement training that aligns with both intuitive and analytical risk evaluation. Hazard recognition and appropriate safe responses largely depend on effective training. A specific study found that targeted training significantly helps improve the level of assessment and provision of appropriate responses in various security situations [31].

For this reason, using specific scenario-based exercises that simulate high-risk situations can enhance police officers' preparedness. Emphasizing that police training should take into account both cognitive and emotional dimensions of risk, Rundmo [32] points out that worry and concern are often emotional precursors to cognitive risk assessment. Therefore, training must consider all specifics of emotional and cognitive responses. Additionally, adaptive training should be based on specific scenarios of various risks in police action. It must also be grounded in analytical and affective understandings of risk, which are crucial for improving risk perception [33]. Namian, *et al.* [34] emphasize that programs focusing on experiential learning show that interactive safety training effectively increases awareness and prepares personnel for unexpected hazards. Regarding Burket [35] it could be said that current training focuses heavily on improving physical skills in the police environment, such as running faster or better aiming with firearms. Also, in comparison, training for decision-making and action processes is significantly underrepresented in European training plans.

A recent case from France illustrates the complexity of police decision-making: during a traffic stop, a driver attempted to evade control, leading one of the two officers involved to fire a fatal shot [36]. This incident raises questions about the group dynamics involved in decision-making, even in routine operations. Therefore, it is crucial to examine the factors that led to the shooting—whether they were perception errors, excessive caution, communication problems between the officers, or perhaps legal frameworks that legitimized the action. Problem-solving OT requires officers to make a wide range of "what" and "how" decisions that must be recognized and processed in the moment, enabling them to decide immediately on the most effective and safest course of action [37]. On the other hand, reproductive OT requires less decision-making, focusing solely on execution. This includes isolated actions such as drawing a weapon or shooting at static targets. In reproductive OT, the "what" variable is missing, which is critical in officers' perception, as it often presents itself as a surprise or through the unexpected behavior and determination of the adversary [37]. For example, during a traffic stop, officers may not initially notice that the driver is carrying a knife. In such cases, immediate decisions on tactics are required to handle the situation while ensuring safety and compliance with legal regulations.

The goal of operational training (OT) is to prepare police officers as effectively as possible for real-life operations. The NRW study "Violence Against Police Officers" [38] highlights a disproportion between real operations and training in its qualitative section, causing officers to feel helpless. The main issue is identified as the limited time available for OT, where the scope and

 doi:10.20944/preprints202502.1967.v1

intensity of training are central factors preventing the automation of operational techniques [38]. Besides that, problem-solving approaches that could be applied in daily police work but are not well-known or explicitly trained include strategies used by police units in the USA and the UK. A well-known strategy is the TIT FOR TAT approach, which signals to the counterpart that police officers are friendly in their interactions but can defend themselves if necessary [22].

Also, the Hessian University for Police and Administration examined OT for police cadets. Over five weeks, training in self-defence, firearms, and tactics was analyzed through an online questionnaire, which was answered by 18,356 officers (after data cleaning). The survey was conducted using a qualitative four-eye principle and a stopwatch. Effective training time for each participant in self-defense was 23.13%, 15.04% for firearms training, and 13.89% for tactical training, resulting in a total of 16.68% active training time. This means that approximately 83% of OT consisted of passive activities, such as waiting times between training stations or during firearms training while waiting for ranges to become available, and must be considered unproductive training time. The 16.68% active time included 10.65% for operational tactics and techniques, with problem-solving tactics accounting for 6.03% of active time.

Problem-solving competence, however, is a crucial factor for successful operations and should be emphasized with a higher proportion of practical exercises [38]. On the other side, it is not enough to show officers two or three intervention techniques once a year in the context of OT to prepare them for possible resistance in the field. Certainly, the arrest techniques are effective and also good. However, no officer can internalize them if they are only shown once a year and not practised and repeated regularly, for example as part of the duty sport [38].

A study on police intervention techniques [22] is particularly significant in this context, as psychomotor skills in applying handcuffs were investigated. Three psychomotor areas were defined: 1) applying handcuffs, 2) searching the person, and 3) controlling the application of handcuffs using an arm lever. The sobering result was that after two years, only 31-36% of the participants still mastered the correct operational technique [39]. Psychomotor skills are defined by various sensory, emotional, and cognitive abilities of a person, enabling them to behave successfully in a given context. Psychomotor skills, especially in police intervention techniques, must be practised and trained for a long time until they become automated. This can determine success or failure in an operation, as well as prevent a dangerous situation from spiraling out of control. Besides that, studies by Pinizzotto and Davis [40] found that attackers with the intent to kill often abandon their attack once they perceive that police officers can tactically counter their planned assault [21]. The strategy is based on the assumption that people initially behave cooperatively and respond according to the attitude or behaviour of their counterparts. If the counterpart behaves cooperatively, this is reciprocated. If the behaviour is uncooperative, the response is also uncooperative. When applied correctly, this strategy can lead to positive social interaction.

Memmert [41] describes in his book "Football Games Are Decided in the Head" that top football athletes demonstrate a particular ability to combine perception, reaction, and action speed (reactive agility). These problem-solving processes are necessary to quickly and appropriately manage specific events. Memmert emphasizes that cognition – influenced by attention, perception, anticipation, and memory – significantly contributes to creativity in finding effective solutions. Another key aspect is game intelligence, which can be translated into police ET: the ability to anticipate and predict the opponent's actions is similar to predictive intelligence in the police context.

Also, mental performance is defined by Memmert [41] across six areas: a) integrative, multisensory, and experience-based perception; b) processes of recognizing personal processes and categorizing people, objects, and events; c) conscious and unconscious processes such as imagining, modelling, and hypothesizing; d) experience-driven changes in perception that lead to adaptable processing strategies; e) attention processes and expectations, which involve actively exploring the stimulus situation; and f) mental activities. These six cognitive factors can be summarized as "higher mental functions and processes" that are necessary for finding situation-appropriate solutions [41]. Pinizzotto, Davis, and Miller [40], for example, suggest that gang members often display a cold-

 doi:10.20944/preprints202502.1967.v1

blooded street gang mentality with little sense of guilt. They are fixated on key concepts such as respect, status, honor, and loyalty. Police training to understand these mentalities is a valuable addition to officer training, allowing for a more appropriate and proactive, violence-free interaction when dealing with such "cultures of honor."

An example of successful interaction between police and their counterpart using the TIT-for-TAT strategy comes from a football context. After a game, German police officers visited a pub where violent football fans were gathered. They started a conversation with the fans and offered them a beer, gradually developing a friendly rapport. The police officers acted according to the TIT-for-TAT strategy: they were friendly but prepared to respond appropriately if provoked. This strategy emphasizes the equality of both parties without demonstrating superiority and highlights reconciliation as a virtue [35]. In other words, "once you have reacted appropriately and the situation is resolved, you can return to friendly interaction" [36].

Another potential strategy to enhance police safety, identify problems early, and respond appropriately is the TDODAR Decision Model. This tool, well-known in British aviation, is used to make complex decisions under pressure, particularly by pilots, but also by IT professionals when servers crash or chefs when meals are spoiled. It can also be applied to processes in everyday police work. TDODAR stands for Time, Diagnosis, Options, Decide, Assign, and Review, and provides a structured mechanism for decision-making in critical situations. Time plays a central role in selecting from various options under pressure, making decisions, assigning tasks, and finally reviewing the situation to evaluate the actions taken [42].

According to Staller and Körner [37], making evidence-based decisions is part of the awareness process of a professional, modern police force, where science provides essential support through controlled knowledge production. Simulations and exercises can help prepare for extreme situations. They help identify weaknesses, implement better strategies, and establish operational approaches. However, experience gained from one operation cannot be fully transferred to the next. Organizational resilience and police officers' ability to restore safety during a crisis is insufficient for lasting success, as these rely primarily on familiar action patterns [43].

Interactive scenario training is designed to closely simulate reality, aiming to teach officers appropriate behavior patterns in high-stress situations and link these with theoretical and practical knowledge. Trainees are sensitized to dangers, their attention and cognitive skills are sharpened, and certain behavior patterns are partly automated [20]. Very person is aware of perceptual differences compared to others. Examples include the subjectively different perceptions of speed or time. Perception, however, is also influenced by various factors such as external or internal substances (hormones, alcohol), deficiencies (hunger, fitness), as well as psychological factors (knowledge, attitudes, prejudices). Material environmental factors, like the equipment of operational spaces and the availability of appropriate protective vests, also play a role. Social factors, such as the perception of superiors or colleagues, one's opportunities for advancement, the assessment of dangerous situations, and not least time pressure and information deficits, also influence perception [44]. These perceptual distortions and errors in perception can have fatal consequences, such as wrongful convictions of innocent prisoners due to misidentifications, accounting for approximately 52% of the highest error rates [45].

The perception of risks refers to how people assess and respond to dangers, uncertainties, and potential negative consequences. This perception varies significantly and is influenced by personal experiences, cultural backgrounds, social environments, media coverage, and psychological factors. People tend to assess and prioritize risks differently, with some risks seen as particularly threatening and others considered less relevant. Perception, according to Haller [46] is based on three factors: context, source, and individuals, and it develops through social and communicative interactions among people. Source-related factors such as time, location, shock, and control are perceived as less threatening, the further away the source of danger is. Conversely, the closer the danger, the higher the threat is perceived. Contextual factors include, for example, the evaluation perspective, personal benefit, and individual involvement. This perception can lead to different behaviors to protect oneself

 doi:10.20944/preprints202502.1967.v1

from potential dangers. The perception of police officers is mostly spatial and situational, performed unconsciously by the individual. They seek to derive categories, upon which situation assessments are created (own situation, foreign situation, other danger situations), which are significant for the subsequent course of operations. Risk perception and "evaluating it correctly" greatly influence risk assessment, and the two are inextricably linked. Risk research has found that awareness of uncertainties or existing dangers increases as the focus on security strategies in society grows [47].

People in leadership positions, such as commanders of police units, tend to be more cautious in risk assessment than when making decisions only for themselves. Objectively, inaction for others can even be riskier (Omission Bias) than active intervention. Inaction can, in many cases, be equivalent to wrong action, especially in critical situations. Leaders are particularly challenged because they must bear full responsibility for the decisions and actions of their group. This leads commanders to carefully weigh whether and how to let their units intervene in a situation. Many commanders, therefore, tend to avoid intervention, fearing possible mistakes and the consequences for themselves. This is also referred to as the fear of acting too late (Too Late Bias) or hasty action (Commission Bias).

Studies have shown that personal influences on perception are gender-specific and depend on professional or private attitudes, as well as one's own assessment of competence. Insecure individuals tend to overestimate risks and behave accordingly over-cautiously. People who consider themselves competent tend to underestimate risks. Similarly, laypersons overestimate risk and perceive information selectively. Overconfidence, with the assumption that one is exceptionally skilled, is also associated with a lack of vulnerability to dangers [47]. In the analysis of situations in which police officers are injured or killed, the potential danger becomes clear. For example, traffic stops, compared to routine operations, are among the interventions with fewer violent incidents. Nonetheless, a latent danger exists, the consequences of which can include injuries, death, or post-traumatic stress, demanding that police officers enhance their danger radar through targeted perception [18].

Further analysis of German and American studies on police officers who were killed in the line of duty or survived a surprise attack point to dangerous perceptual distortions. Traffic stops are often perceived as harmless routine checks, without considering that the counterpart may perceive the situation as a threat to their freedom and may be willing to use violence to escape. Misjudgments by officers are often based on the positive external impression of the counterpart or the failure to consider potential companions [48]. These factors accounted for 9.2% of all errors in daily police operations involving initially underestimated dangerous situations. 7.5% were identified as significant intervention errors [1].

Füllgrabe [49] recommends a concrete approach for police officers called "mental judo." This includes a series of components and serves as a checklist on how to react to any operational situation both mentally and practically, proposing a network of intellectual, moral, and physical domains. The author assumes that self-protection through trained perception – known in police jargon as the "danger radar" – as well as calm vigilance and the training of problem-solving thinking, helps foster a sense of control over the situation and prevents the emergence of fear. Crisis management can be positively influenced by prior mental preparation for dangers, as automated operational techniques can be recalled. This is particularly important when perceiving a potentially dangerous counterpart. Additionally, the author sees a demand on the psychological immune system (thoughts about the offender, anger, feelings of helplessness, etc.) when it comes to serious injuries and threats, to escape the dangerous situation. Debriefing helps to avoid post-traumatic symptoms and anger.

The misunderstanding in assessing a dangerous situation is by no means that a person's attention is clouded by careless interaction. "The problem is rather that one has not developed sufficient or adequate cognitive schemas for dangerous situations since the beginning of their professional career, has not developed a 'danger radar'" [2]. Until recently, this deficit played little role in daily police work because interactions were harmless. "However, the deficit becomes apparent in dangerous situations when the police officer does not know how to act, hesitates, perhaps even has their service weapon taken from them, and is shot" [22,40].

 doi:10.20944/preprints202502.1967.v1

Professional operational forces, such as members of special units of the Austrian Federal Police, claim to be able to assess risks in operations, especially in ad-hoc situations. This is achieved through years of daily training under difficult conditions. In addition to trained perception skills, personal factors also play an important role, influencing risk perception. These include possible situation biases, personal attitudes, and individual behavior. These personality traits are linked to work performance and show a connection between risk and performance. This means that a person's personality can influence their perception of risk situations, risk-taking, and risk behavior [50].

The risks perceived in ad-hoc operations by special units depend on each team member. The flow of information plays a crucial role during this phase, as all perceived information must be conveyed to commanders, who are not directly involved in the operational situation. Commanders must be able to rely on the information they receive. This information comes from each team member and depends on their perception skills as well as risk tolerance. Additionally, the risk tolerance of commanders influences the subsequent course of operations or the approach to ad-hoc operations, as personal risk perception and behavior affect group norms. Depending on personality type, the risk tolerance of leaders can vary, leading to a lack of assertiveness in dealing with risks, a loss of control, or the failure to recognize an actual threat because the risk is perceived as too insignificant [50]. A promising solution to this problem lies in establishing formal risk management, which can minimize workplace and operational risks both organizationally and personally.

Implicit (learned strategies) and explicit (training and continuing education) knowledge and behaviors can greatly enhance danger perception concerning self-protection. Implicit knowledge especially includes knowledge of causal relationships and experienced events influenced by one’s own value system. This knowledge has been gathered through experience. Other methods aimed at enhancing perception and subsequently reducing errors among police officers include stress reduction, concentration and relaxation exercises, yoga, autogenic training, balance sports, and breathing exercises, which are recommended [46,48]. Additionally, danger perception is trained in operational training to eliminate sources of error and address deficits.

According to Füllgrabe [51] survivability also encompasses the psychological foundation necessary for successfully managing dangers. The psychological state of police officers, particularly those in special units, plays a crucial role during operations, as many police techniques place both physical and psychological demands on officers. These factors must be well-coordinated and interrelated during application. Survivability refers to the capability of surviving, which depends on the frequency of training, inner attitude, and individual skills. In a study conducted by DuCharme in the early 2000s involving 290 Canadian and American police officers, it was revealed that 93% of officers fell during service, with 76% experiencing multiple falls. During 89% of arrests, officers fell, and 94% of those had to defend themselves from the ground [27]. These results show that unpredictable danger situations, combined with uncertainty in handling equipment, significantly contribute to officers ending up in dangerous situations where their survivability is greatly reduced. This low survivability endangers both the assailants and the officers themselves.

2. Theoretical and Methodical Design

This study investigates the role of group dynamics, risk perception, and training in ensuring safety and operational efficiency in high-risk police activities. The research was conducted through problem-centred interviews [52] with current and former members of Austria's special police units, with a primary focus on identifying key operational risks, analyzing team dynamics, and understanding how risk perception and training influence decision-making under pressure. The study is guided by three core research questions:

1. What operational risks are subjectively perceived by special police forces in high-risk situations? – This question explores the categorization of risks as subjectively experienced by officers in ad-hoc operations. The findings provide insights into perceived threats, including those related to tactical uncertainties, environmental constraints, and psychological pressures encountered in real-time crisis scenarios.

 doi:10.20944/preprints202502.1967.v1

2. How do group dynamic factors influence safety and the management of high-risk police operations? – The study examines key elements of group dynamics, including: a) communication and interaction – how information flows within the team and how members coordinate actions; b) interpersonal attraction and cohesion – the strength of emotional bonds, trust, and collaboration within the unit; c) social integration and influence – the ways in which new members are accepted and how individuals impact group behavior; d) power and control – the distribution of authority and decision-making structures within the unit;
   e) group culture – the shared norms, values, and beliefs that shape team cohesion and operational effectiveness. These factors are analyzed to assess their contribution to the safe and successful execution of high-risk operations.
3. What influence does risk perception have on safety in high-risk operations, and what role does training play? – This section examines how officers perceive risk and how their awareness impacts safety. Additionally, it explores the role of training in enhancing situational awareness, improving decision-making, and reducing operational errors. The study highlights specific training strategies that reinforce risk perception and enhance overall operational readiness.

2.1. Semi-Structured Interviews

Semi-structured interviews, specifically problem-centred interviews [49], were chosen for this empirical study to capture the subjective perceptions and experiences of the interviewees. Although the narrative principle is in the foreground, the interview is structured and guided by the interviewer based on the chosen theoretical framework and the underlying research questions.

The interview is conducted using a structured yet flexible approach. A detailed set of questions, known as the interview guide, provides the framework and ensures that all relevant topics are systematically addressed. At the same time, this approach allows for spontaneous deep dives into specific topics, enabling a thorough analysis of complex issues and the acquisition of both practical and theoretical insights [53].

This method allows direct engagement with the experiences and expertise of the respondents, which is particularly important for analyzing ad-hoc operations. By gaining immediate access to their experiences and perceivedstrengths and weaknesses in operational practice can not only be identified but also examined in detail.

Interviewing experts from the police field provides the unique advantage of linking theoretical knowledge with subjective experiences and critically comparing them. This is especially valuable, as police work is heavily influenced by situational circumstances and experience, which often cannot be adequately reflected in standardized theoretical models. The interviews fill this gap by making the implicit knowledge of the interviewees explicit and integrating it into the research process.

For the selection of experts, it was crucial to choose individuals from the BM.I (Austrian Ministry of the Interior) and specifically from the special unit EKO Cobra, who are either currently active or have served in the past. These experts bring extensive knowledge, both in operational and theoretical/teaching areas. Their experience includes roles as operational trainers, observers, instructors, and practitioners.

Given the complexity of the topic, special attention was paid to ensuring that the selected experts had many years of experience in their respective specialized areas. Among the interviewees were two senior officers—an officer from the LPD (State Police Directorate) Vienna and a former EKO officer, as well as a location manager or commander of EKO Cobra. Additional experts included a tactics trainer and a firearms trainer from EKO Cobra, as well as an observer from the unit. The remaining interview partners were operational officers from EKO Cobra at BM.I. All of the interviewees possess extensive experience from numerous operations both domestically and abroad, which they have successfully managed. They acquired their expertise in various functions and training roles, both in Austria and abroad, and have held or currently hold several command functions. All interviewees were male, as there are no women working in this special operations unit.

In the course of the study, five specific research questions and related sub-questions were formulated, which were answered by current and former members of the special unit. To obtain a

 doi:10.20944/preprints202502.1967.v1

comprehensive picture of operational activities and risk perception, a total of ten experts were interviewed. The anonymization of the participants ensured their personal protection and enabled open and honest engagement with the topics.

2.2. Study Area

Austria is a landlocked country in southern Central Europe (Figure 3). Its immediate neighbors are Hungary, Slovakia, Czechia, Germany, Switzerland, Italy and Slovenia. Austria declares neutrality after the Second World War and joins the United Nations; it is a democratic country. It has been a member of the European Union since 1995. The federal territory comprises nine provinces, with a total area of about 84,000 square kilometres. As in other industrialized countries, increasing life expectancy and declining birth rates are leading to a growth of older population groups also in Austria. On 1 January 2024, the average age of the population was 43.4 years, which corresponds to an increase of 6 years of life since 1980[54].

Total population in 2024 was 9 158 750 people, of which 50.7% are women. In 2022, the life expectancy of women was 84 years with increase of 0.5 years compared to 2012; and that of men 79 years with increase of increased 0.8 years compared to 2012 [54]. At the beginning of 2024, 1 766 206 people under the age of 20 (19.3%) lived in Austria, 5 575 396 people (60.9%) were of working age from 20 to 64 years and 1 817 148 people (19.8%) were of retirement age of 65 years and more. The average age of the population was 43.4 years and differed significantly according to nationality: Austrian nationals, at 45.2 years, were about nine years older than Austrian residents with a different nationality (36.0 years).

The number of Austrian citizens decreased by 17 068 in 2023, whereas the population with foreign citizenship increased by 71 068. On 1 January 2024, a total of 1 800 866 non-Austrian nationals were part of the population. Their share of the population was thus 19.7%.

 doi:10.20944/preprints202502.1967.v1

Figure 3. Study area.

In 2023, the five main crime areas are divided into property crime (162,242 offences), white-collar crime (103,330 offences), violent crime (85,374 offences), cybercrime (65,864 offences) and organized crime (40,333 offences). Violent crimes account for around 16 percent of all reports. By far the largest part was caused by property offences, financial and economic offences, and cybercrimes. In the reporting year, slightly more than 40,000 bodily injury offences were reported, while cybercrimes reached nearly 65,900 (Figure 4).

For the seventh time in a row, more than every second case was solved. This means that an average of 756 cases were solved every day in Austria [55]. Police also recorded more violent crimes in 2023. In 85,374 reported cases, suspects carried, used or threatened to use a total of 350 firearms, 2,479 stabbing weapons and 615 bladed weapons. Following a decline in the previous year, more violent offences in the private sphere were reported to the authorities in 2023. There was a smaller increase in reported crimes in the area of violence in the private sphere: 20,590 reports were filed, an increase of 3.5 percent compared to 2022. In 2023, 30 male and 42 female victims were recorded for reported murder offenses. Compared to the previous year, this represents a decrease of 9.1% for male victims and an increase of 7.7% for female victims [55].

 doi:10.20944/preprints202502.1967.v1

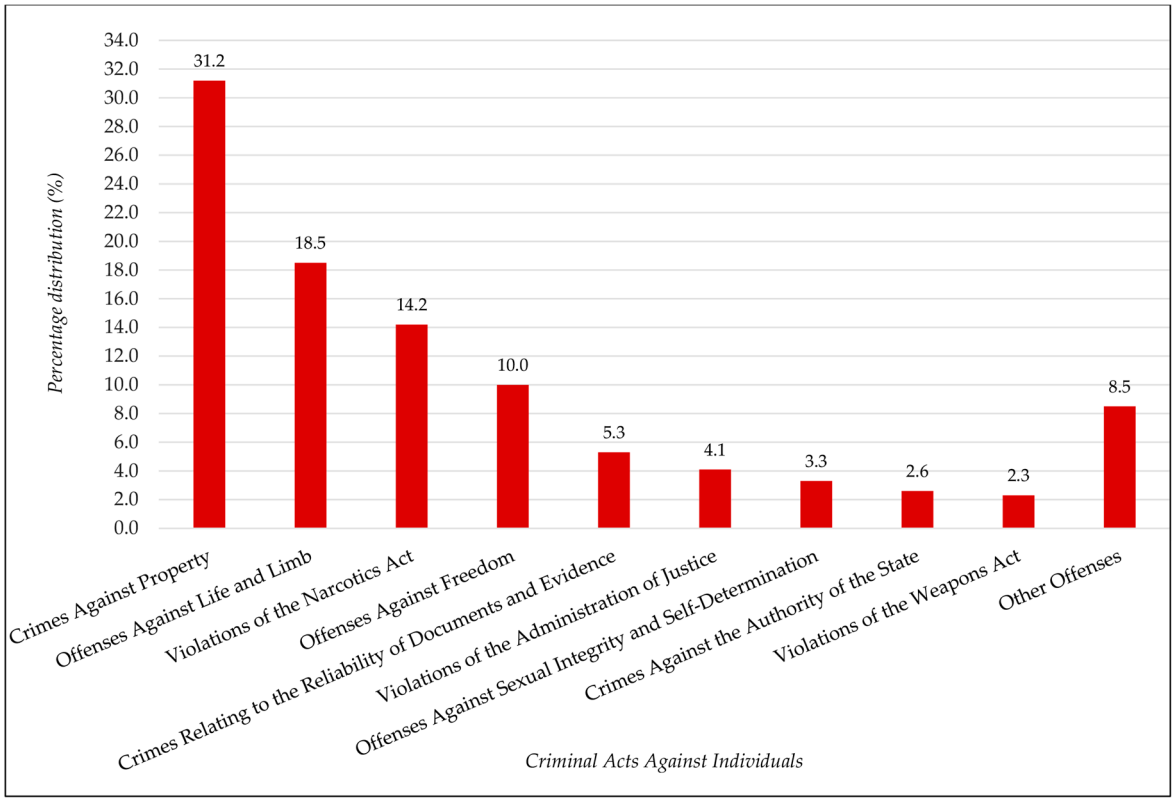

Figure 4. Overview of all offenses by offense groups in Austria (2023).

The Security Police Act (SPG) not only regulates the organizational aspects of the police, such as the structure and responsibilities of executive bodies and authorities but also includes the material level of state hazard prevention through these executive bodies. The legal provisions that obligate police officers to fulfill their duties are primarily outlined in the SPG, the corresponding service regulations (Guideline Regulation [RLV]), and the Civil Servants Act (BDG) of 1979. The BDG defines the general duties of civil servants, with § 43 being particularly relevant. This paragraph stipulates that civil servants must perform their official duties in accordance with the applicable legal system faithfully, diligently, impartially, and with dedication. Moreover, they must always ensure that their behavior maintains public confidence in the proper discharge of their duties.

Supporting and informing citizens, as long as it aligns with service interests and impartiality requirements, is also expected as part of their official duties. The RLV specifically outlines how public safety officers (OdöSd) should conduct themselves on duty and what tasks they must fulfill. According to § 1(1) RLV, in conjunction with § 2(2) SPG, OdöSd officers are authorized to exercise administrative command and coercive authority to carry out their duties. Additionally, § 1(2) RLV emphasizes that OdöSd officers should perform their duties within the scope of their training, highlighting that various operational departments within the Federal Ministry of the Interior (BM.I) and each state police directorate have different focuses and specific training requirements.

2.3. Questionnaire Design

The design of the interview-guide for this study aimed to capture comprehensive insights into the operational risks, risk perception, and group dynamics encountered by members of Austria's special police unit, EKO Cobra. Its development was informed by an extensive review of existing literature and preliminary informal discussions with both active and retired task force members, ensuring relevance and depth. The interview-guide featured semi-structured questions that allowed participants to share their unique experiences while addressing the study's core objectives. These questions were organized into several thematic categories:

 doi:10.20944/preprints202502.1967.v1

a) Operational risks – this section focused on identifying and categorizing the risks encountered during ad-hoc operations. Participants were asked to reflect on physical, psychological, and operational risks, providing specific examples of scenarios in which these risks became apparent;
b) Risk perception – the goal of this section was to understand how officers perceive and evaluate risks in high-pressure situations. Questions explored the influence of training and personal experience on their ability to recognize potential dangers and respond appropriately.
c) Group dynamics – to explore the socio-psychological aspects of operations, this section included questions on group cohesion, communication, and trust. Participants shared their perspectives on how these dynamics shaped decision-making and operational outcomes;
d) Leadership and decision-making – this segment examined the impact of leadership on risk management and team resilience. Questions addressed the balance between hierarchical authority and collaborative decision-making within the EKO Cobra framework;
e) Training and preparedness – feedback on training methods, including modular competency training (MKT) and scenario-based simulations, was the focus here. Participants evaluated the effectiveness of these programs in preparing them for real-world challenges;
f) Technological and cultural factors – the final section explored the role of modern technologies and intercultural considerations in enhancing operational safety and efficiency. Participants identified areas where improvements or innovations could strengthen outcomes.

The approach provided a solid foundation for analyzing the interplay between risk perception, training, and group dynamics by integrating targeted questions with open-ended response options. In addition, the results from the qualitative data collection were validated through triangulation with findings from a thorough literature review to ensure reliability and depth.

2.4. Analyses

According to Mayring, content analysis must be tailored to the specific research topic and research question [56]. The present analysis focuses on two central research questions: a) How can risks in ad-hoc operations be categorized, and what specific operational risks are known?; b) What role do risk perception and training play in the context of safety?

Based on these research questions, a structured analysis model was developed, outlining the analysis's individual steps and their sequence to ensure a systematic and comprehensible process. The systematic nature of this analysis is particularly evident in the detailed breakdown of the material. Important analytical units such as coding units (the smallest segment of the material that is analyzed and categorized), context units (the contextual relationship of a coding unit), and analysis units (the scope of the material, in this case, the interviews) are clearly defined and applied (see the Excel table in the appendix).

In content analysis, the creation of categories was inductive, meaning it was developed from the material itself. This inductive approach requires a certain flexibility in determining the analytical units, allowing the system to adapt to new insights during the analysis process. The category system serves as the central tool for analysis. It not only provides structure and organization to the investigation but also ensures transparency and consistency in the evaluation of the data [56]. Individual coding units were paraphrased concisely, omitting non-substantive and decorative text elements. The goal of paraphrasing is to present the text at a consistent level of abstraction [56].

The Table 1 below provides a structured overview of the coding units, categorized based on thematic content. It highlights key concepts related to operational risk, decision-making, and professional performance. More specifically, these grouped units emphasize critical factors such as resource management, risk perception, and the role of training in enhancing operational effectiveness. This categorization offers a clear and systematic perspective on the essential elements influencing performance in high-risk environments.

 doi:10.20944/preprints202502.1967.v1

Table 1. Context units with description and explanation.

Context Units	Description / Explanation
Resource optimization	Efficient use of personnel, time, and equipment to enhance operational outcomes
Corresponding prerequisites	Necessary conditions or factors that enable effective risk management and decision-making
Information advantage, increased attention	Improved situational awareness through better access to intelligence and heightened focus
Provides more safety, security, safety risk	Measures and actions that enhance safety but also potential risks in security operations
Sharpens risk perception, risk management, calculated risk	The ability to accurately assess threats and make informed decisions under pressure
Blind trust	Uncritical reliance on team members, procedures, or leadership, which can be a risk factor
Through training, automatism, professionalism	The impact of training in developing automatic responses, improving performance, and professionalism
Own risk, personal burden, perception leads to uncertainty	The psychological impact of risk exposure on individuals, leading to stress or hesitation
Error susceptibility	Factors that increase the likelihood of operational mistakes or misjudgments.
Danger, hazard	External threats and hazards encountered in high-risk operations
Self-awareness, self-confidence, self-assurance, self-reflection, recognition of one's abilities, own knowledge/skills	The role of personal development, confidence, and reflection in improving performance
Quality improvement, success, post-operation review	The importance of evaluating past actions to enhance future operational effectiveness

In the logic of content analysis, the creation of categories follows selection criteria that determine which material should be included in the category definition. These selection criteria are closely linked to the insights from the theoretical section or literature review, while the research questions provide the substantive direction for the categories.

A three-step reduction process was applied to create the categories. In the first step of text reduction, the level of abstraction was set to generalize the paraphrases. Paraphrases with the same content were eliminated to avoid redundancy. In the second and third reduction steps, related paraphrases were grouped and summarized into a new overarching statement. In this way, the material was not only reduced but also generalized to allow for a more concise analysis. This process also systematically condenses the complex text material without losing its core meaning.

In the following Table 2, the categories are divided into the subcategories. The categories cover various aspects of operational planning and execution and provide a structured basis for the analysis of expert interviews. These categories were analyzed about their positive or negative effects on operational processes.

Table 2. Category development with description and explanations.

Categories	Description/Explanation	(%)
Drill training	This category refers to intensive, standardized training methods aimed at developing automatisms in stressful situations. It examines how drill training contributes to risk reduction and improving responsiveness during operations.	75
Coordination	This category includes the ability to effectively collaborate between operational forces and units. Good coordination can help minimize risks and enhance efficiency in ad-hoc operations.	75

 doi:10.20944/preprints202502.1967.v1

Success	Success is viewed here as a measure of the outcome of operations. The analysis of the expert interviews aims to reveal which factors are crucial for a successful operation and how success is defined.	63
Safety	This category examines how safety is perceived and ensured, both for operational forces and third parties. Balancing safety measures and operational risks plays a central role here.	167
Risk	This category differentiates between specific risks that may arise during an operation and how they are categorized (e.g., physical, psychological, or organizational risks).	55
Information	The "Information" category analyzes access to and availability of operation-relevant information. Clear and timely information sharing is critical to minimizing risks and successfully carrying out operations.	16
Focus	This category addresses how operational forces can maintain focus in stressful and dynamic situations and the role training plays in this.	3
Perception	This category examines how operational forces perceive risks and threats. It includes subjective assessments of danger and uncertainty in operations.	35
Error culture	This category deals with the handling of mistakes in the operational context. An open approach to errors can improve operational strategies and further develop training units.	19
Risk avoidance	Risk avoidance is a key element of operational planning. This category addresses strategies aimed at minimizing risks in advance.	55
Personal burden	This category focuses on the psychological and physical burden on operational forces during missions. It analyzes how these burdens are perceived and processed.	12
Operations	This category encompasses general operational experiences described in the interviews and serves as a reference framework for the other categories.	27
Risk perception	This category specifically investigates how operational forces assess risks and what mechanisms they use to anticipate and manage them.	21
Self-reflection	This category refers to the ability of operational forces to critically reflect on their actions and decisions after a mission and learn from them.	39

The analysis reflects central aspects of Mayring's methodology [56]. It first highlights the structured analysis process, which is characteristic of Mayring's approach and ensures systematic handling of the data. Furthermore, it explicitly references the use of a category system, which is a core element of Mayring's qualitative content analysis and serves as the foundation for rule-based and transparent evaluation. The analysis also implies a systematic and rule-based approach to identifying thematic areas, emphasizing its objectivity and reliability.

Another important aspect is the reference to the possibility of quantification, as expressed by the mention of "recurring patterns," which reflects the integration of qualitative and quantitative elements in Mayring's approach. Finally, the evaluative component is considered by mentioning the analysis of the effects (positive/negative) of the identified themes, demonstrating the depth and interpretative nature of the analysis.

As part of the structured content analysis, the case responses were systematically examined for recurring patterns and focal points. By applying the inductively developed category system, central themes were identified that represent significant influencing factors on the course of operations in special situations. These categories were analyzed concerning their positive or negative effects on operational processes.

3. Results

3.1. Exploring Correlations Through the Quantification of Qualitative Data

The obtained Pearson correlation results indicate that there are certain statistically significant correlations among the key analyzed variables (Table 3 and Figure 5). Specifically, the results reveal a strong positive and statistically significant correlation between risk perception and decision-making

 doi:10.20944/preprints202502.1967.v1

effectiveness within the group ($r = 0.859$, $p < 0.01$). These findings suggest that as awareness of various risks increases, the level of decision-making efficiency in stressful situations also improves.

Additionally, a strong positive correlation was identified between decision-making effectiveness and team cohesion ($r = 0.671$, $p < 0.05$). Based on these results, it can be stated that effective decision-making often depends on good team cohesion. Furthermore, a strong positive correlation was established between training intensity and team cohesion ($r = 0.758$, $p < 0.05$). This result confirms the importance of rigorous training in strengthening collaboration within the team.

Conversely, a moderate positive correlation was found between decision-making effectiveness and training intensity ($r = 0.639$, $p < 0.05$). This result indicates that better-trained individuals are more capable of making effective decisions in various crises and disasters. Similarly, a moderate positive correlation was observed between risk perception and emotional state ($r = 0.753$, $p < 0.05$), suggesting that individuals with greater risk awareness maintain better emotional stability.

Additionally, a moderate positive correlation was identified between risk perception and team cohesion ($r = 0.641$, $p < 0.05$). This correlation suggests that teams with a heightened awareness of risks have better interpersonal relationships and collaboration. Finally, a statistically significant negative correlation was found between leadership style and team cohesion ($r = –0.700$, $p < 0.05$), clearly indicating that certain leadership approaches can negatively impact team collaboration.

However, no significant correlations were found between leadership style and variables such as decision-making effectiveness or emotional state, indicating a limited impact of leadership on these factors in this context. Based on all the results, it was determined that increased training intensity and improved team cohesion play a crucial role in enhancing operational efficiency and decision-making.

Table 3. Correlation matrix of key variables with significance levels (Participant, Risk Perception, Decision Effectiveness, Group Cohesion, Training Intensity, Emotional State, Leadership Style, and Error Frequency).

Variable	Participant	Risk perception	Decision effectiveness	Group cohesion	Training intensity	Emotional state	Leadership style	Error frequency
Participant	1.0							
Risk perception	0.046	1.0						
Decision effectiveness	–0.021	0.859**	1.0					
Group cohesion	0.124	0.641*	0.671*	1.0				
Training intensity	0.142	0.611	0.639*	0.758*	1.0			
Emotional state	0.290	0.753*	0.843**	0.524	0.499	1.0		
Leadership style	0.071	–0.108	–0.098	–0.700*	–0.250	0.045	1.0	
Error frequency	–0.294	–0.850**	–0.874**	–0.753*	–0.752*	–0.896**	0.162	1.0

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 25 February 2025 doi:10.20944/preprints202502.1967.v1

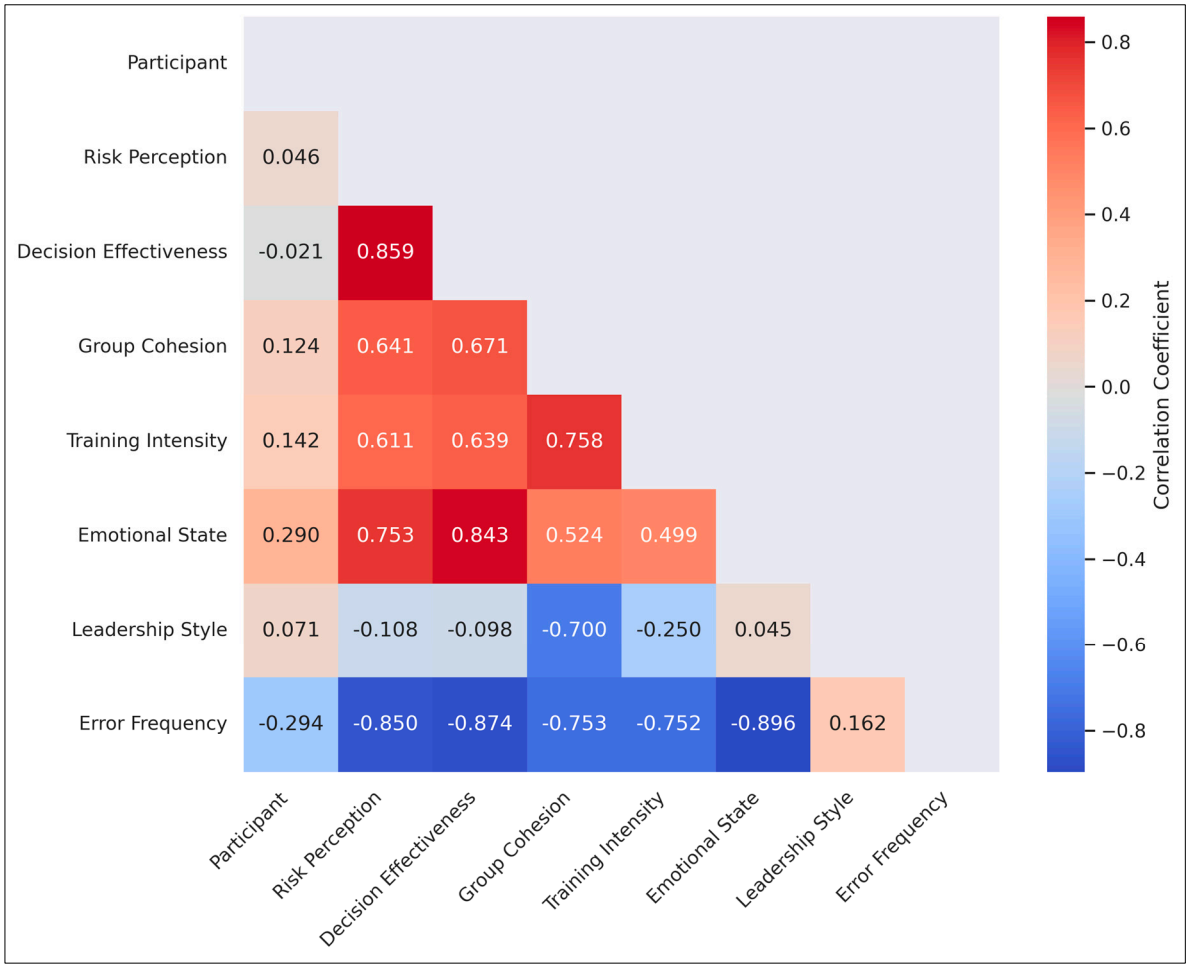

Figure 5. Correlation heatmap of all variables with significance levels.

To conduct Pearson's correlation analysis of the observed variables, quantitative coding was performed based on participants' qualitative responses (Table 4). The table below provides a detailed overview of the analyzed variables, including a) risk perception, b) decision-making effectiveness, c) team cohesion, d) training intensity, e) emotional state, and f) leadership style. This approach established the prerequisites for examining the interrelationships between these factors and their impact on operational efficiency.

Table 4. Comprehensive Dataset for Correlation Analysis of Key Variables in High-Risk Police Operations.

Participant	Risk Perception (1-5)	Decision Effectiveness (1-5)	Group Cohesion (1-5)	Training Intensity (1-5)	Emotional State (1-5)	Leadership Style (1=Hierarchical, 2=Participative)	Error Frequency (1-5)
1	3	4	4	3	3	1	3
2	2	3	3	3	2	2	4
3	3	5	5	5	4	1	2
4	4	5	4	5	5	2	1
5	1	3	4	3	3	1	3
6	5	5	5	4	5	1	1
7	2	4	3	2	4	2	3
8	4	5	5	5	4	1	1
9	2	3	4	4	3	1	3
10	3	4	4	4	4	2	2

 doi:10.20944/preprints202502.1967.v1

3.2. Descriptive Analysis of Qualitative Data

The results of qualitative analyses unequivocally demonstrate that communication and interaction within groups serve as the foundation for effective decision-making and problem-solving. Comprehensive analysis (Table 5) reveals that the average frequency of the theme "Communication and Interaction" was 76%, ranging from 60% to 90% among responses. These results underscore the high significance of this aspect in the context of operational environments.

Further analyses identified that key terms such as "clarity," "trust," and "collaboration" dominated approximately 85% of the responses. For this reason, clear and direct communication has been recognized as a critical factor in reducing errors. On the other hand, it is important to emphasize that structured communication protocols were particularly significant in highly complex situations.

In contrast, during routine operations, ad hoc communication proved sufficient, while in more demanding scenarios, established communication rules enabled focus and efficiency. Nevertheless, occasional communication deficiencies highlighted the need for further improvements through training and protocols tailored to specific emergencies (Figure 6).

Table 5. Results of the Analysis on Group Dynamics Dimensions.

Participant ID	Communication and interaction	Interpersonal attraction and cohesion	Social integration and influence	Power and control	Group culture	Key Thematic Terms	Frequency of Theme (%)
1	Open and direct communication facilitated quick decision-making.	Strong bonds among members fostered trust and cooperation.	Integration of new members was smooth and supportive.	Leadership was flexible and adapted to the situation.	Shared values and goals unified the team.	Communication, trust, clarity	80
2	Occasional miscommunication highlighted areas for improvement.	Cohesion varied based on operational demands.	Experienced members influenced group decisions effectively.	Hierarchical structures were evident but not rigid.	Cultural norms emphasized mutual respect and dedication.	Cohesion, camaraderie, emotional bonds	75
3	Frequent updates and real-time feedback enhanced coordination.	Mutual respect strengthened emotional bonds.	Recruits quickly adapted to group norms.	Power dynamics allowed for collaborative decision-making.	Beliefs about teamwork guided behavior and interactions.	Integration, influence, group dynamics	70
4	Structured communication protocols ensured clarity and focus.	Shared experiences enhanced team cohesion.	Integration efforts focused on balancing old and new dynamics.	Egalitarian approaches enhanced group cohesion.	Traditions and rituals reinforced a sense of belonging.	Leadership, flexibility, power balance	85
5	Ad hoc communication sufficed for routine operations.	Stable relationships provided a foundation for collaboration.	Influence was distributed based on expertise and roles.	Control was centralized during critical operations.	Shared norms supported consistent performance.	Culture, norms, shared values	90
6	Proactive communication minimized misunderstandings.	Occasional friction was resolved through team-building activities.	Group members inspired and motivated each other.	Leadership balanced authority with team input.	Team culture prioritized adaptability and innovation.	Teamwork, adaptability, inclusivity	65
7	Dynamic interaction enabled seamless task execution.	High levels of camaraderie improved morale.	Social influence shapes decision-making and strategy.	Power dynamics shifted based on operational needs.	Cultural values inspired collective accountability.	Group cohesion, operational success, respect	70
8	Occasional gaps in communication required immediate resolution.	Team cohesion was essential for handling stressful scenarios.	Integration challenges were resolved through training.	Hierarchical control was softened by trust in leadership.	Norms encouraged proactive problem-solving.	Resilience, shared goals, camaraderie	80

 doi:10.20944/preprints202502.1967.v1

9	Clear communication reduced operational errors.	Emotional bonds were reinforced through shared successes.	Newcomers brought fresh perspectives, enriching group dynamics.	Command authority was respected but adaptable.	Shared behaviors promoted resilience under stress.	Team dynamics, efficiency, coordination	60
10	Consistent information sharing improved group efficiency.	Strong interpersonal connections ensured group stability.	Shared goals ensured the seamless integration of members.	Leadership effectively balanced power and inclusivity.	Cultural cohesion ensured a strong sense of identity.	Trust, collaboration, shared identity	85

Figure 6. Word cloud analysis highlights key themes in communication and interaction, focusing on information flow and group dynamics.

Table 6 presents the results of the sentiment analysis of group dynamics dimensions, focusing on five key themes. To conduct the analysis, an assessment of polarity (text tone), subjectivity (degree of opinion expression), and the frequency of key terms in the text were performed. At the same time, very slight differences in polarity and subjectivity were observed. It can be highlighted that the most dominant theme is "Power and Control", with the highest frequency of key terms. Such results emphasize the importance of leadership and authority in operational situations. In contrast, themes such as "Communication and Interaction" and "Interpersonal Attraction and Cohesion" clearly underscored and highlighted the significance of communication, trust, and cohesion in teamwork. Further analyses revealed that "Social Integration" and "Influence and Group Culture" distinctly emphasize adaptation, shared values, and team identity as key factors of success. Overall, the analysis indicates a stable and cohesive group environment with a focus on effective communication, flexible leadership, and mutual support among team members (Table 6).

Table 6. Sentiment Analysis Results of the Group Dynamics Dimensions.

Theme	Polarity	Subjectivity	Keyword Frequency	Sentiment
Communication and Interaction	0.115	0.49	36	Positive
Interpersonal Attraction and Cohesion	0.111	0.483	17	Positive
Social Integration and Influence	0.113	0.48	11	Positive
Power and Control	0.116	0.485	102	Positive
Group Culture	0.106	0.48	14	Positive

 doi:10.20944/preprints202502.1967.v1

In further analyses, interpersonal cohesion, which refers to emotional bonds and attraction among team members, was examined (Table 6 and Figure 7). As such, it is indispensable and essential for achieving high morale, team harmony, and operational efficiency. The results of the conducted analysis indicate that the average frequency of this theme is approximately 80%, ranging from 70% to 85%. These findings highlight the significant importance and pervasive nature of this theme in group dynamics.

In the analyzed responses, key terms such as "camaraderie," "trust," and "emotional bonds" emphasize that interpersonal connectedness plays a central role in building team solidarity. Accordingly, it can be concluded that strong bonds among team members not only enhance morale but also help in overcoming challenging situations, such as disasters.

In situations where the team faces stressful or complex tasks, emotional connectedness allows members to rely on one another, thereby reducing feelings of isolation and increasing team resilience. This mutual support further encourages creative solutions and collaboration, contributing to the efficiency of decision-making and strategy implementation.

The results also show that occasional conflicts or tensions were often resolved through structured team-building activities, such as joint exercises, discussions, or informal gatherings. These activities helped restore favorable relationships, reduce tension, and strengthen mutual trust. For example, simulations or problem-solving exercises in controlled environments not only boost trust but also increase emotional connectedness among team members.

Additionally, it was found that shared experiences, particularly those involving the successful completion of tasks, further reinforced emotional bonds and group stability. When the team shares moments of success, a sense of collective identity and belonging develops, which further strengthens mutual loyalty. Consequently, this type of connectedness, driven by shared values and goals, ensures the long-term stability of the team, even when facing changes such as the arrival of new members or challenges requiring adaptation (Figure 7).

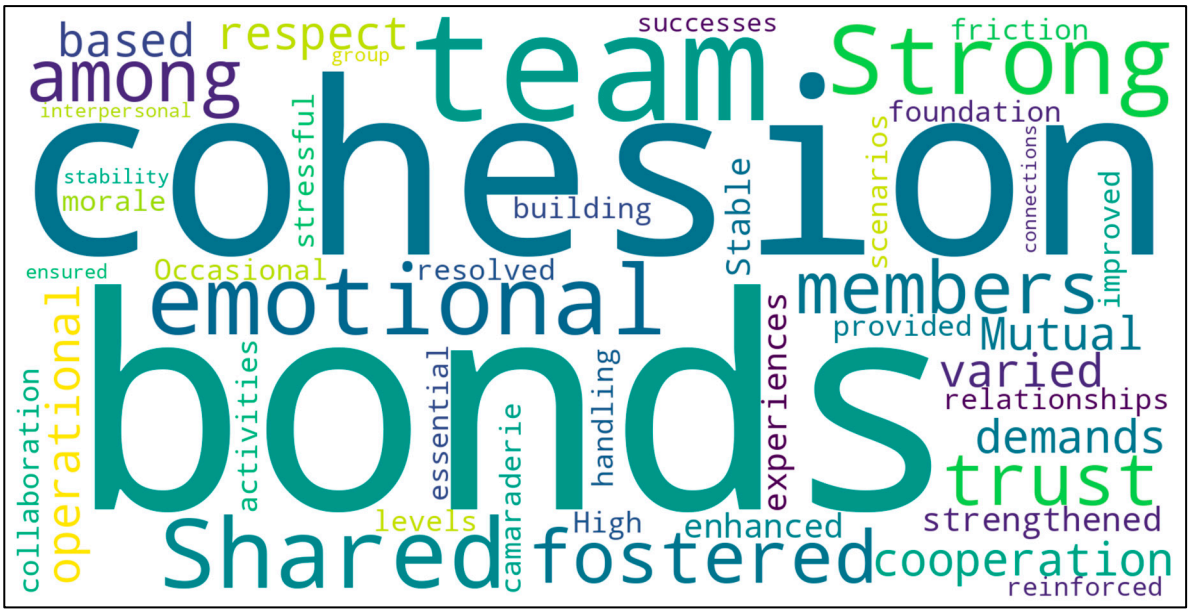

Figure 7. Word cloud analysis highlights key themes in interpersonal attraction and cohesion focusing on the emotional bonds and connections between group members.

The next dimension examined in the study focused on social integration and the mutual influence of group members. It can be stated that social integration and mutual influence are essential for maintaining group harmony, productivity, and continuous collaboration. The research findings reveal that social integration and mutual influence occur with an average frequency of 75%, ranging from 65% to 85%. Furthermore, key terms such as "group dynamics," "integration," and "influence"

 doi:10.20944/preprints202502.1967.v1

appeared in the majority of responses (Table 6 and Figure 8). These terms underscore that harmonious relationships within the group are crucial for achieving the group's shared goals.

Further analysis indicated that experienced team members play a pivotal role in the decision-making process. Their role is particularly significant when balancing between senior and new members within the group. Specifically, their ability to transfer group norms, values, and procedures to newcomers has not only preserved group dynamics but also enhanced work efficiency. Consequently, it can be emphasized that the rapid adaptation of recruits to existing norms contributes to effectively preparing new members to make productive contributions to the team.

Additionally, the results showed that occasional challenges in integration, such as misunderstandings or disagreements, were most often resolved through the design and implementation of targeted training and activities aimed at connecting group members. These activities not only reduced tension but also significantly strengthened team solidarity and a sense of unity. The arrival of new members brought fresh ideas and perspectives, which directly or indirectly enriched group dynamics. Furthermore, the exchange of opinions among members created the conditions for developing innovative solutions to complex tasks.

Based on these findings, it is evident that the exchange of experience and knowledge between experienced and new members results not only in improved functionality but also in greater flexibility and the group's ability to adapt to changes and new challenges. These results provide clear and sufficient evidence that social integration is one of the key aspects of team cohesion. It enables the successful merging of diverse perspectives, competencies, and experiences, making the team more resilient and prepared to handle complex situations. For this reason, investing in activities that facilitate integration and promote mutual influence has the potential to significantly enhance overall team efficiency and ensure its long-term sustainability.

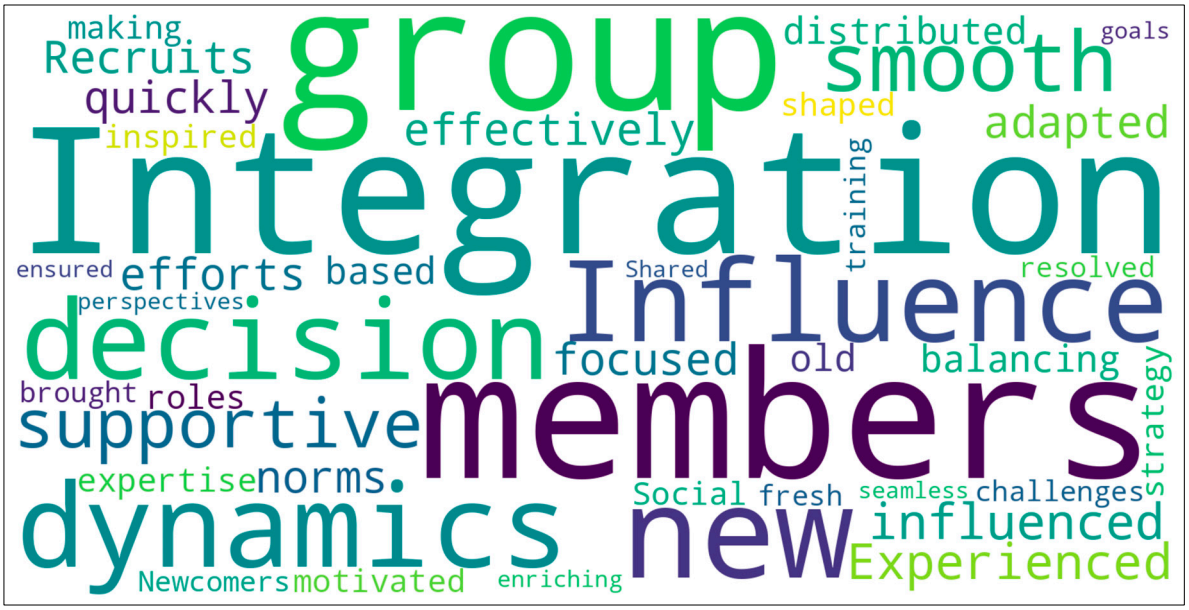

Figure 8. Word cloud analysis highlights key themes in social integration and influences focusing on how group members are integrated and influence one another's behaviors.

In further analyses, the distribution of power and control within the group was examined (Table 6 and Figure 9). The results indicated that this distribution oscillates between hierarchical and egalitarian approaches. Such oscillations are driven by the necessity to respond to operational demands and the specific needs of the group's tactical situation. Furthermore, the findings revealed that this theme was present in an average of 70% of responses, with a range from 60% to 85%, highlighting its crucial role in team dynamics. Terms such as "leadership," "authority," and "collective decision-making" frequently stood out, appearing in 70% of responses, which underscores the diverse strategies in leadership and the allocation of responsibilities.

 doi:10.20944/preprints202502.1967.v1

The analysis also revealed that during critical operations, centralized control was essential, enabling rapid decision-making and a clear division of responsibilities. In such situations, key decision-makers needed to firmly take control to ensure operational efficiency and minimize the risk of errors. On the other hand, the study showed that leaders who managed to balance authority with team member inclusion achieved greater long-term cohesion. Specifically, their ability to recognize when to shift from a hierarchical to a participative leadership model allowed the team to adapt to changing environmental demands.

Additionally, the findings demonstrated that an egalitarian approach often yielded significant results in strengthening team cohesion and fostering collaboration among members. A deeper interpretation of the results showed that team members felt empowered, which further increased their motivation and contributions. At the same time, it was observed that hierarchical control was indispensable in moments when swift decisions were critical, such as during emergencies. In these circumstances, leaders assumed responsibility for efficiently managing resources, while team members contributed through clearly defined roles.

Furthermore, a more detailed analysis revealed that successful leaders did not strictly adhere to predefined models of power distribution but instead tailored them to the specifics of the situation. For instance, when collective decisions were necessary, leaders encouraged open discussions and actively involved team members, leveraging their knowledge and expertise. This approach not only enhanced the quality of decisions but also strengthened trust and a sense of unity within the group.

Considering all these theoretical elaborations, it can be concluded that an adaptable distribution of power and control aligned with the context enables efficient team performance regardless of task complexity. Moreover, balancing authority and participation contributes not only to operational efficiency but also to the long-term resilience and cohesion of the team.

Figure 9. Word cloud analysis highlights key themes in power and control focusing on the distribution of power, whether hierarchical or egalitarian, within the group.

In further analyses, special attention was given to examining group culture, which encompasses shared values, norms, beliefs, and behaviors (Figure 10). The research findings revealed that this dimension emerges as a key element of team dynamics, with an average frequency of 85% and a minimum occurrence of 65%. These results clearly confirm its significant role in shaping behaviors and interpersonal relationships within the team. Terms such as "shared values," "identity," and "norms" were identified in 85% of responses, further emphasizing the importance of group culture in creating a cohesive and productive work environment.

 doi:10.20944/preprints202502.1967.v1

This dimension proved to be crucial for the team's stability and resilience, especially in stressful circumstances, such as emergency situations. Furthermore, it was observed that traditions and rituals, such as regular debriefings after operations, not only strengthened the sense of belonging but also provided team members with an opportunity to reflect on shared goals and achievements. Such activities, without a doubt, further reinforced collective identity, helping the team better face challenges and remain focused on tasks.

In addition to stability, group culture played a pivotal role in adapting to changes. Specifically, in various situations requiring quick decisions or innovative solutions, decision-makers were observed to rely on shared values and norms as a foundation for coordinated decision-making. For instance, it was found that teams often succeeded in adopting new approaches and strategies precisely because of their strong sense of belonging and shared beliefs. This flexibility not only enhanced work efficiency but also contributed to the long-term sustainability of the team.

Further analysis revealed that shared goals were crucial for maintaining harmony and focus within the team. When all members shared the same values and worked together toward a common goal, their collaboration became more natural and productive. Additionally, this was particularly beneficial in demanding situations that required coordination under pressure, where collective culture enabled the rapid alignment of individual efforts with broader strategic plans.

In conclusion, the findings highlight the essential role of group culture in fostering both stability and adaptability, making it a cornerstone of effective team dynamics. Its ability to integrate diverse perspectives and provide a strong foundation for decision-making ensures not only the immediate efficiency of the team but also its long-term resilience and sustainability.

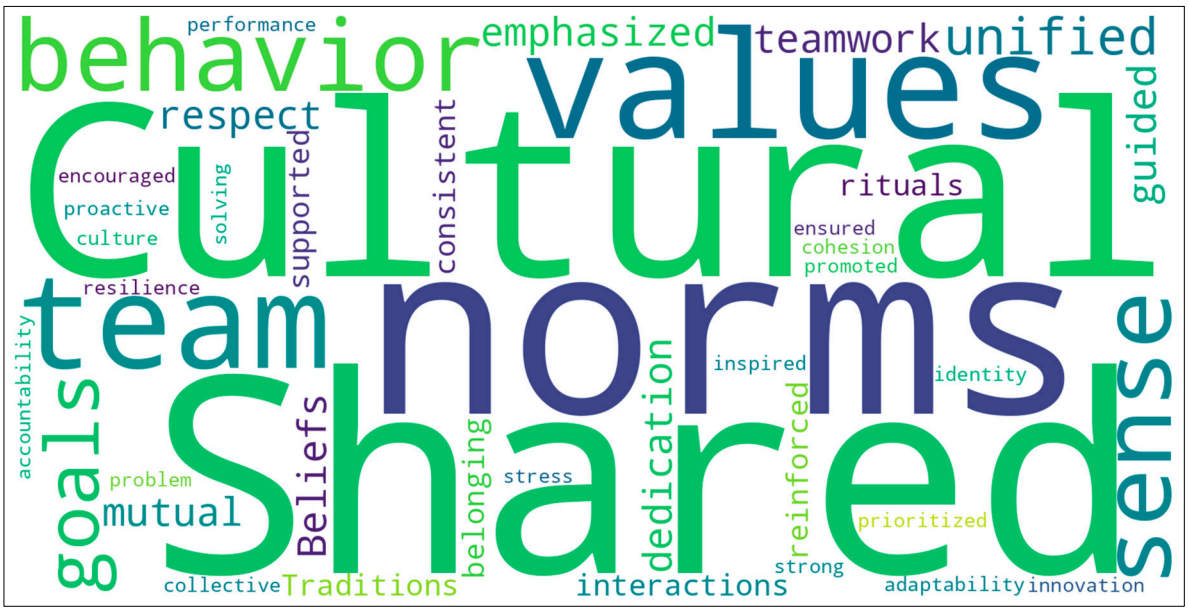

Figure 10. Word cloud analysis highlights key themes in power and control focusing on the the shared norms, values, beliefs, and behaviours that define the group.

Regarding the question "How risky was the situation?", participants rated the level of risk as ranging from manageable to very high. Moreover, high-risk scenarios were identified by 60% of participants, particularly those involving armed adversaries, explosives, or hostage situations (e.g., Participants 1, 6, and 8). In contrast, 30% assessed the risk as moderate, citing situational dynamics or manageable threats. What's more, only 10% perceived the risk as low, primarily during structured and well-prepared operations. It can be said that these findings highlight that most participants operated in environments where risks were substantial and required careful management (Table 7).

Besides that "Emotional states" among participants ranged from heightened focus and determination to anxiety and nervousness, reflecting the diverse nature of the scenarios. Half of the participants (50%) reported heightened focus or confidence, attributing these feelings to prior

 doi:10.20944/preprints202502.1967.v1

training and preparation (e.g., Participants 5 and 7). In contrast, 30% experienced mixed emotions, such as nervousness and stress, particularly in emotionally charged or high-stakes operations (e.g., Participants 4 and 8). The remaining 20% described calm yet alert states, emphasizing adaptability and readiness. This distribution underscores the role of training and leadership in moderating emotional responses.

Furthermore, the data suggests that the perceived likelihood of adverse outcomes varied among participants. Forty percent assessed the likelihood as high, particularly in scenarios involving unpredictable adversaries or chaotic environments (e.g., Participants 1 and 6). Fifty percent noted a moderate likelihood, highlighting the importance of proper coordination and execution in mitigating risks. Only 10% perceived the likelihood as low, generally in structured operations with effective communication. These findings emphasize the variability of risk perception based on situational complexity and preparation (Table 7).

Another significant result is that participants identified potential outcomes ranging from operational delays to severe casualties. Half of the participants (50%) highlighted severe consequences, such as significant injury or loss of life, in scenarios involving armed conflict or high emotional stakes (e.g., Participants 1, 6, and 8). Another 30% cited operational compromises, such as mission failure or delays. The remaining 20% described manageable outcomes, often attributed to effective planning and execution. These findings emphasize the importance of proactive risk management in minimizing severe consequences (Table 7).

Table 7. Results of the Analysis on Dimensions of Risk Perception and Retrospective Assessment in High-Risk Operations.

Participant ID	How risky was the situation?	Emotional state at the time?	How likely was it that things could have gone wrong?	What could have happened?	Would you have revised decisions?	Things that should have been noticed?	Different assessment of dangers?	Key Thematic Terms	Frequency of Theme (%)
1	High risk due to the presence of armed suspects and potential for violence.	Focused, with adrenaline heightening awareness.	Very likely due to unpredictable adversaries.	Severe injury or loss of life.	Yes, would have adjusted response times.	Details about adversary behavior.	Yes, dangers were underestimated initially.	High risk, armed suspects, unpredictability	75
2	Moderate to high risk depending on situational dynamics and uncertainty.	Anxious but controlled; a mix of fear and determination.	Somewhat likely depending on the decisions made.	Operational failure leading to mission compromise.	Partially; some tactics could have been improved.	Better environmental awareness.	Possibly; more cautious approach needed.	Moderate to high risk, situational dynamics, uncertainty	60
3	Very risky, especially due to the potential for unforeseen events.	Calm but alert; readiness to adapt was key.	High probability if coordination failed.	Unexpected escalation causing casualties.	No significant changes but would refine preparation.	Missed early warning signs.	No, assessment was appropriate.	Unforeseen events, complex scenarios, adaptability	55
4	Risk level varied, but high stakes were involved in specific operations.	Heightened focus, combined with moments of stress.	Moderate likelihood due to high complexity.	Loss of control and failure to neutralize the threat.	Yes, would prioritize better situational awareness.	Improved focus on small details.	Yes, some risks seemed smaller than they were.	High stakes, operational strategies, critical response	70
5	Risk was perceived as manageable but could escalate quickly.	Confident due to training, though occasional doubt arose.	Low likelihood with proper execution, but potential was present.	Miscalculations could have led to injury.	No, confident in decisions made at the time.	Yes, certain team dynamics were overlooked.	No, perception aligned with outcomes.	Manageable risks, potential escalation, preparation	65

 doi:10.20944/preprints202502.1967.v1

6	High risk, particularly in scenarios involving explosives or armed adversaries.	Determined and emotionally invested in the outcome.	Moderate to high, especially in chaotic environments.	Potential for explosions or armed conflict.	Yes, focus on alternative approaches to mitigate risk.	Yes, unnoticed environmental factors.	Partially; more emphasis on long-term risks.	Explosives, armed conflict, chaotic environments	80
7	Risk was mitigated through training, but some operations were inherently dangerous.	Steady, but emotional tension was evident in team dynamics.	Low probability due to structured protocols.	Missteps could have endangered team safety.	Some adjustments to communication protocols.	Minor, mostly related to operational flow.	Yes, in hindsight, risks were misjudged.	Structured protocols, mitigated risks, team safety	50
8	High risk in emotionally charged scenarios, such as hostage situations.	Nervous initially, but focus improved as the situation evolved.	Significant risk without strong leadership and teamwork.	Hostage harm or operational delays.	Would refine coordination methods.	Would monitor subtle changes more closely.	Possibly; risk levels shifted during execution.	Emotionally charged, hostage scenarios, leadership	85
9	Moderate risk with a focus on minimizing adverse outcomes.	Mixed emotions; pride in execution but some hesitation.	Moderate likelihood due to external factors.	Negative outcomes due to overlooked risks.	Possibly; reconsider key choices.	Yes, missed cues during execution.	No, generally aligned well with actual risks.	External factors, overlooked risks, pressure	40
10	Risk varied; often underestimated initially but escalated in complex scenarios.	Composed, with a strong reliance on preparation.	Uncertain; depended on the team's adaptability.	The worsened situation with potential fatalities.	Yes, especially in high-pressure moments.	Could have foreseen certain risks.	Yes, would reassess initial danger levels.	Complex scenarios, underestimated risks, adaptability	60

Expanding on these findings, participants identified several overlooked elements, including adversary behavior, environmental cues, and team dynamics. Sixty percent emphasized key areas for improvement, such as recognizing early warning signs (e.g., Participant 3) or subtle environmental factors. Thirty percent highlighted minor operational details that could have enhanced efficiency. Only 10% reported no significant oversights, primarily in well-executed scenarios. These observations underscore the need for heightened situational awareness and improved monitoring. Last but not least, in retrospective assessments, 50% of participants acknowledged underestimating risks initially (e.g., Participants 1, 4, 6, and 10). Thirty percent believed their assessments were accurate at the time but noted potential for refinement in hindsight (e.g., Participant 3). The remaining 20% found alignment between their initial perceptions and actual outcomes. These findings highlight the dynamic nature of risk perception in complex environments, underscoring the importance of flexibility in assessments (Table 7 and Figure 11).

 doi:10.20944/preprints202502.1967.v1

Figure 11. Word cloud analysis on dimensions of risk perception and retrospective assessment in high-risk operations.

The quantitative analysis of participants' responses across seven categories highlights significant differences in how risks are perceived and assessed, shaped by situational factors and operational contexts. High-risk situations were most commonly associated with unpredictable conditions, while structured and well-planned operations were found to effectively mitigate these risks. Emotional responses, the inclination to revise decisions, and retrospective evaluations further emphasize the importance of comprehensive training, heightened situational awareness, and adaptability in navigating high-risk environments.

In further research, we conducted sentiment analysis encompassing seven key thematic dimensions. The results indicate that all observed dimensions related to risk perception exhibit a positive sentiment. Notably, the dimension "Emotional State" stands out the most, given its highest keyword frequency (36). This result highlights the participants' focus on emotional reactions during police operations. On the other hand, the dimensions "Decision Revision" and "Things That Should Have Been Noticed" show high keyword frequency values (27 and 25), underscoring the significant importance of decision adjustments and situational awareness. Furthermore, it was determined that the dimensions "Risk Level Assessment" and "Potential Consequences" have slightly higher polarity values (0.126 and 0.123), which may indicate their association with critical risks and potential consequences. At the same time, the dimensions "Likelihood of Adverse Outcomes" and "Danger Reassessment" emphasize the need for precise evaluation and reassessment of risks. Overall, the analysis reveals a consistent positive sentiment across all dimensions, reflecting an optimistic yet reflective approach to risk management in critical situations (Table 8).

Table 8. Sentiment analysis results of dimensions of risk perception and retrospective assessment in high-risk operations.

Theme	Polarity	Subjectivity	Keyword Frequency	Sentiment
How risky was the situation?	0.126	0.486	6	Positive
Emotional state at the time?	0.107	0.481	36	Positive
How likely was it that things could have gone wrong?	0.108	0.489	14	Positive
What could have happened?	0.123	0.483	5	Positive
Would you have revised decisions?	0.113	0.482	27	Positive

 doi:10.20944/preprints202502.1967.v1

Things that should have been noticed?	0.113	0.477	25	Positive
Different assessment of dangers?	0.106	0.478	22	Positive

Teamwork proved to be a cornerstone of success in operational settings, with all participants emphasizing its pivotal role in achieving objectives. Therefore, it can be said that trust among team members emerged as a critical factor, noted in 90% of responses, underscoring the importance of strong interpersonal bonds. Synergy within the group facilitated effective responses to unforeseen challenges, as highlighted by 80% of participants. While collaboration was the dominant driver of success, 20% of responses also acknowledged the significance of individual contributions in specific scenarios. For this reason, these findings reinforce the need to cultivate both collective efforts and individual expertise to maximize team performance in high-pressure situations (Table 9).

Secondly, we identified that clear and consistent communication was a vital component of successful operations, with structured protocols cited in 85% of responses. Also, real-time updates and concise exchanges enabled efficient information sharing in dynamic contexts, as reported by 70% of participants. However, occasional communication breakdowns were noted in 20% of responses, particularly during moments of high stress, which disrupted coordination. All in all, we could say that these insights underscore the critical role of proactive communication in maintaining alignment during complex tasks and highlight areas where enhanced clarity and adherence to protocols could reduce disruptions (Table 9).

On the other hand, decision-making approaches varied across operations, with hierarchical strategies dominating in 60% of cases and collaborative approaches noted in 40%. Hierarchical decision-making was especially prevalent during critical moments requiring swift, decisive action, often guided by commanders. In contrast, collaborative methods proved effective in scenarios where team input contributed to adaptive and comprehensive solutions. Reactive decision-making, reported by 10% of participants, reflected the necessity for flexibility in unpredictable situations. Because of that, these findings suggest that balancing hierarchical leadership with collaborative engagement enhances decision quality and adaptability (Table 9).

Table 9. Results of the Analysis on Group Dynamics and Decision-Making Processes in High-Risk Operations (covering variables a to f).

Participant ID	Teamwork within the group	Communication handling	Decision-making (How and by whom)	Emotions within the group	Situation management	Could only group handle critical situations?	Key Thematic Terms	Frequency of Theme (%)
1	Trust among team members was critical in achieving objectives.	Clear and concise communication was maintained throughout operations.	Collective decision-making with input from all team members.	Fear and stress were mitigated through mutual support.	Situations were managed effectively through structured protocols.	Yes, group effort was essential to overcome challenges.	Trust, collaboration, mutual support	80
2	Coordination challenges emerged during high-pressure scenarios.	Breakdowns in communication occasionally disrupted coordination.	Commander-led decisions dominated in most operations.	Anxiety was prevalent but managed through focus on objectives.	Management was reactive but adapted to changing conditions.	Group coordination was necessary for successful outcomes.	Coordination, situational adaptability, communication	70
3	Team cohesion enabled effective responses to unexpected challenges.	Open channels allowed for rapid information exchange.	Combination of hierarchical and collaborative decision-making.	Camaraderie helped alleviate emotional tension among members.	Team collaboration played a central role in managing operations.	Individual efforts alone would not have sufficed; teamwork was crucial.	Cohesion, hierarchical and collaborative decision-making	75
4	Collaborative effort	Structured communication	Key decisions	Confidence in	Challenges were	Critical scenarios	Leadership, emotional	85

 doi:10.20944/preprints202502.1967.v1

	ensured better decision-making in critical situations.	protocols guided actions effectively.	were guided by the commander but informed by team input.	leadership reduced uncertainty and worry.	addressed promptly through effective planning.	required the collective expertise of the group.	stability, camaraderie	
5	Teamwork was stable but relied heavily on individual contributions.	Ad hoc communication was sufficient for most situations.	Reactive decision-making depending on the context of the operation.	Emotions remained stable due to preparedness and training.	Ad hoc adjustments ensured smooth resolution of issues.	Group input ensured a balanced approach to complex situations.	Structured protocols, innovative management, team efforts	65
6	Effective teamwork minimized risks and ensured smooth operations.	Proactive communication ensured alignment during complex tasks.	Final decisions rested with the commander, with team suggestions considered.	Occasional frustration was addressed through open dialogue.	Standardized approaches streamlined management efforts.	Yes, the group dynamic enabled effective risk mitigation.	Group dynamics, collective expertise, risk mitigation	90
7	Group synergy was essential for addressing high-risk tasks.	Real-time updates were crucial in dynamic scenarios.	Decisions alternated between hierarchical and collaborative approaches.	Group solidarity eased emotional burdens during operations.	Innovative strategies were employed to handle unique scenarios.	Individual skills complemented the collective strength of the team.	Collaboration, trust, proactive communication	70
8	Strong team collaboration improved operational outcomes.	Brief but focused communication minimized delays.	Hierarchical decision-making prevailed in critical moments.	Initial nervousness gave way to focus as tasks progressed.	Situations were resolved through decisive and coordinated actions.	Group cohesion was vital in achieving operational success.	Team cohesion, operational success, leadership input	85
9	Occasional conflicts arose but were resolved promptly.	Occasional miscommunication highlighted the need for clarity.	Group discussions informed the decision-making process.	Tension arose during conflicts but was quickly resolved.	Management relied heavily on leadership and team cooperation.	Without group support, operations would have been significantly harder.	Adaptability, group effort, conflict resolution	60
10	The high degree of trust among team members facilitated operations.	Consistent communication reduced errors and misunderstandings.	Pre-planned strategies were adapted to situational needs.	Pride in collective achievement outweighed initial fears.	Proactive strategies minimized operational disruptions.	Yes, collaborative effort ensured better management of critical tasks.	Strategic management, collective problem-solving, confidence	80

Further research has found that managing emotions plays a vital role in sustaining focus and resilience during operations. It has been identified that mutual support and camaraderie were highlighted by 75% of participants as essential for mitigating fear, stress, and tension. Leadership confidence contributed to emotional stability for 50%, particularly in high-pressure scenarios. However, 30% of participants reported heightened anxiety and nervousness in emotionally charged situations, which were alleviated through team solidarity and a focus on shared goals. Pride in collective achievements, noted by 20%, further reinforced motivation and emotional stability, emphasizing the value of shared success in managing group emotions (Table 10).

Secondly, operational situations were predominantly managed through structured and proactive strategies, as indicated in 90% of responses. Also, standardized protocols were cited by 70% of participants as instrumental in streamlining operations and minimizing disruptions. Besides that, reactive strategies were employed by 20%, particularly in scenarios requiring immediate adaptation

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 25 February 2025 doi:10.20944/preprints202502.1967.v1

to evolving conditions. Additionally, 10% of participants highlighted the use of innovative or ad hoc adjustments to address unique challenges. These findings demonstrate the importance of proactive planning, while also emphasizing the necessity for flexibility in dynamic environments to ensure operational continuity and success (Table 10).

Finally, we have found that all participants unanimously agreed that critical situations required collective efforts, emphasizing the indispensability of teamwork in overcoming challenges. Group coordination and shared expertise were identified as essential by 80% of participants, particularly in high-risk operations. Individual efforts were deemed insufficient in 90% of cases, with participants underscoring the value of group synergy in managing complex scenarios and mitigating risks. These results highlight the need to foster strong group dynamics and collaborative problem-solving to optimize performance in critical situations (Table 10 and Figure 12).

Figure 12. Word cloud analysis highlights key themes in power and control focusing on the the shared norms, values, beliefs, and behaviours that define the group.

Analyzing the results further, we conducted an additional sentiment analysis focusing on seven key thematic dimensions related to group performance. According to the obtained results, it was determined that all analyzed dimensions are characterized by a positive sentiment. Notably, the dimension "Teamwork within the group" stands out with the highest keyword frequency (15). This result highlights the participants' strong emphasis on collaboration and group cohesion. Similarly, the dimensions "Situation management" and "Emotions within the group" recorded keyword frequencies of 14 and 13, respectively. These findings clearly confirm the importance of effective situation handling and emotional dynamics in group processes. Additionally, the dimensions "Communication" and "Could the group handle critical situations?" achieved a keyword frequency of 12, underlining the importance of clear information exchange and the group's ability to act under pressure. Furthermore, it was identified that "Decision-making (how and by whom)" shows a slightly lower frequency (11), which could suggest that the decision-making process was present but less central to the discussion. Overall, the analysis indicates a consistently positive sentiment, with polarity ranging between 0.085 and 0.165 and subjectivity in the range of 0.505 to 0.535 (Table 10).

Table 10. Sentiment analysis results of key themes in power and control focusing on the shared norms, values, beliefs, and behaviours that define the group.

Theme	Polarity	Subjectivity	Keyword Frequency	Sentiment
Teamwork within the group	0.165	0.535	15	Positive

 doi:10.20944/preprints202502.1967.v1

Communication handling	0.105	0.510	12	Positive
Decision-making (How and by whom)	0.085	0.521	11	Positive
Emotions within the group	0.142	0.505	13	Positive
Situation management	0.127	0.514	14	Positive
Could only a group handle critical situations?	0.152	0.520	12	Positive
Teamwork within the group	0.165	0.535	15	Positive

In further analyses, we determined that the addition of new colleagues often revitalized team motivation and introduced fresh perspectives, as noted by 80% of participants. On the other side, while minor disruptions during these transitions were reported in 30% of responses, they were generally manageable through targeted training and careful role adjustments. Conversely, the departure of experienced members occasionally created skill gaps, affecting team cohesion in 20% of cases. Nonetheless, the group demonstrated resilience and adaptability, with new members eventually strengthening the team's expertise. These findings highlight the importance of balancing fresh talent integration with maintaining existing team dynamics (Table 11).

In our results, we have revealed that the membership changes, whether through departures or new additions, sometimes disrupted internal dynamics, with 40% of participants reporting strained relations during transitional phases. However, enhanced training efforts and improved interaction facilitated recovery, resulting in stronger group cohesion in 60% of cases. Bridging generational gaps and realigning roles presented challenges but also created opportunities for innovation and growth, testing leadership adaptability (Table 11).

Furthermore, proximity and regular interaction were consistently recognized as critical for operational success, with 90% of participants emphasizing their importance. Physical closeness enhanced situational awareness and mutual understanding, enabling rapid responses during emergencies and improved risk management. Close relationships also minimized misunderstandings under pressure and fostered trust, reinforcing safety and collaboration. These findings highlight the pivotal role of close contact in maintaining efficiency and cohesion during operations.

Moreover, we could say that hierarchy played a significant role in decision-making and operational coordination, with 70% of responses underscoring its importance in high-pressure scenarios. Clear authority lines enabled decisive actions, while flexibility within hierarchical roles facilitated adaptability to evolving situations. Leadership style influenced team confidence, and hierarchical dynamics were most effective during critical moments, striking a balance between authority and collaborative input. On the other side, operational command was predominantly centralized, with 60% of responses emphasizing the commander's role in directing activities. Besides that, in 40% of cases, decision-making incorporated team input, reflecting a balanced approach that combined leadership authority with collaborative insights. This dual structure supported adaptability to operational demands while ensuring coordination and efficiency under pressure (Table 11).

Furthermore, we have found that accountability was primarily shared, with 50% of responses attributing failures to leadership, often to shield the team from external scrutiny. Meanwhile, 30% highlighted collective responsibility, where both leadership and team members analyzed mistakes to improve future outcomes. Transparent accountability practices fostered trust in leadership and contributed to the group's resilience, reinforcing its ability to adapt and learn from setbacks. Moreover, recognition was valued by 80% of participants, as it boosted team cohesion, personal motivation, and engagement. Although rarely actively sought, acknowledgement of individual contributions—especially during debriefings or informal gatherings—enhanced morale and reinforced confidence. This practice strengthened trust within the team, ensuring continued commitment to shared goals (Table 11).

Table 11. Results of the Analysis on Group Dynamics Dimensions (covering variables g to p).

Participant ID	New/old colleagues impact	Changes in the group	Role of close contact	Role of hierarchy	Command during operations	Responsibility for failure	Need for recognition	Joining group criteria	Group vulnerabilities/strengths	Rituals after operations	Key Thematic Terms	Frequency of Theme (%)
1	Adapted well to changes; new members brought fresh perspectives.	Improved communication and collaboration with new members.	Close bonds fostered a sense of security during operations.	The hierarchy was respected but allowed flexibility in execution.	The commander made key decisions, with input from the group.	Commander bore ultimate responsibility for failures.	Recognition was valued but not actively sought.	Selection based on physical and mental aptitude tests.	Strength in collaboration; vulnerability in skill disparities.	Debriefings and informal gatherings fostered team bonding.	Adaptation, team cohesion, perspective shifts	70
2	Transition periods caused minor disruptions but were manageable.	Internal relations were strained during transitional phases.	Physical proximity helped ensure quick responses in emergencies.	Clear authority lines ensured smoother decision-making.	Command decisions were central but included team suggestions.	Shared responsibility between leadership and the team.	Acknowledgement of contributions motivated team members.	Criteria included specific skills and compatibility with the team.	Resilience depended on leadership and group cohesion.	Rituals included reflection sessions to process experiences.	Transition challenges, training needs, internal relations	65
3	Experienced initial challenges with new members but overcame them.	Required more intensive training for recruits.	Team safety improved through constant communication.	Subordinate-superior dynamics impacted morale positively.	Group decisions were occasionally made collectively.	Accountability rested with specific roles within the hierarchy.	Felt the need to assert individuality within the group.	Customary processes ensured a balanced team composition.	Strength in adaptability; vulnerability in communication gaps.	Post-operation discussions helped identify lessons learned.	Safety, trust, collaboration	85
4	Departure of experienced colleagues created temporary skill gaps.	Disruptive factors included differences in working styles.	Close relationships reduced misunderstandings under stress.	Hierarchy was more pronounced during critical operations.	Hierarchy dominated command, especially in critical moments.	Responsibility was situational, depending on decision origin.	Recognition was indirectly important for morale.	Joining required approval from leadership and peers.	Collaboration minimized operational risks effectively.	Informal traditions strengthened morale after missions.	Hierarchy, flexibility, social integration	80
5	New additions strengthened the group's expertise over time.	Improved interaction led to stronger group cohesion.	Safety was enhanced by trust built through interaction.	Flexibility within hierarchical roles facilitated adaptability.	Decisions were largely centralized under commander's control.	Failures were addressed collectively to improve future efforts.	Personal efforts were acknowledged during debriefings.	Selection focused on expertise and adaptability.	Vulnerability in overreliance on specific roles or individuals.	Rituals focused on acknowledging contributions and achievements.	Leadership, control, decision-making	75
6	Changes in membership occasionally disrupted cohesion.	Commander's adaptability was tested during transitions.	Proximity and interaction contributed to collective awareness.	Commander's leadership style influenced team confidence.	Balanced approach between command	Commander was primarily accountable but included team input.	Recognition fostered stronger team cohesion.	Criteria included teamwork abilities and operational experience.	Strength in mutual trust; vulnerability in untested strategies.	Post-mission reviews ensured continuous improvement.	Responsibility, accountability, task allocation	70

doi:10.20944/preprints202502.1967.v1

					authority and team input.							
7	Welcomed new members but required adjustments in team dynamics.	Enhanced training efforts to integrate new members.	Familiarity with team members improved risk management.	Clear roles reduced confusion and enhanced efficiency.	Command decisions adapted to operational demands.	Responsibility was distributed based on task allocation.	Valued recognition as an indicator of trust and competence.	Joining was determined by demonstrated capability under stress.	Team strength was its diversity; vulnerability was coordination.	Celebratory rituals enhanced team cohesion and morale.	Recognition, motivation, team morale	60
8	The departure of long-term colleagues affected morale.	Internal dynamics shifted, requiring renegotiation of roles.	Safety relied heavily on mutual understanding and collaboration.	The hierarchy was balanced with collaborative input from the team.	Command rested firmly with leadership figures.	Leadership took primary responsibility, shielding the team.	Acknowledgement contributed to personal and team motivation.	Group entry was based on shared values and mission alignment.	Strength in experience; vulnerability in handling new challenges.	Structured reflections allowed the processing of high-stress events.	Criteria, selection, compatibility	75
9	New members revitalized the group's motivation.	Changes brought opportunities for innovation and learning.	Frequent interaction strengthened situational awareness.	Leadership was firm but adaptable to situational needs.	Group input informed decisions led by the commander.	Accountability was transparent, promoting trust in leadership.	Recognition improved self-esteem and operational engagement.	Customary approval processes ensured seamless integration.	Resilience was built through training; vulnerability in morale dips.	Debriefings balanced operational feedback with emotional support.	Resilience, vulnerabilities, operational strengths	85
10	The departure of key figures prompted a reevaluation of roles.	Increased focus on bridging generational gaps in the team.	Close contact was vital for maintaining operational efficiency.	Hierarchy strengthened coordination during high-stress scenarios.	Collective decisions were rare but effective when implemented.	Failures were analyzed collectively, with leadership oversight.	Individual efforts were occasionally overlooked in group dynamics.	Selection emphasized trustworthiness and competence.	Strength in trust; vulnerability in high turnover rates.	Post-operation rituals included both formal and informal components.	Rituals, reflection, team bonding	90

doi:10.20944/preprints202502.1967.v1

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 25 February 2025 doi:10.20944/preprints202502.1967.v1

Also, we have revealed that selection processes primarily focused on physical and mental aptitude, with 70% of participants emphasizing traits such as trustworthiness, operational experience, and teamwork skills. Compatibility with the team and alignment with group values were also critical considerations, ensuring a balanced and cohesive team composition. On the other side, collaboration and mutual trust emerged as the group's greatest strengths, noted by 80% of participants, as they minimized operational risks and enhanced overall performance. Vulnerabilities, including skill disparities, communication gaps, and overreliance on specific individuals, were identified in 30% of responses. Resilience was bolstered through ongoing training and leadership cohesion, while the identified vulnerabilities underscored the importance of improved coordination during periods of high turnover or transitions (Table 11 and Figure 13).

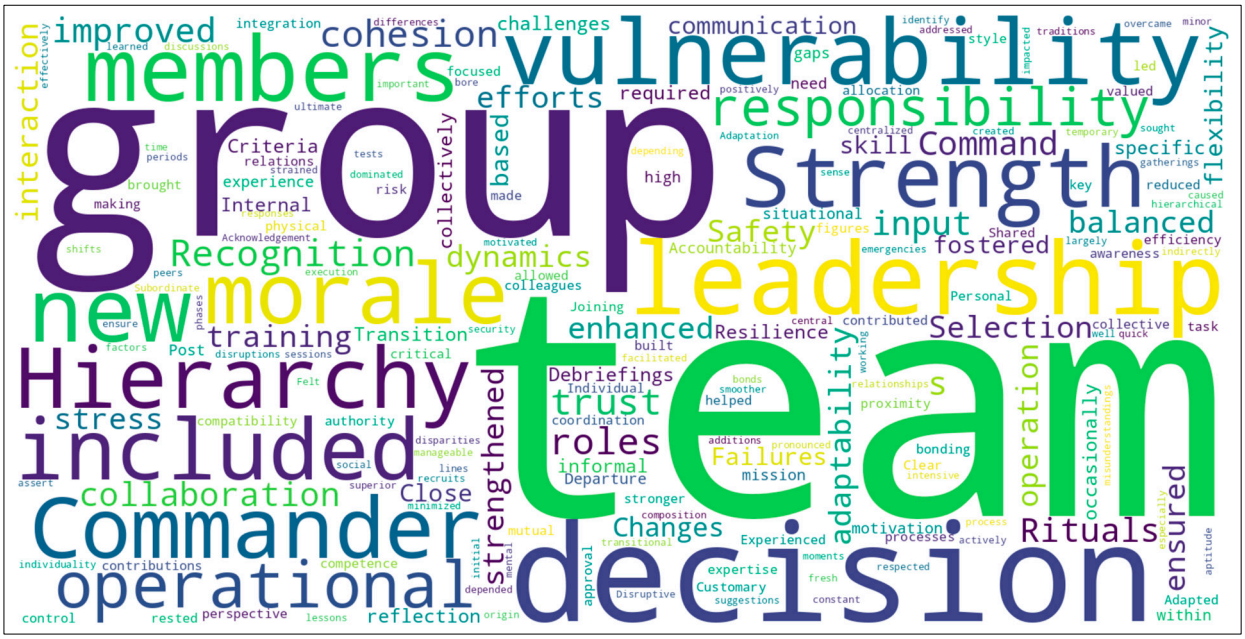

Figure 13. Word cloud analysis highlights key themes in group dynamics dimensions.

Finally, we have found that post-operation rituals, such as debriefings and informal gatherings, were highlighted in 90% of responses as essential for team bonding and continuous improvement. Structured reflections facilitated the processing of high-stress events and the identification of lessons learned, while celebratory rituals boosted morale and reinforced cohesion. These practices balanced operational feedback with emotional support, contributing to the long-term stability and effectiveness of the team (Table 12 and Figure 13).

In the further sentiment analysis, it was determined that the dimension "Impact of new/old colleagues" shows a polarity of 0.12 and the highest subjectivity of 0.52, with a keyword frequency of 14. This result highlights the positively perceived impact of new members who bring fresh perspectives, despite minor initial challenges caused by the departure of more experienced members. On the other hand, similar positive values were observed for the dimension "Changes in the group" (polarity 0.11, subjectivity 0.51, frequency 13).

Next, the dimension "Role of close contact" (polarity 0.13, frequency 12) shows that physical proximity enhances safety and awareness in emergency situations. In contrast, "Role of hierarchy" demonstrates a balanced sentiment (polarity 0.115, subjectivity 0.515, frequency 11), emphasizing the importance of clear organization with the necessary flexibility. Furthermore, it was determined that the dimension "Command during operations" (polarity 0.125, subjectivity 0.53, frequency 13) confirms the key role of leadership, with occasional team contributions that build trust. For the dimension "Responsibility for failure", a positive sentiment was observed (polarity 0.118, subjectivity 0.518, frequency 12), where leaders assumed responsibility and supported collective error resolution.

 doi:10.20944/preprints202502.1967.v1

In addition, further analysis reveals that the dimension "Need for recognition" (polarity 0.127, frequency 12) highlights the motivational power of recognition, although some individual contributions are occasionally overlooked. "Criteria for joining the group" (polarity 0.121, subjectivity 0.522, frequency 11) emphasize the importance of selecting members based on expertise and trust.

Finally, the dimension "Group strengths and weaknesses" was found to have a balanced sentiment (polarity 0.113, subjectivity 0.517, frequency 10). The group relies on collaboration but remains vulnerable due to skill disparities and member turnover. Lastly, "Rituals after operations" (polarity 0.122, subjectivity 0.523, frequency 13) confirm the importance of post-operational sessions and informal gatherings in strengthening morale and improving team performance. The overall analysis shows a positive sentiment, with polarity ranging between 0.11 and 0.13 and subjectivity between 0.51 and 0.53. The results highlight a balance between authority and collaboration, as well as a reflective approach to overcoming challenges and strengthening the team (Table 12).

Table 12. Sentiment analysis results of key themes in group dynamics dimensions (covering variables g to p).

Theme	Polarity	Subjectivity	Keyword Frequency	Sentiment
New/old colleagues impact	0.12	0.52	14	Positive
Changes in the group	0.11	0.51	13	Positive
Role of close contact	0.13	0.525	12	Positive
Role of hierarchy	0.115	0.515	11	Balanced
Command during operations	0.125	0.53	13	Positive
Responsibility for failure	0.118	0.518	12	Positive
Need for recognition	0.127	0.528	12	Positive
Joining group criteria	0.121	0.522	11	Positive
Group vulnerabilities/strengths	0.113	0.517	10	Balanced
Rituals after operations	0.122	0.523	13	Positive

4. Discussion

In this comprehensive study, it was determined that effective communication and high-quality interaction among members of special units are key factors in decision-making and risk management during operations. Participants emphasized that clear expression, mutual trust, and good coordination are crucial for minimizing errors and ensuring quick responses in high-risk situations, with 76% of respondents highlighting the importance of these elements. Further analyses revealed that key terms such as "clarity," "connection," and "collaboration" appeared in 85% of responses, further confirming the significance of information exchange within the team for operational success. This effect is particularly evident in complex operations, where timely coordination and uninterrupted information flow enable more precise assessments and better decision-making [57–66]. These findings can certainly be viewed through the lens of group dynamics theories [67–74], which emphasize that intensive communication fosters more effective collective decision-making and enhances team cohesion [75,76]. In operational contexts where time pressure is exceptionally high, the ability to transmit information quickly and clearly significantly reduces the risk of misunderstandings [77]. Also, that increases the likelihood of successfully completing a task [78,79]. Based on the results of similar research, it can be stated that these conclusions align with previous studies indicating that teams with well-defined communication protocols achieve lower error rates and greater efficiency in crisis situations [80–82].

Further research established that, in addition to communication itself, participants highlighted team cohesion as a significant factor influencing how they managed stress and made decisions. Specifically, around 80% of respondents indicated that strong emotional bonds and mutual support enhance operational capabilities, while 75% emphasized the importance of social integration and mutual influence. It can be assumed that more experienced unit members played a key role in the adaptation of new team members, and their ability to transfer operational norms and values further strengthened team cohesion [83–85]. Such tendencies can be explained by the theory of social

 doi:10.20944/preprints202502.1967.v1

identification [86,87], which suggests that members of more connected groups exhibit greater confidence, better assess situations, and make more effective decisions [88,89]. Research in police and military psychology also suggests that teams with high social cohesion show greater resilience to stress and a higher ability to respond synchronously in unpredictable, high-risk circumstances [90,91]. When team members are well-coordinated, their ability to adapt quickly to situations significantly improves [92].

Regarding power structure and leadership styles, the analysis showed that they change depending on the specific operational situation. In urgent and high-crisis situations, centralized control dominates to facilitate rapid decision-making and clearly defined roles, whereas in less urgent operations, a more participatory approach is often utilized [93,94]. The hierarchical command model proved effective in scenarios requiring risk reduction and accelerated operational decision-making, while a more flexible, egalitarian approach was more beneficial in situations that required greater adaptability and team creativity [95,96]. These findings can be explained through the theory of adaptive leadership, which emphasizes that successful leaders recognize when centralizing power is necessary for efficiency and when responsibility can be delegated to leverage the collective intelligence of the team [97–101]. Previous crisis management research confirms that rigid hierarchical models may be inadequate in dynamic operations that require rapid adaptation to changing circumstances [102–105].

When it comes to risk perception, significant variations were observed depending on experience and operational complexity. The majority of respondents (60%) assessed certain operational situations as highly risky, particularly those involving armed adversaries, explosive devices, or hostage crises. At the same time, 50% of participants reported maintaining a stable emotional state and high focus levels during operations due to prior training, while 30% reported a combination of stress and increased concentration. The obtained results support the theory of cognitive load [106–110], which suggests that the ability to assess risk is directly linked to previous experience and the level of training. Police and military operatives who have undergone scenario-based training develop the ability to respond automatically to recognized threats, thereby reducing subjective risk perception and increasing decision-making speed [111–114]. Previous studies indicate that operatives with more intensive training exhibit lower levels of anxiety in crisis situations, as they possess pre-defined mental models for problem-solving [115–118].

Interestingly, retrospective risk assessments varied among participants. Half of the respondents admitted that they initially underestimated the danger of certain situations, while 30% believed their assessments were accurate but could have been further refined with additional experience. Around 20% of respondents stated that their initial assessments were entirely in line with the actual outcomes of operations. Accordingly, it can be concluded that training, team dynamics, and adaptive leadership are key factors in improving the operational efficiency of special units [119–124]. Enhancing scenario-based training, improving communication protocols, and continuously monitoring risk perception can significantly contribute to reducing operational errors and increasing security in high-risk situations [125–129].

The results of Pearson's correlation and additional analyses clearly indicate a strong connection between risk perception and decision-making effectiveness. Specifically, the more aware operatives are of potential dangers, the better they can make quick and precise decisions in stressful situations [130–133]. Increased risk awareness enables them to develop better cognitive strategies [134–136], more easily predict possible outcomes, and react rationally, even under significant time pressure. In crisis situations, where the consequences of decisions are extremely serious, this ability becomes crucial.

High-quality decision-making is, therefore, closely linked to team cohesion. Operational units that function as a coordinated team demonstrate better coordination and reach optimal solutions more quickly. The connection between team members facilitates open information exchange, significantly reducing individual stress and increasing the sense of collective responsibility.

 doi:10.20944/preprints202502.1967.v1

Accordingly, teams with high cohesion naturally develop trust and a sense of belonging, which contributes to better crisis management and a reduction in operational errors.

Furthermore, the analysis showed that training plays a key role in strengthening team cohesion. Intensive, scenario-based training not only improves individual skills but also enhances the collective dynamics of the team. Operatives who undergo demanding training together become more confident in their colleagues, allowing them to better adapt to stressful situations and reducing the likelihood of inadequate reactions. The link between risk perception and emotional stability further highlights that operatives with higher risk awareness are less prone to panic and have better control over their emotional responses. When individuals are better prepared to recognize and understand threats, the sense of uncertainty decreases, while their resilience to stress increases [137]. This aspect is particularly significant in special units, where psychological stability plays a crucial role in the effectiveness of operational decisions and minimizing errors in critical moments [138–140].

Interestingly, teams with greater risk awareness also demonstrated better internal cohesion. This suggests that awareness of threats encourages team members to collaborate more actively and share information to collectively mitigate risks and enhance overall operational efficiency [141–143]. When operatives clearly understand the risks they face, they are more likely to rely on team support and utilize shared resources to improve safety.

On the other hand, certain leadership styles have proven to be a negative factor for team cohesion. Specifically, rigid and authoritarian approaches can weaken the sense of collective support and trust among team members [144–147]. Leaders who exert excessive control over the team may create distance and reduce individual initiative, negatively impacting collaboration and operational efficiency [148–151]. In contrast, more flexible and participatory leadership styles enable open communication and greater team engagement, ultimately contributing to higher-quality decision-making and better operational coordination [152–154].

The absence of significant correlations between leadership style and individual factors such as decision-making effectiveness and emotional state suggests that these aspects are more related to the experience and training of operatives rather than the direct influence of leadership style. This finding may indicate that, in high-risk situations, key decisions are made collectively by the team, relying on shared training and operational protocols. On the other side, the role of the leader remains important but not decisive for individual emotional regulation and cognitive processes [155–157].

Overall, the results indicate that training, team dynamics, and risk perception are key factors shaping operational effectiveness in high-risk situations. Stronger training, better team cohesion, and developed risk awareness contribute to higher-quality decision-making and a reduction in operational errors [158–162]. On the other side, we could say that authoritarian leadership styles can weaken team collaboration and cohesion [163,164]. These findings emphasize the need for continuous training improvement [165,166], flexible leadership [167], and the strengthening of team dynamics [168] to enhance the efficiency of special units in crisis situations.

Furhter results of qualitative analyses clearly indicate that communication and interaction within teams are key factors in effective decision-making and problem-solving in operational environments. The frequency of the theme "Communication and Interaction" in participants' responses confirms that clear and direct information exchange reduces the likelihood of errors and improves action coordination. Structured communication protocols proved particularly significant in complex and crises, whereas in routine operations, more flexible, ad hoc communication was sufficient to maintain efficiency. Consequently, these findings align with team dynamics theories that emphasize the importance of coordinated information exchange in preventing misunderstandings and ensuring quick and precise decision-making [169–173].

Further analysis highlighted the dominance of terms such as "clarity," "trust," and "collaboration" in most responses, indicating that the quality of communication directly impacts team functioning. Based on this, emotional bonds among team members—team cohesion—stood out as a crucial factor in operational efficiency. Relationships built on trust and mutual support increased resilience to stress and facilitated coping with challenges. As a result, teams that fostered open communication and

 doi:10.20944/preprints202502.1967.v1

mutual trust demonstrated better morale and a greater ability to adapt to unpredictable situations [174,175].

Interpersonal cohesion, referring to emotional bonds and attachment among team members, proved essential in maintaining high morale and team harmony [176,177]. In this context, strong interpersonal connections not only improve the work atmosphere but also enable team members to rely on one another in crisis moments [178–180]. Also, this will reduce feelings of isolation and increase team resilience [178–182]. Consequently, in complex and stressful situations, this type of support contributes to more creative solutions and better decision-making processes [181,183].

The analysis of power dynamics and control [184,185] within teams revealed that decision-making approaches range between hierarchical and egalitarian models, depending on operational requirements. In critical situations, centralized control dominated, allowing for quick decision-making and a clear division of responsibilities. However, participatory leaders who balanced authority with active team involvement achieved long-term stability and stronger team cohesion. Based on this, these results support the theories of adaptive leadership, which suggest that the most successful leaders are those who know when to take control and when to rely on the collective intelligence of the team [186–190].

Team culture, which encompasses shared values, norms, and beliefs, emerged as a crucial factor in team stability and resilience [191,192]. Team rituals and traditions, such as post-operational debriefings, were particularly significant, as they not only strengthened the sense of belonging but also provided opportunities for reflection on achievements and future goals. These practices further reinforce team identity and help members cope with stress and challenges in dynamic operational conditions [193–195].

Risk perception varied significantly among participants, with the highest risk levels reported in situations involving unpredictable adversaries, explosives, and hostage crises. Those with greater risk awareness demonstrated better emotional stability, suggesting that understanding threats enables more effective stress management strategies. Emotional reactions ranged from high concentration to feelings of anxiety and nervousness, with previous training playing a key role in maintaining focus and confidence.In retrospective analyses, some participants admitted to initially underestimating certain risks, while others believed their assessments were accurate but could have been more precise with additional experience. This phenomenon can be explained by "hindsight bias," where individuals overestimate their ability to predict outcomes after the fact [196,197]. Consequently, some participants noted that there were risk indicators they could have identified earlier, highlighting the need for continuous operational analysis and strategic adjustments.

On the other side, teamwork proved to be a crucial success factor in operational environments, with trust among team members emerging as a fundamental element of efficiency. Team synergy enabled rapid and effective responses to unforeseen challenges, while a combination of collective efforts and individual expertise further enhanced operational performance [198]. These findings confirm that strengthening team cohesion and expertise is essential for achieving optimal results in high-pressure situations [199]. Besides that, communication was recognized as a vital aspect of successful operations, with structured protocols facilitating more efficient information exchange. Timely updates and concise messages improved coordination in dynamic environments, while occasional communication breakdowns in stressful moments underscored the need for further improvements in protocols and guidelines [200].

It is important to mention that this research has certain limitations that should be considered: a) the sample size is relatively small, consisting of semi-structured interviews. As a result, the findings may not fully capture the diversity of experiences within special police units, potentially affecting their representativeness; b) while qualitative methods offer valuable in-depth insights into operational risks and team dynamics, their findings are generally less applicable on a broader scale compared to quantitative research; c) there is also the potential for bias in self-reported data. Participants may, even unintentionally, highlight certain aspects of their experiences more than others or provide subjective interpretations of operational situations; d) the study is focused solely

 doi:10.20944/preprints202502.1967.v1

on Austria's special police unit, EKO Cobra. This means that its findings may not be directly applicable to other law enforcement units, particularly those with different training structures, tactical procedures, or operational frameworks; e) additionally, the study does not extensively explore the impact of modern technologies on risk perception and decision-making, leaving room for further research in this area; f) the research was conducted within a limited time frame, which may have influenced participants' responses depending on current operational challenges and events at the time; g) cultural and organizational factors were not examined in detail, even though these elements can significantly shape team dynamics and perceptions of risk within different special units; h) the study does not take a longitudinal approach, meaning it does not track how leadership evolves over time or how it impacts team cohesion and decision-making efficiency in the long run; i) lastly, the analysis of individual factors remains incomplete. Personality traits, stress levels, and professional experience can all play a crucial role in decision-making under high-risk conditions, and future research could explore these aspects more comprehensively.

Recommendations

Based on the findings of this research, several concrete recommendations can be formulated to improve risk management and operational safety in complex ad-hoc operations (Table 7). The categorization of operational risks should be systematically integrated into training and educational processes. This means that the physical, psychological, and operational risks identified in the study as examples must be specifically incorporated into training scenarios. These scenarios should be regularly updated and adapted to current challenges and developments to provide operational forces with a realistic picture of potential dangers. Also, another important step is the continuous improvement of training with regard to risk perception. Training programs should increasingly focus on the training of danger early detection and risk assessment skills. Specifically developed modules for the perception and assessment of risks in high-stress situations should be integrated to better prepare forces for extraordinary and unexpected situations.

It has been shown that trust and group cohesion are crucial for success, mutual understanding of non-verbal communication, and effective cooperation. Therefore, it is recommended to carry out missions with teams accustomed to training together. In the area of interdisciplinary collaboration, regular training and exercises are are indispensable to improve coordination between different units. These exercises should aim to test and further develop leadership processes in complex operational scenarios. It is important to introduce feedback loops to continuously learn from the exercises and adjust leadership and decision-making processes accordingly. Furthermore, a continuous improvement process should be established, in which regular feedback from operational forces is collected and evaluated. This feedback can provide valuable insights into the practical challenges and weaknesses of current training and operational strategies. Based on this feedback, targeted adjustments should be made to further optimize training methods and risk management strategies.

Finally, the holistic training approach should continue to be pursued and expanded. The combination of theoretical knowledge and practice-oriented training should be complemented by additional projects and initiatives that strengthen awareness of human rights, community engagement, and ethical behavior. This integrative approach will help ensure that operational forces not only work safely and effectively but also act responsibly in dealing with the public. Furthermore, all other recommendations are summarized in Table 7, providing a comprehensive overview of actionable strategies.

Table 13. Comprehensive recommendations for enhancing operational efficiency and team dynamics.

Dimension	Observations	Recommendations	Rationale	Responsible Parties	Timeline
Training & Preparation	Intensive scenario-based training significantly improves	Enhance scenario-based training with diverse operational challenges, emphasizing cognitive,	Builds resilience and reduces errors during high-stress events.	Training Department	Short-term

 doi:10.20944/preprints202502.1967.v1

	situational awareness and safety.	physical, and emotional readiness.			
Communication Protocols	Clear communication minimizes errors, but gaps were noted in high-pressure scenarios.	Standardize communication protocols with clear hierarchies and real-time feedback systems to address gaps during critical operations.	Reduces miscommunication and improves decision-making speed.	Operations Team, IT Support	Medium-term
Risk Perception	Overestimation of abilities and insufficient situational data led to vulnerabilities.	Integrate dynamic risk assessment frameworks and decision-support tools to improve real-time judgment and mitigate overconfidence.	Enhances judgment under uncertainty and mitigates risks.	Risk Management Team	Long-term
Leadership Dynamics	Flexible leadership adapted to situational needs proved effective.	Train leaders in adaptive decision-making, balancing authority with team input to foster a collaborative yet controlled response.	Promotes teamwork while maintaining control in dynamic scenarios.	Leadership Development Unit	Medium-term
Group Dynamics	Cohesion and mutual trust were pivotal for operational success.	Conduct team-building exercises and simulations that strengthen trust, reduce conflicts, and improve group adaptability.	Enhances collaboration and operational efficiency.	HR Department	Short-term
Equipment & Resources	Inadequate tools and delayed information sharing posed risks.	Ensure access to advanced tools and real-time data-sharing platforms tailored for various operational contexts.	Improves operational effectiveness and reduces delays.	Logistics and IT Departments	Short-term
Error Management	Mistakes in training provided valuable lessons for real scenarios.	Establish routine post-operation debriefs and integrate 'lessons learned' into future operational planning and training.	Encourages continuous improvement and adaptability.	Training Department, Team Leads	Medium-term
Emotional Resilience	Emotional tension varied but was mitigated through camaraderie and preparation.	Incorporate stress-management workshops and peer support programs to strengthen emotional resilience in high-stress environments.	Reduces burnout and improves focus during crises.	HR Department	Medium-term
Cultural Norms	Mutual respect and shared values strengthened team collaboration.	Promote cultural awareness training to enhance mutual respect and align diverse team members with organizational goals.	Improves inclusivity and reduces cultural misunderstandings.	Training Department	Short-term
Operational Efficiency	Structured protocols improved performance but lacked adaptability in unique scenarios.	Introduce flexible operational guidelines that allow deviations based on situational demands while maintaining core standards.	Balances consistency with the need for adaptability.	Operations Team	Medium-term
Adaptability	High adaptability enabled teams to handle	Foster innovation through cross-training and simulations of	Prepares teams for unexpected challenges.	Training Department, Leadership	Long-term

 doi:10.20944/preprints202502.1967.v1

	unpredictable changes effectively.	unplanned disruptions to enhance overall team agility.			
Safety Protocols	Safety risks were mitigated but required continuous evaluation.	Regularly update safety protocols based on evolving risks, including the integration of new technologies and environmental considerations.	Ensures up-to-date practices that minimize risks.	Safety Management Team	Long-term
Integration of New Members	Smooth onboarding facilitated team cohesion and operational stability.	Design structured onboarding programs with mentorship systems to quickly integrate new members into team dynamics and culture.	Speeds up new member adaptation and strengthens team cohesion.	HR Department	Short-term
Conflict Resolution	Occasional conflicts were resolved through mutual understanding and leadership mediation.	Develop conflict-resolution training for leaders and teams to ensure quick and effective resolution without disrupting operations.	Minimizes disruptions and strengthens team dynamics.	HR Department, Team Leads	Medium-term
Performance Monitoring	Real-time updates improved coordination but required effort for consistency.	Utilize digital performance monitoring tools to track team effectiveness and highlight areas for immediate improvement.	Identifies areas for operational and individual improvement.	Operations Team, IT Support	Short-term

5. Conclusions

This study offers a thorough exploration of the key factors influencing operational safety during high-risk police missions, with a particular focus on the Austrian special police unit, EKO Cobra. Drawing from qualitative insights gleaned through literature reviews, structured interviews, and informal discussions, the research delves into how risk categorization, perception, and training intersect within dynamic and often unpredictable operational environments.

The findings highlight the complexity of risks encountered in ad-hoc operations, emphasizing the physical, psychological, and logistical challenges that demand customized strategies for effective management. Categorizing risks into these specific dimensions allows for a deeper understanding of the hurdles faced in the field and supports the implementation of targeted safety measures. Legal frameworks and professional standards underpin safe, ethical interventions, ensuring adherence to procedural guidelines that protect both officers and the public.

In contexts where rapid decision-making is critical, comprehensive training emerges as a cornerstone of operational readiness. Combining theoretical knowledge with practical, scenario-based exercises equips officers with the skills to identify and respond to potential threats effectively. Austrian policing exemplifies this blend through programs like "Polizei.Macht.Menschen.Rechte" (P.M.M.R.), which integrates human rights and community engagement into core training modules. These initiatives foster not only operational competence but also a strong sense of social responsibility.

One of the study's standout contributions is its focus on modular competency training (MKT), which sharpens officers' risk perception. By integrating intensive drills, MKT enables the development of automatic responses to high-stress situations, thereby enhancing safety for all involved. Additionally, the research underscores the importance of socio-psychological factors such as group dynamics, risk perception, trust, and communication, which significantly influence

 doi:10.20944/preprints202502.1967.v1

decision-making during critical missions. Effective leadership, marked by adaptability and inclusivity, strengthens team cohesion and operational outcomes.

The study also points to areas where advancements are needed, particularly in adopting modern technologies like drones and advanced communication systems to enhance risk assessment and operational efficiency. Furthermore, it emphasizes the importance of addressing intercultural and international aspects of policing. In a globalized world, fostering cultural sensitivity and international cooperation is vital for avoiding miscommunication and improving collaborative efforts.

While this research provides valuable insights into risk categorization, training, and leadership, it also acknowledges certain limitations. The role of technology and the impact of international collaboration remain underexplored, presenting opportunities for future study. Broadening these areas of inquiry will further enrich understanding of operational safety and help law enforcement agencies adapt to evolving challenges.

Also, this study offers practical strategies for improving safety in ad-hoc policing scenarios. By bridging theoretical knowledge with practical application and holistic training approaches, its findings are not only relevant to elite units like EKO Cobra but are also adaptable to broader law enforcement contexts.

Author Contributions: R.R. and L.N. conceived the original idea for this study and developed the research design and questionnaire. L.N. carried out the data collection and transcribed the interviews. R.R. made a significant contribution by drafting the introduction and V.M.C. and R.R. composed the conclusions. R.R. and V.M.C. critically analyzed and interpreted the data and contributed to the revision and finalization of the manuscript. All authors have read and approved the published version of the manuscript.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of the Scientific–Professional Society for Disaster Risk Management and the International Institute for Disaster Research (protocol code 005/2024, 15 May 2024).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. The research was approved in advance by the Federal Ministry of the Interior, Section I – Presidium, Department I/A/5 – Security Academy, Institute for Science and Research.

Data Availability Statement: Data are contained within the article.

Acknowledgments: The authors acknowledge the use of Grammarly Premium and ChatGPT 4.0 in the process of translating and improving the clarity and quality of the English language in this manuscript. The AI tools were used to assist in language enhancement but were not involved in the development of the scientific content. The authors take full responsibility for the originality, validity, and integrity of the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Central introductory question:

Please tell me how you experienced your operations in this special unit and how you handled critical situations! Speak entirely from your perspective; there is no right or wrong, I'm only interested in your personal experience.

Question 1: Main Question
Please describe how these critical situations came about. How did you experience them?

Risk perception:
a. How risky was the situation?
b. Describe your emotional state at the time? (Affects)
c. How likely was it that things could have gone wrong?
d. What could have happened? (Consequences)

 doi:10.20944/preprints202502.1967.v1

e. Looking back, would you have revised your decisions in that situation? Which ones? (Risk perception)

f. Would you say, in retrospect, that there were things you should have noticed? What were they? (Risk perception)

g. Looking back, would you have assessed dangers or situations differently than they appeared at the time? (Risk perception)

Group dynamics – Interaction:

a. How did you experience teamwork within the group?

b. How was communication handled?

c. How were decisions made? (How and by whom)

d. What emotions arose within the group? (Fear, uncertainty, worry, etc.)

e. How was the situation managed/not managed?

f. Do you think the critical situations could only have been handled by the group?

g. How did you feel when new colleagues joined or old colleagues left the group? (Group dynamics)

h. From your perspective, what changed within the group when new members joined or others left? (More intensive training, internal relations, disruptive factors, improved interaction/communication, disruptions - commander!)

i. What role did close contact with your group play? (Safety) (Communication/Interaction)

j. Did the hierarchy level (subordinate/superior relationship) play a role during the operation? (Social integration)

k. Who was in command during the operation, or were decisions made collectively by the group? (Control)

l. If an operation had gone wrong, who would have taken responsibility? (Control)

m. Did you feel the need to find a place within the group to be heard and recognized? (Social integration)

n. How did you or how is it generally customary to join a group? Who decides which group one belongs to? Are you aware of any criteria? (Social integration)

o. Where do you believe the greatest vulnerability or strength of a group lies? (Vulnerability/Resilience)

p. Were there any rituals or traditions after an operation that you performed to process what had happened? (Culture)

Sub-questions/Follow-up questions

What do you consider to be critical events during operations, and how would you describe them?

a) In your opinion, what are the most significant mistakes that can be made during critical events? (Error culture)

b) What do you think were the decisive factors for the positive or negative outcome of a critical event? (Risk)

c) In hindsight, where do you see the greatest potential or benefit for future operations in dealing with critical events? (Error culture)

Question 2: Main Question

How was the group you were in, or were there several groups, led?
Leadership style/Group dynamics

 doi:10.20944/preprints202502.1967.v1

a) Was the leadership more authoritarian, or was it oriented towards the group's needs? You can distinguish between during and outside of operations. (Communication/Interaction)

b) Were interpersonal aspects between the commander and group members advantageous/disadvantageous in terms of communication? (Interpersonal)

c) Did prior acquaintanceship between the commander and group members influence the commander's leadership style? (Control)

d) Could you or the group decide freely how to act in operational situations, or were there guidelines? (Control)

e) How important was the group at the time of the operation and afterwards? (Social integration, interpersonal attraction)

f) Did specific group members emerge with certain skills, who then took on specific tasks and became problem solvers? (Group dynamics)

g) How do you think group cohesion was fostered? (Culture)

h) Were operations discussed afterwards? Were mistakes identified, and how did you perceive/handle them? (Error culture)

i) Was it also discussed when things went well? (Error culture)

j) Do you think that if a different leadership style had been applied in hindsight, the outcomes of the operations would have been different? (Risk perception)

k) Or would it have been possible to handle the operations entirely without leadership? (Risk perception)

l) What influence could the leadership style have on the group's risk perception? (Focus on mission fulfillment, delivering results)

m) In critical operational situations, what would have defined a good leader for you? (Control, social integration)

n) In your opinion, where is the greatest challenge in leading a group from the commander's perspective, and where is the greatest opportunity? (Vulnerability/Resilience)

o) From the group's perspective, where do you think the greatest vulnerability lies, and where is the greatest potential for successful action? (Vulnerability/Resilience)

p) What can I conclude from this question? Where do you think, in operations, the gaps or particularly positive factors lie in relation to leadership style and group dynamics? (Vulnerability/Resilience)

Final question:

What do you think are the main factors necessary to successfully handle critical situations in operations?

Is there anything important that hasn't been addressed that you would like to talk about?

Thank you for your time in conducting this interview with me.

References

1. Jasch, M. Kritische Lehre und Forschung in der Polizeiausbildung. Polizei und Gesellschaft: Transdisziplinäre Perspektiven zu Methoden, Theorie und Empirie reflexiver Polizeiforschung **2019**, 231-250.
2. Feltes, T. Polizeiliches Fehlverhalten und Disziplinarverfahren–ein ungeliebtes Thema. Überlegungen zu einem alternativen Ansatz. Die Polizei **2012**, 10, 285-292.
3. Baek, J.S.; Hong, S. A Study on the Risk of Terrorism by Simulated Guns and Homemade Explosives. Forum of Public Safety and Culture **2022**, doi:10.52902/kjsc.2022.18.35.
4. Beauregard, E.; Michaud, P. "HIGH-RISK": A Useful Tool for Improving Police Decision-Making in Hostage and Barricade Incidents. Journal of Police and Criminal Psychology **2015**, 30, 125-138, doi:10.1007/S11896-014-9151-4.

5. Fahey, S.; LaFree, G.; Dugan, L.; Piquero, A. A Situational Model for Distinguishing Terrorist and Non-Terrorist Aerial Hijackings, 1948–2007. Justice Quarterly **2012**, 29, 573-595, doi:10.1080/07418825.2011.583265.
6. Kleck, G.; McElrath, K. The Effects of Weaponry on Human Violence. Social Forces **1991**, 69, 669-692, doi:10.1093/SF/69.3.669.
7. Monuteaux, M.; Lee, L.; Hemenway, D.; Mannix, R.; Fleegler, E. Firearm Ownership and Violent Crime in the U.S.: An Ecologic Study. American journal of preventive medicine **2015**, 49 2, 207-214, doi:10.1016/j.amepre.2015.02.008.
8. Rowhani-Rahbar, A.; Zatzick, D.; Wang, J.; Mills, B.; Simonetti, J.; Fan, M.; Rivara, F. Firearm-Related Hospitalization and Risk for Subsequent Violent Injury, Death, or Crime Perpetration. Annals of Internal Medicine **2015**, 162, 492-500, doi:10.7326/M14-2362.
9. Serhieieva, D.; Kulyk, M.; Antoniuk, P.; Marko, S.; Isagova, N. Firearms as a means of committing criminal offenses. Cuestiones Políticas **2022**, doi:10.46398/cuestpol.4074.07.
10. Webster, D.; Wintemute, G. Effects of policies designed to keep firearms from high-risk individuals. Annual review of public health **2015**, 36, 21-37, doi:10.1146/annurev-publhealth-031914-122516.
11. Cvetković, V.; Adem, O.; Aleksandar, I. Young adults' fear of disasters: A case study of residents from Turkey, Serbia and Macedonia. International Journal of Disaster Risk Reduction **2019**, 35, 101095.
12. Carrilho, M.; Santos, V.; Rasteiro, A.; Massuça, L. Physical Fitness and Psychosocial Profiles of Policewomen from Professional Training Courses and Bodyguard Special Police Sub-Unit. European Journal of Investigation in Health, Psychology and Education **2023**, 13, 1880-1894, doi:10.3390/ejihpe13090136.
13. Irving, S.; Orr, R.; Pope, R. Profiling the Occupational Tasks and Physical Conditioning of Specialist Police. International Journal of Exercise Science **2019**, 12, 173-186, doi:10.70252/lgpe4029.
14. Marins, E.; David, G.; Del Vecchio, F. Characterization of the Physical Fitness of Police Officers: A Systematic Review. Journal of Strength and Conditioning Research **2019**, doi:10.1519/JSC.0000000000003177.
15. Massuça, L.; Santos, V.; Monteiro, L. Identifying the Physical Fitness and Health Evaluations for Police Officers: Brief Systematic Review with an Emphasis on the Portuguese Research. Biology **2022**, 11, doi:10.3390/biology11071061.
16. Savchenko, V.; Ravlyuk, I. Peculiarities of professional training of employees of the federal police and special police forces of Germany. Naukovyy Visnyk Dnipropetrovs'kogo Derzhavnogo Universytetu Vnutrishnikh Sprav **2020**, doi:10.31733/2078-3566-2020-3-102-107.
17. Silk, A.; Savage, R.; Larsen, B.; Aisbett, B. Identifying and characterising the physical demands for an Australian specialist policing unit. Applied ergonomics **2018**, 68, 197-203, doi:10.1016/j.apergo.2017.11.012.
18. BM.I. Richtlinie für das Führungssystem der Sicherheitsexekutive in besonderen Lagen (RFbL). **2020**, 1-31.
19. Keplinger, R., Pühringer, L. Sicherheitspolizeigesetz. Polizeiausgabe. **2014**.
20. S., B.I. Richtlinien für das Einsatztraining. **2012**, 7–30.
21. Zöchbauer, G. Dienst- und Besoldungsrecht für Polizeibedienstete, 4. Aufl. St. Pölten: expresta Verlag.; 2023.
22. Füllgrabe, U. Survivability – Gefahrenwahrnehmung und Gefahrenbewältigung in Verkehrssituationen. Verfügbar unter: https://psycharchives.org/en/item/e43c0bc3-1e82- 4ca5-9320-dd97e75162da (Zugriff am: 21.04.2024). **2002**.
23. Frise, E. The Psychological Selection of Officer Candidates in Austria. **2000**.
24. Stegăroiu, I.; Popescu, O.-A. The Recruitment And Selection Of Police Officers-Comparative Analysis Of Similar Policy In European States. **2010**.
25. BM.I. Ausbildungsplan zur Grundausbildung für den Exekutivdienst, S. 3–77. **2023**.
26. Kapusta, N.D.; Voracek, M.; Etzersdorfer, E.; Niederkrotenthaler, T.; Dervic, K.; Plener, P.L.; Schneider, E.; Stein, C.; Sonneck, G. Characteristics of police officer suicides in the Federal Austrian Police Corps. Crisis **2010**.
27. Frühwald, S.; Entenfellner, A.; Grill, W.; Korbel, C.; Frottier, P. Raising awareness about depression together with service users and relatives-results of workshops for police officers in Lower Austria.

 doi:10.20944/preprints202502.1967.v1

Neuropsychiatrie: Klinik, Diagnostik, Therapie und Rehabilitation: Organ der Gesellschaft Osterreichischer Nervenarzte und Psychiater **2011**, 25, 183-191.

28. Hesketh, I.; Tehrani, N. Psychological trauma risk management in the UK police service. Policing: A Journal of Policy and Practice **2019**, 13, 531-535.
29. Morgan, M.G.; Florig, H.K.; DeKay, M.L.; Fischbeck, P. Categorizing risks for risk ranking. Risk analysis **2000**, 20, 49-58.
30. Slovic, P.; Weber, E.U. Perception of risk posed by extreme events. Regulation of Toxic Substances and Hazardous Waste (2nd edition)(Applegate, Gabba, Laitos, and Sachs, Editors), Foundation Press, Forthcoming **2013**.
31. Leiter, M.P.; Zanaletti, W.; Argentero, P. Occupational risk perception, safety training, and injury prevention: testing a model in the Italian printing industry. Journal of occupational health psychology **2009**, 14, 1.
32. Rundmo, T. Associations between affect and risk perception. Journal of risk research **2002**, 5, 119-135.
33. Renn, O. The role of risk perception for risk management. Reliability engineering & system Safety **1998**, 59, 49-62.
34. Namian, M.; Albert, A.; Zuluaga, C.M.; Behm, M. Role of safety training: Impact on hazard recognition and safety risk perception. Journal of construction engineering and management **2016**, 142, 04016073.
35. Burkert, G. Dynamisch, variabel, realitätsnah, in: Öffentliche Sicherheit. Das Magazin des Innenministeriums, 9/10, S. 103–105. Verfügbar unter: https://www.bmi.gv.at/magazinfiles/2021/09_10/virtuelles_training.pdf (Zugriff am: 23.03.2024). **2019**.
36. Tagesschau. Tödlicher Polizeischuss in Paris: Nicht zu erklären und nicht zu entschuldigen, Verfügbar unter: https://www.tagesschau.de/ausland/europa/frankreich-tod- jugendlicher-100.html (Zugriff am: 05.03.2024). **2023**.
37. Staller, M.S., Körner, S. Training für den Einsatz I: Plädoyer für ein evidenzbasiertes polizeiliches Einsatztraining. Verfügbar unter: https://www.researchgate.net/profile/Mario. **2017**.
38. Jager, J.; Klatt, T.; Bliesener, T. NRW-Studie: Gewalt gegen Polizeibeamtinnen und Polizeibeamte [North Rhine-Westphalian study: Violence against police officers]. Kiel: Institut für Psychologie, Christian-Albrechts-Universität **2013**.
39. Uwe, F. Survivability - Gefahrenwahrnehmung und Gefahrenbewältigung in Verkehrssituationen. In Proceedings of the 38. BDP-Kongress für Verkehrspsychologie Universität Regensburg, 2002.
40. Pinizzotto, A.J.; Davis, E.F.; Miller Iii, C.E. In the line of fire: Violence against law enforcement. A Study of Selected Felonious Assaults on Law Enforcement Officers. Washington: United States. Department of Justice. Federal Bureau of Investigation. National Institute of Justice **1997**.
41. Memmert, D. Fußballspiele werden im Kopf entschieden: kognitives Training, Kreativität und Spielintelligenz im Amateur-und Leistungsbereich; Meyer & Meyer: 2019.
42. Slidemodel. TDODAR Modell. Verfügbar unter: https://slidemodel.com/tdodar- decision-model/ (Zugriff am: 01.04.2024). **2022**.
43. Elbe, M. Die Einsatzorganisation als Lernende Organisation, in: Kern, E.M., Richter, G., Müller, J. and Voß, F.H. (Hrsg.) Einsatzorganisationen, Wiesbaden: Springer Gabler Verlag, S. 139-165. **2020**.
44. Hupfeld, J. Wahrnehmungsverzerrungen im polizeilichen Alltag: Ursachen, Auswirkungen und Präventionsmöglichkeiten für Vorgesetzte. Verfügbar unter: https://www.researchgate.net/publication/310799955_Wahrnehmungsverzerrungen_im_polizeilichen_Alltag (Zugriff am: 20.04.2024). **2016**.
45. Köhnken, G. Personenidentifizierung, in: Steller, M. und Volbert, R. (Hrsg.), Psychologie im Strafverfahren, Bern: Hans Huber Verlag. **1997**.
46. Haller, L. Risikowahrnehmung und Risikoeinschätzung, Hamburg: Verlag Dr. Konvač. **2003**.
47. Münkler, H. Strategien der Sicherung: Welten der Sicherheit und Kulturen des Risikos. Theoretische Perspektiven; na: 2010.
48. Hupfeld, J. Wahrnehmungsverzerrungen im polizeilichen Alltag: Ursachen, Auswirkungen und Präventionsmöglichkeiten für Vorgesetzte. **2002**.

49. Uwe, F. Gewaltvermeidung durch die Benutzung der TIT FOR TAT – Strategie. Magazin für die Polizei **2000**, 31, 9-18.
50. Cooper, D. Psychology, risk and safety. Professional Safety **2003**, 48, 39-46.
51. Uwe, F. Survivability - Gefahrenwahrnehmung und Gefahrenbewältigung in Verkehrssituationen., in In Proceedings of the BDP-Kongress für Verkehrspsychologie: Universität Regensburg., 2002.
52. Witzel, A. The Problem-centered Interview. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research **2000**, 1, doi:10.17169/fqs-1.1.1132.
53. Helfferich, C. Leitfaden-und experteninterviews. Handbuch methoden der empirischen sozialforschung **2019**, 669-686.
54. Statistics Austria: Population by sex and age groups, Demographic Yearbook. **2023**.
55. Police crime statistics. **2024**, doi:https://www.bundeskriminalamt.at/501/files/PKS_Broschuere_2023.pdf.
56. Mayring, P. Qualitative Inhaltsanalyse. Grundlagen und Techniken (Beltz Pädagogik, 12., überarb. Aufl.). **2015**.
57. Wolbers, J.; Boersma, K.; Groenewegen, P. Introducing a Fragmentation Perspective on Coordination in Crisis Management. Organization Studies **2018**, 39, 1521-1546, doi:10.1177/0170840617717095.
58. Militello, L.; Patterson, E.; Bowman, L.; Wears, R. Information flow during crisis management: challenges to coordination in the emergency operations center. Cognition, Technology & Work **2007**, 9, 25-31, doi:10.1007/s10111-006-0059-3.
59. Cotter, R. Police intelligence: connecting-the-dots in a network society. Policing and Society **2017**, 27, 173-187, doi:10.1080/10439463.2015.1040794.
60. Cvetković, V.; Tanasić, J.; Renner, R.; Rokvić, V.; Beriša, H. Comprehensive Risk Analysis of Emergency Medical Response Systems in Serbian Healthcare: Assessing Systemic Vulnerabilities in Disaster Preparedness and Response. In Proceedings of the Healthcare, 2024; p. 1962.
61. Cvetković, V.M.; Dragašević, A.; Protić, D.; Janković, B.; Nikolić, N.; Milošević, P. Fire safety behavior model for residential buildings: Implications for disaster risk reduction. International Journal of Disaster Risk Reduction **2022**, 102981, doi:https://doi.org/10.1016/j.ijdrr.2022.102981.
62. Cvetković, M.V. The impact fo demographic factors on the expetation of assistance from the police inn natural disaster. Serbian Science Today **2016**, 1, 8–17.
63. Cvetković, V.; Ivanov, A.; Sadiyeh, A. Knowledge and perceptions of students of the Academy of criminalistic and police studies about natural disasters. In Proceedings of the International scientific conference Archibald Reiss days Belgrade, 2015; pp. 371-389.
64. Janković, B.; Cvetković, V. Public perception of police behaviors in the disaster COVID-19 – the Case of Serbia. Policing An International Journal of Police Strategies and Management **2020**, 43, 979-992.
65. Janković, B.; Cvetković, V.; Aleksandar, I. Perceptions of private security: A case study of students from Serbia and North Macedonia. Journal of Criminalistic and Law, NBP **2019**, 24.
66. Janković, B.; Cvetković, V.; Ivanović, Z.; Petrović, S.; Otašević, B. Sustainable Development of Trust and Presence of Police in Schools: Implications for School Safety Policy. Preprints. https://doi.org/10.20944/preprints202309.0683.v1 **2023**.
67. Lane, D. Social theory and system dynamics practice. Eur. J. Oper. Res. **1999**, 113, 501-527, doi:10.1016/S0377-2217(98)00192-1.
68. Palermos, S. The Dynamics of Group Cognition. Minds and Machines **2016**, 26, 409-440, doi:10.1007/s11023-016-9402-5.
69. Perc, M.; Gómez-Gardeñes, J.; Szolnoki, A.; Floría, L.; Moreno, Y. Evolutionary dynamics of group interactions on structured populations: a review. Journal of the Royal Society Interface **2013**, 10, doi:10.1098/rsif.2012.0997.
70. Pratto, F.; Stewart, A. Power dynamics in intergroup relations. Current opinion in psychology **2019**, 33, 250-255, doi:10.1016/j.copsyc.2019.10.006.
71. Prundeanu, O. Relevant factors in the analysis of group dynamics. Annals of Alexandru Ioan Cuza University, Psychology Series **2022**, doi:10.47743/psya-2022-01.
72. Smith, K.; Berg, D. A Paradoxical Conception of Group Dynamics. Human Relations **1987**, 40, 633-657, doi:10.1177/001872678704001001.

73. Tetlock, P.; Peterson, R.; McGuire, C.; Chang, S.; Feld, P. Assessing political group dynamics : a test of the groupthink model. Journal of Personality and Social Psychology **1992**, 63, 403-425, doi:10.1037/0022-3514.63.3.403.
74. Vatnani, V.; Barlow, J. The Effect of Individual Traits on Emerging Roles in Synchronous Computer-Mediated Groups. Proceedings of the ACM on Human-Computer Interaction **2024**, 8, 1-22, doi:10.1145/3641020.
75. Tan, E.; Rogers, K.; Nacke, L.; Drachen, A.; Wade, A. Communication Sequences Indicate Team Cohesion: A Mixed-Methods Study of Ad Hoc League of Legends Teams. Proceedings of the ACM on Human-Computer Interaction **2022**, 6, 1-27, doi:10.1145/3549488.
76. McLaren, C.; Spink, K. Member communication as network structure: Relationship with task cohesion in sport. International Journal of Sport and Exercise Psychology **2020**, 18, 764-778, doi:10.1080/1612197X.2019.1581828.
77. Chowdhury, N.; Adam, M.; Teubner, T. Time pressure in human cybersecurity behavior: Theoretical framework and countermeasures. Comput. Secur. **2020**, 97, 101963, doi:10.1016/j.cose.2020.101931.
78. Maule, A.; Hockey, G.; Bdzola, L. Effects of time-pressure on decision-making under uncertainty: changes in affective state and information processing strategy. Acta psychologica **2000**, 104 3, 283-301, doi:10.1016/S0001-6918(00)00033-0.
79. Song, H.; Gao, R.; Zhang, Q.; Li, Y. The nonlinear effect of time pressure on innovation performance: New insights from a meta-analysis and an empirical study. Frontiers in Psychology **2023**, 13, doi:10.3389/fpsyg.2022.1049174.
80. Pelfrey, W.; Young, A. Police Crisis Intervention Teams: Understanding Implementation Variations and Officer-Level Impacts. Journal of Police and Criminal Psychology **2020**, 35, 1-12, doi:10.1007/S11896-019-9314-4.
81. Oostinga, M.S.D.; Giebels, E.; Taylor, P. Communication Error Management in Law Enforcement Interactions: A Sender's Perspective. Criminal Justice and Behavior **2019**, doi:10.1177/0093854819870856.
82. Bertrand, B.; Evain, J.; Piot, J.; Wolf, R.; Bertrand, P.; Louys, V.; Terrisse, H.; Bosson, J.; Albaladéjo, P.; Picard, J. Positive communication behaviour during handover and team-based clinical performance in critical situations: a simulation randomised controlled trial. British journal of anaesthesia **2021**, doi:10.1016/j.bja.2020.12.011.
83. Mathieu, J.; Kukenberger, M.; D'Innocenzo, L.; Reilly, G. Modeling reciprocal team cohesion-performance relationships, as impacted by shared leadership and members' competence. The Journal of applied psychology **2015**, 100 3, 713-734, doi:10.1037/a0038898.
84. Bedwell, W. Adaptive Team Performance: The Influence of Membership Fluidity on Shared Team Cognition. Frontiers in Psychology **2019**, 10, doi:10.3389/fpsyg.2019.02266.
85. Lepine, J. Adaptation of teams in response to unforeseen change: effects of goal difficulty and team composition in terms of cognitive ability and goal orientation. The Journal of applied psychology **2005**, 90 6, 1153-1167, doi:10.1037/0021-9010.90.6.1153.
86. Stets, J.; Burke, P. Identity theory and social identity theory. Social Psychology Quarterly **2000**, 63, 224-237, doi:10.2307/2695870.
87. Hogg, M. Social Identity Theory. **2016**, doi:10.1007/978-3-319-29869-6_1.
88. Hogg, M.; Grieve, P. Social Identity Theory and the Crisis of Confidence in Social Psychology: A Commentary, and Some Research on Uncertainty Reduction. Asian Journal of Social Psychology **1999**, 2, 79-93, doi:10.1111/1467-839X.00027.
89. Liu, X.; Xu, Y.; Montes-Soldado, R.; Herrera, F. Social network group decision making: Managing self-confidence-based consensus model with the dynamic importance degree of experts and trust-based feedback mechanism. Inf. Sci. **2019**, 505, 215-232, doi:10.1016/J.INS.2019.07.050.
90. Kanapeckaitę, R.; Bagdžiūnienė, D. Relationships between team characteristics and soldiers' organizational commitment and well-being: the mediating role of psychological resilience. Frontiers in Psychology **2024**, 15, doi:10.3389/fpsyg.2024.1353793.
91. Ha, J.; Jue, J. The Mediating Effect of Group Cohesion Modulated by Resilience in the Relationship between Perceived Stress and Military Life Adjustment. Sustainability **2022**, doi:10.3390/su14137794.

92. Geuzinge, R.; Visse, M.; Duyndam, J.; Vermetten, E. Social Embeddedness of Firefighters, Paramedics, Specialized Nurses, Police Officers, and Military Personnel: Systematic Review in Relation to the Risk of Traumatization. Frontiers in Psychiatry **2020**, 11, doi:10.3389/fpsyt.2020.496663.
93. Post, C.; De Smet, H.; Uitdewilligen, S.; Schreurs, B.; Leysen, J. Participative or Directive Leadership Behaviors for Decision-Making in Crisis Management Teams? Small Group Research **2022**, 53, 692-724, doi:10.1177/10464964221087952.
94. Hayirli, T.; Stark, N.; Hardy, J.; Peabody, C.; Kerrissey, M. Centralization and democratization: Managing crisis communication in health care delivery. Health Care Management Review **2023**, 48, 292-300, doi:10.1097/HMR.0000000000000377.
95. Greer, L.; De Jong, B.; Schouten, M.; Dannals, J. Why and When Hierarchy Impacts Team Effectiveness: A Meta-Analytic Integration. Journal of Applied Psychology **2018**, 103, 591, doi:10.1037/apl0000291.
96. Hooper, P.; Kaplan, H.; Boone, J. A theory of leadership in human cooperative groups. Journal of theoretical biology **2010**, 265 4, 633-646, doi:10.1016/J.JTBI.2010.05.034.
97. Bonini, A.; Panari, C.; Caricati, L.; Mariani, M.G. The relationship between leadership and adaptive performance: A systematic review and meta-analysis. PLOS ONE **2024**, 19, doi:10.1371/journal.pone.0304720.
98. Bulutlar, F.; Kamaşak, R. Complex Adaptive Leadership for Performance: A Theoretical Framework. **2014**, 59-65, doi:10.1007/978-94-007-7362-2_9.
99. Heifetz, R.; Grashow, A.; Linsky, M. The Practice of Adaptive Leadership: Tools and Tactics for Changing Your Organization and the World. **2009**.
100. Jefferies, S. Adaptive Leadership in a Socially Revolving World: A Symbolic Interactionist Lens of Adaptive Leadership Theory. Performance Improvement **2017**, 56, 46-50, doi:10.1002/PFI.21741.
101. Lichtenstein, B.; Uhl-Bien, M.; Marion, R.; Seers, A.; Orton, J.; Schreiber, C. Complexity leadership theory: An interactive perspective on leading in complex adaptive systems. Emergence: Complexity and Organization **2006**, 8, doi:10.5465/AMR.1989.4308385.
102. Korn, J. Crises and Systems Thinking. Advances in Engineering Software **2020**, 8, 93-106, doi:10.14428/aes.v8i1.56283.
103. Moynihan, D. Crisis Management Policy and Hierarchical Networks. **2005**, doi:10.2139/SSRN.817308.
104. Safaei, A.S.; Farsad, S.; Paydar, M. Emergency logistics planning under supply risk and demand uncertainty. Operational Research **2020**, 1-24, doi:10.1007/S12351-018-0376-3.
105. Scott, R.; Nowell, B. Networks and Crisis Management. **2020**, doi:10.1093/ACREFORE/9780190228637.013.1650.
106. Ayres, P. Something old, something new from cognitive load theory. Comput. Hum. Behav. **2020**, 113, 106503, doi:10.1016/j.chb.2020.106503.
107. Merriënboer, J.; Sweller, J. Cognitive Load Theory and Complex Learning: Recent Developments and Future Directions. Educational Psychology Review **2005**, 17, 147-177, doi:10.1007/S10648-005-3951-0.
108. Paas, F.; Tuovinen, J.; Tabbers, H.; Van Gerven, P. Cognitive Load Measurement as a Means to Advance Cognitive Load Theory. Educational Psychologist **2003**, 38, 63-71, doi:10.1207/S15326985EP3801_8.
109. Sewell, J.; Maggio, L.; Cate, T.; Van Gog, T.; Young, J.; O'Sullivan, P. Cognitive load theory for training health professionals in the workplace: A BEME review of studies among diverse professions: BEME Guide No. 53. Medical Teacher **2018**, 41, 256-270, doi:10.1080/0142159X.2018.1505034.
110. Sweller, J. Measuring cognitive load. Perspectives on Medical Education **2018**, 7, 1-2, doi:10.1007/s40037-017-0395-4.
111. Heusler, B.; Sutter, C. Shoot or Don't Shoot? Tactical Gaze Control and Visual Attention Training Improves Police Cadets' Decision-Making Performance in Live-Fire Scenarios. Frontiers in Psychology **2022**, 13, doi:10.3389/fpsyg.2022.798766.
112. Horn, R.; Lewinski, W.; Heidner, G.S.; Lawton, J.; Allen, C.; Albin, M.; Murray, N. Assessing between-officer variability in responses to a live-acted deadly force encounter as a window to the effectiveness of training and experience. Ergonomics **2023**, 1-16, doi:10.1080/00140139.2023.2278416.

113. Kleygrewe, L.; Hutter, R.; Koedijk, M.; Oudejans, R. Virtual reality training for police officers: a comparison of training responses in VR and real-life training. Police Practice and Research **2023**, 25, 18-37, doi:10.1080/15614263.2023.2176307.
114. Martaindale, M.; Sandel, W.; Duron, A.; McAllister, M. Can a Virtual Reality Training Scenario Elicit Similar Stress Response as a Realistic Scenario-Based Training Scenario? Police Quarterly **2023**, 27, 109-129, doi:10.1177/10986111231182729.
115. Bahora, M.; Hanafi, S.; Chien, V.; Compton, M. Preliminary Evidence of Effects of Crisis Intervention Team Training on Self-Efficacy and Social Distance. Administration and Policy in Mental Health and Mental Health Services Research **2008**, 35, 159-167, doi:10.1007/s10488-007-0153-8.
116. Fiske, Z.; Songer, D.; Schriver, J. A National Survey of Police Mental Health Training. Journal of Police and Criminal Psychology **2020**, 36, 236-242, doi:10.1007/s11896-020-09402-1.
117. Hassell, K. The impact of Crisis Intervention Team Training for police. International Journal of Police Science & Management **2020**, 22, 159-170, doi:10.1177/1461355720909404.
118. Teller, J.; Munetz, M.; Gil, K.; Ritter, C. Crisis intervention team training for police officers responding to mental disturbance calls. Psychiatric services **2006**, 57 2, 232-237, doi:10.1176/APPI.PS.57.2.232.
119. Fiore, S.; Ross, K.; Jentsch, F. A Team Cognitive Readiness Framework for Small-Unit Training. Journal of Cognitive Engineering and Decision Making **2012**, 6, 325-349, doi:10.1177/1555343412449626.
120. Klein, G.; Pierce, L. Adaptive Teams. **2007**.
121. Mammadov, R.A. The application of special operations forces combat tactics. The Proceeding "Bulletin MILF" **2024**, doi:10.56132/2791-3368.2024.2-49-08.
122. Raybourn, E.; Mendini, K.; Heneghan, J.; Deagle, E. Adaptive thinking & leadership simulation game training for special forces officers. **2005**.
123. White, S.; Mueller-Hanson, R.; Dorsey, D.; Pulakos, E.; Wisecarver, M.; Deagle, E.; Mendini, K. Developing Adaptive Proficiency in Special Forces Officers. **2005**, doi:10.1037/e584632011-001.
124. Yammarino, F.; Mumford, M.; Connelly, M.; Dionne, S. Leadership and Team Dynamics for Dangerous Military Contexts. Military Psychology **2010**, 22, doi:10.1080/08995601003644221.
125. Chang, A.; Dym, A.; Venegas-Borsellino, C.; Bangar, M.; Kazzi, M.; Lisenenkov, D.; Qadir, N.; Keene, A.; Eisen, L. Comparison between Simulation-based Training and Lecture-based Education in Teaching Situation Awareness. A Randomized Controlled Study. Annals of the American Thoracic Society **2017**, 14, 529, doi:10.1513/AnnalsATS.201612-950OC.
126. Figueroa, M.; Sepanski, R.; Goldberg, S.; Shah, S. Improving Teamwork, Confidence, and Collaboration Among Members of a Pediatric Cardiovascular Intensive Care Unit Multidisciplinary Team Using Simulation-Based Team Training. Pediatric Cardiology **2013**, 34, 612-619, doi:10.1007/s00246-012-0506-2.
127. Haugland, V.; Reime, M. Scenario-based simulation training as a method to increase nursing students' competence in demanding situations in dementia care. A mixed method study. Nurse education in practice **2018**, 33, 164-171, doi:10.1016/j.nepr.2018.08.008.
128. Schulz, F.; Nguyen, Q.; Baetzner, A.; Sjöberg, D.; Gyllencreutz, L. Exploring medical first responders' perceptions of mass casualty incident scenario training: a qualitative study on learning conditions and recommendations for improvement. BMJ Open **2024**, 14, doi:10.1136/bmjopen-2024-084925.
129. Yahoodik, S.; Yamani, Y. Effectiveness of risk awareness perception training in dynamic simulator scenarios involving salient distractors. Transportation Research Part F: Traffic Psychology and Behaviour **2021**, doi:10.1016/j.trf.2021.06.009.
130. Chauvin, C.; Clostermann, J.-P.; Hoc, J.-M. Situation Awareness and the Decision-Making Process in a Dynamic Situation: Avoiding Collisions at Sea. Journal of Cognitive Engineering and Decision Making **2008**, 2, 1-23, doi:10.1518/155534308X284345.
131. Gamble, K.; Vettel, J.; Vettel, J.; Vettel, J.; Patton, D.; Eddy, M.; Davis, F.; Garcia, J.; Garcia, J.; Spangler, D.; et al. Different profiles of decision making and physiology under varying levels of stress in trained military personnel. International journal of psychophysiology : official journal of the International Organization of Psychophysiology **2018**, 131, 73-80, doi:10.1016/j.ijpsycho.2018.03.017.

132. Price, T.; LaFiandra, M. The perception of team engagement reduces stress induced situation awareness overconfidence and risk-taking. Cognitive Systems Research **2017**, 46, 52-60, doi:10.1016/j.cogsys.2017.02.004.
133. Starcke, K.; Brand, M. Decision making under stress: A selective review. Neuroscience & Biobehavioral Reviews **2012**, 36, 1228-1248, doi:10.1016/j.neubiorev.2012.02.003.
134. Cook, P.; Bellis, M. Knowing the risk. Public Health **2001**, 115, 54-61, doi:10.1038/SJ.PH.1900728.
135. Janssen, E.; Ruiter, R.; Waters, E. Combining risk communication strategies to simultaneously convey the risks of four diseases associated with physical inactivity to socio-demographically diverse populations. Journal of Behavioral Medicine **2018**, 41, 318-332, doi:10.1007/s10865-017-9894-3.
136. Langdon, G.; Balchin, K.; Mufamadi, P. Evaluating risk awareness in undergraduate students studying mechanical engineering. European Journal of Engineering Education **2010**, 35, 553-562, doi:10.1080/03043797.2010.489939.
137. Bauer, E.; MacNamara, A.; Sandre, A.; Lonsdorf, T.; Weinberg, A.; Morriss, J.; Van Reekum, C. Intolerance of uncertainty and threat generalization: A replication and extension. Psychophysiology **2020**, doi:10.1111/psyp.13546.
138. Elagina, V.; Apalikova, I. FORMATION OF PSYCHOLOGICAL STABILITY CADETS OF A MILITARY UNIVERSITY. Современные проблемы науки и образования (Modern Problems of Science and Education) **2021**, doi:10.17513/SPNO.30619.
139. Goncharova, N.; Ivanova, A. Differential psychological analysis of the features of psychological stability of the law enforcement officials. Vestnik of the St. Petersburg University of the Ministry of Internal Affairs of Russia **2022**, doi:10.35750/2071-8284-2022-1-217-224.
140. Kravchenko, K. Theoretical and methodological fundamentals of psychological stability problematics of the Armed Forces of Ukraine personnel conditioned by the russian federation armed aggression. Visnyk Taras Shevchenko National University of Kyiv. Military-Special Sciences **2022**, doi:10.17721/1728-2217.2022.49.38-47.
141. Fan, X.; Sun, S.; Yen, J. On Shared Situation Awareness for Supporting Human Decision-Making Teams. **2005**, 17-24.
142. Ghobadi, S.; Mathiassen, L. Risks to Effective Knowledge Sharing in Agile Software Teams: A Model for Assessing and Mitigating Risks. Information Systems Journal **2017**, 27, 699-731, doi:10.1111/isj.12117.
143. Lotrecchiano, G.; Mallinson, T.; Leblanc-Beaudoin, T.; Schwartz, L.; Lazar, D.; Falk-Krzesinski, H. Individual motivation and threat indicators of collaboration readiness in scientific knowledge producing teams: a scoping review and domain analysis. Heliyon **2016**, 2, doi:10.1016/j.heliyon.2016.e00105.
144. Du, J.; Li, N.; Luo, Y. Authoritarian Leadership in Organizational Change and Employees' Active Reactions: Have-to and Willing-to Perspectives. Frontiers in Psychology **2020**, 10, doi:10.3389/fpsyg.2019.03076.
145. Eslahchi, M. Leadership and collective learning: a case study of a social entrepreneurial organisation in Sweden. The Learning Organization **2023**, doi:10.1108/tlo-11-2022-0133.
146. Gu, J.; Wang, G.; Liu, H.; Song, D.; He, C. Linking authoritarian leadership to employee creativity. Chinese Management Studies **2018**, 12, 384-406, doi:10.1108/CMS-10-2017-0294.
147. Lau, R.; Cheung, G.; Cooper–Thomas, H. The influence of dispositions and shared leadership on team–member exchange. Journal of Managerial Psychology **2021**, 36, 258-271, doi:10.1108/JMP-01-2020-0025.
148. Maynard, M.; Mathieu, J.; Rapp, T.; Gilson, L.; Kleiner, C. Team leader coaching intervention: An investigation of the impact on team processes and performance within a surgical context. The Journal of applied psychology **2020**, doi:10.1037/apl0000814.
149. Nordbäck, E.; Espinosa, J. Effective Coordination of Shared Leadership in Global Virtual Teams. Journal of Management Information Systems **2019**, 36, 321-350, doi:10.1080/07421222.2018.1558943.
150. Riener, G.; Wiederhold, S. Team Building and Hidden Costs of Control. Journal of Economic Behavior and Organization **2016**, 123, 1-18, doi:10.1016/J.JEBO.2015.12.008.
151. Sarin, S.; O'Connor, G. First Among Equals: The Effect of Team Leader Characteristics on the Internal Dynamics of Cross-Functional Product Development Teams. Journal of Product Innovation Management **2009**, 26, 188-205, doi:10.1111/J.1540-5885.2009.00345.X.

152. Agung, A.; Kharisma, M.; Dewa, I.; Satrya, G.; Ciputra, U.; Surabaya, C.C. Participatory Leadership Style of Top Management at Medi Groups Bali. Asia Pacific Journal of Management and Education **2022**, doi:10.32535/apjme.v5i3.1894.
153. Mitson, R.; Xu, H.; Hmielowski, J. Understanding the efficacy of leadership communication styles in flex work contexts. Corporate Communications: An International Journal **2024**, doi:10.1108/ccij-02-2024-0033.
154. Rennie, S.; Prieur, L.; Platt, M. Communication style drives emergent leadership attribution in virtual teams. Frontiers in Psychology **2023**, 14, doi:10.3389/fpsyg.2023.1095131.
155. George, J. Emotions and Leadership: The Role of Emotional Intelligence. Human Relations **2000**, 53, 1027-1055, doi:10.1177/0018726700538001.
156. Glasø, L.; Einarsen, S. Emotion regulation in leader–follower relationships. European Journal of Work and Organizational Psychology **2008**, 17, 482-500, doi:10.1080/13594320801994960.
157. Torrence, B.; Connelly, S. Emotion Regulation Tendencies and Leadership Performance: An Examination of Cognitive and Behavioral Regulation Strategies. Frontiers in Psychology **2019**, 10, doi:10.3389/fpsyg.2019.01486.
158. Cooley, E. Training an Interdisciplinary Team in Communication and Decision-Making Skills. Small Group Research **1994**, 25, 25-25, doi:10.1177/1046496494251002.
159. Crichton, M. Improving team effectiveness using tactical decision games. Safety Science **2009**, 47, 330-336, doi:10.1016/J.SSCI.2008.07.036.
160. Marks, M.; Sabella, M.; Burke, C.; Zaccaro, S. The impact of cross-training on team effectiveness. The Journal of applied psychology **2002**, 87 1, 3-13, doi:10.1037/0021-9010.87.1.3.
161. Silva, A.; Conte, D.; Clemente, F. Decision-Making in Youth Team-Sports Players: A Systematic Review. International Journal of Environmental Research and Public Health **2020**, 17, doi:10.3390/ijerph17113803.
162. Stout, R.; Salas, E. The Role of Planning in Coordinated Team Decision Making: Implications for Training. Proceedings of the Human Factors and Ergonomics Society Annual Meeting **1993**, 37, 1238-1242, doi:10.1177/154193129303701808.
163. Kelly, S.; Macdonald, P. A Look at Leadership Styles and Workplace Solidarity Communication. International Journal of Business Communication **2019**, 56, 432-448, doi:10.1177/2329488416664176.
164. Wendt, H.; Euwema, M.; Van Emmerik, I.J.H. Leadership and Team Cohesiveness Across Cultures. Leadership Quarterly **2009**, 20, 358-370, doi:10.1016/J.LEAQUA.2009.03.005.
165. Van Assen, M. Training, employee involvement and continuous improvement – the moderating effect of a common improvement method. Production Planning & Control **2021**, 32, 132-144, doi:10.1080/09537287.2020.1716405.
166. Rodríguez, J.; Guenaga, J.; Iruarrizaga, J.H.; De La Mata, A.A. Initiatives for the improvement of continuous management training. **2015**, 15, 61-92, doi:10.5295/CDG.130411JL.
167. Yukl, G. How leaders influence organizational effectiveness. Leadership Quarterly **2008**, 19, 708-722, doi:10.1016/J.LEAQUA.2008.09.008.
168. Kozlowski, S. Advancing research on team process dynamics. Organizational Psychology Review **2015**, 5, 270-299, doi:10.1177/2041386614533586.
169. Coury, B.; Terranova, M. Collaborative Decision Making in Dynamic Systems. Proceedings of the Human Factors and Ergonomics Society Annual Meeting **1991**, 35, 944-948, doi:10.1177/154193129103501311.
170. Gorman, J. Team Coordination and Dynamics. Current Directions in Psychological Science **2014**, 23, 355-360, doi:10.1177/0963721414545215.
171. Ho, Y.-C. Team decision theory and information structures. Proceedings of the IEEE **1980**, 68, 644-654, doi:10.1109/proc.1980.11718.
172. Kleinman, D. Coordination in Human Teams: Theories, Data and Models. IFAC Proceedings Volumes **1990**, 23, 417-422, doi:10.1016/S1474-6670(17)51769-3.
173. Silver, S. Decision-Making Groups and Teams: An Information Exchange Perspective. **2013**, doi:10.4324/9780203754191.
174. De Jong, B.; Dirks, K.; Gillespie, N. Trust and team performance: A meta-analysis of main effects, moderators, and covariates. The Journal of applied psychology **2016**, 101 8, 1134-1150, doi:10.1037/apl0000110.

175. Boies, K.; Fiset, J.; Gill, H. Communication and trust are key: Unlocking the relationship between leadership and team performance and creativity. Leadership Quarterly **2015**, 26, 1080-1094, doi:10.1016/J.LEAQUA.2015.07.007.
176. Zaccaro, S.; McCoy, M. The Effects of Task and Interpersonal Cohesiveness on Performance of a Disjunctive Group Task1. Journal of Applied Social Psychology **1988**, 18, 837-851, doi:10.1111/J.1559-1816.1988.TB01178.X.
177. Arakal, T.; Mampilly, D.S.R. The Impact of Interpersonal Trust on Group Cohesion: An empirical attestation among Scientists in R&D organizations. IRA-International Journal of Management & Social Sciences **2016**, 3, 319-329, doi:10.21013/JMSS.V3.N2.P13.
178. Kang, S. The Power of Play. American Journal of Health Promotion **2020**, 34, 573-575, doi:10.1177/0890117120920488e.
179. Meneghel, I.; Salanova, M.; Martínez, I. Feeling Good Makes Us Stronger: How Team Resilience Mediates the Effect of Positive Emotions on Team Performance. Journal of Happiness Studies **2016**, 17, 239-255, doi:10.1007/S10902-014-9592-6.
180. Pavez, I.; Gómez, H.; Laulié, L.; González, V. Project team resilience: The effect of group potency and interpersonal trust. International Journal of Project Management **2021**, doi:10.1016/j.ijproman.2021.06.004.
181. Carmeli, A.; Friedman, Y.; Tishler, A. Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. Safety Science **2013**, 51, 148-159, doi:10.1016/J.SSCI.2012.06.002.
182. Hartwig, A.; Clarke, S.; Johnson, S.; Willis, S. Workplace team resilience: A systematic review and conceptual development. Organizational Psychology Review **2020**, 10, 169-200, doi:10.1177/2041386620919476.
183. Biggart, L.; Ward, E.; Cook, L.; Schofield, G. The team as a secure base: Promoting resilience and competence in child and family social work. Children and Youth Services Review **2017**, 83, 119-130, doi:10.1016/J.CHILDYOUTH.2017.10.031.
184. Kwatny, H.; Miu-Miller, K. Power System Dynamics and Control. **2016**, doi:10.1007/978-0-8176-4674-5.
185. Simeonova, B.; Galliers, R.; Karanasios, S. Power dynamics in organisations and the role of information systems. Information Systems Journal **2021**, 32, doi:10.1111/isj.12373.
186. Cojocar, W. Adaptive Leadership in the Military Decision Making Process. Military review **2012**, 91, 29.
187. Derue, D. Adaptive leadership theory: Leading and following as a complex adaptive process. Research in Organizational Behavior **2011**, 31, 125-150, doi:10.1016/J.RIOB.2011.09.007.
188. Mallillin, L. Adaptive Theory Approach In Leadership. International Journal of Asian Education **2022**, doi:10.46966/ijae.v3i4.282.
189. Murthy, V.; Murthy, A. Adaptive leadership responses. World Journal of Entrepreneurship, Management and Sustainable Development **2014**, 10, 162-176, doi:10.1108/WJEMSD-05-2013-0029.
190. Thygeson, M.; Morrissey, L.; Ulstad, V. Adaptive leadership and the practice of medicine: a complexity-based approach to reframing the doctor-patient relationship. Journal of evaluation in clinical practice **2010**, 16 5, 1009-1015, doi:10.1111/j.1365-2753.2010.01533.x.
191. Kirkman, B.; Shapiro, D.; Lu, S.; McGurrin, D. Culture and teams. Current opinion in psychology **2016**, 8, 137-142, doi:10.1016/j.copsyc.2015.12.001.
192. Jamshed, S.; Majeed, N. Relationship between team culture and team performance through lens of knowledge sharing and team emotional intelligence. J. Knowl. Manag. **2019**, 23, 90-109, doi:10.1108/JKM-04-2018-0265.
193. Driskell, T.; Salas, E.; Driskell, J. Teams in extreme environments: Alterations in team development and teamwork. Human Resource Management Review **2017**, doi:10.1016/J.HRMR.2017.01.002.
194. Nurmi, N. Coping with coping strategies: how distributed teams and their members deal with the stress of distance, time zones and culture. Stress and health : journal of the International Society for the Investigation of Stress **2011**, 27 2, 123-143, doi:10.1002/SMI.1327.
195. Serfaty, D.; Entin, E.; Volpe, C. Adaptation to Stress in Team Decision-Making and Coordination. Proceedings of the Human Factors and Ergonomics Society Annual Meeting **1993**, 37, 1228-1232, doi:10.1177/154193129303701806.

196. Zimdahl, M.; Undorf, M. Hindsight bias in metamemory: outcome knowledge influences the recollection of judgments of learning. Memory **2021**, 29, 559-572, doi:10.1080/09658211.2021.1919144.
197. Christensen-Szalanski, J.; Willham, C. The hindsight bias: A meta-analysis. Organizational Behavior and Human Decision Processes **1991**, 48, 147-168, doi:10.1016/0749-5978(91)90010-Q.
198. Hertel, G. Synergetic effects in working teams. Journal of Managerial Psychology **2011**, 26, 176-184, doi:10.1108/02683941111112622.
199. Muñoz, A.R.; Vega-Díaz, M.; González-García, H. Team Cohesion Profiles: Influence on the Development of Mental Skills and Stress Management. Journal of sports science & medicine **2023**, 22 4, 637-644, doi:10.52082/jssm.2023.637.
200. Pilny, A.; Dobosh, M.; Yahja, A.; Poole, M.; Campbell, A.; Ruge-Jones, L.; Proulx, J. Team Coordination in Uncertain Environments: The Role of Processual Communication Networks. Human Communication Research **2020**, 46, 385-411, doi:10.1093/hcr/hqz020.