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# From Military Training to Cognitive Readiness: The Role of Military Leader

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**Abstract**
This paper measures the effect of the military leader on Cognitive Readiness (CR) among military personnel in the Malaysian Army (MA) through military training. In Complex Operating Environments (COE), military organizations need to ensure that personnel are cognitively prepared to think critically and respond effectively during deployment. CR refers to military personnel who possess the necessary knowledge, skills, and abilities (KSAs) to perform competently in complex environments. This study underscores the crucial role of the military leader in ensuring that personnel are equipped with these KSAs through effective training. Data were collected from 2,261 military personnel across the Royal Malay Regiment, Royal Ranger Regiment, and Border Regiment, and analyzed using the Statistical Package for Social Science (SPSS, version 25) and Partial Least Squares-Structural Equation Modeling (PLS-SEM, SmartPLS4). The findings demonstrate that the military leader has a significant effect on the CR of military personnel, with a path coefficient of 0.554. Additionally, the model explains that 30.7% of the variance in the CR ($R^2 = 0.307$) is influenced by the military leader. The predictive analysis further shows that the $Q^2$ value for CR is 0.305. In conclusion, the model provides strong evidence that the military leader plays a pivotal role in shaping CR outcomes through their influence on military training.
**Keywords:** Cognitive Readiness, Complex Operating environment, Military Leader, Military Personnel Readiness, Military Training

## Introduction
In the rapidly evolving landscape of military operations, the development of Cognitive Readiness (CR) among military personnel has become increasingly critical. CR refers to the military personnel who are cognitively ready with the necessary military knowledge, skills, and abilities (KSAs) required to perform effectively to sustain competent performance in

complex environments. Complex operating environments (COE) are characterized by their unpredictability, high-stakes scenarios, and rapidly changing dynamics (Tornero-Aguilera et al., 2024; Stergiou et al., 2023). In the military context, such environments can range from intense combat zones to disaster relief operations, where conditions shift rapidly, and decisions must be made in real-time (McInerney et al., 2024).

Military failure and incompetence have emerged as areas of significant concern, particularly in the context of military personnel readiness (McLemore, 2021; Nindl et al., 2018; Raffensperger & Schrage,1997; Goldberg et al., 1991). A key factor influencing these outcomes is the role of the military leader in shaping the CR of their subordinates. Understanding how the military leader affects CR is crucial for addressing readiness gaps and ensuring that military personnel are prepared to meet complex operational demands. This line of inquiry is essential for developing evidence-based strategies to strengthen leadership practices and optimize training approaches, ultimately mitigating the risk of military failures.

Steinberg & Kornguth (2009) mentioned that sustaining competent performance in complex environments requires a multifaceted approach. Adaptive training should focus on developing problem-solving skills for unpredictable scenarios while incorporating stress-management techniques that can enhance resilience and performance under pressure (Fraulini et al., 2024). Additionally, using spaced repetition in military training strengthens the long-term retention of essential tactical knowledge and combat skills, ensuring that soldiers can rely on these competencies during critical missions. Improving cognitive flexibility through targeted military exercises further enables personnel to quickly adjust and adapt to unpredictable battlefield conditions, maintaining operational effectiveness in dynamic environments. However, to maximize these training outcomes, the military leader plays a crucial role in designing and implementing these practices, ensuring that the military training is aligned with mission requirements and that military personnel are prepared to apply their KSA in the real world of COE.

The role of the military leader is central to sustaining competent performance in such complex environments (Bartone et al., 2007). A Military Leader not only guides the development of adaptive problem-solving skills but also fosters a culture of resilience by modeling effective stress-management strategies (Gutmann et al., 2024; Bekesiene et al., 2021). Their leadership ensures that training programs incorporate practices like spaced repetition for skill retention, while they also promote cognitive flexibility among their personnel, encouraging quick and effective adaptation to changing battlefield conditions. By integrating these elements, the military leader plays a pivotal role in preparing their teams to maintain high levels of competence and readiness in unpredictable and high-pressure situations.

The modern battlefield demands mitigating the effects of insurgent enemies' creative tactics, especially at the tactical level, where military personnel must coordinate effectively through proficiency in battle drills and immediate actions (Lopez, 2020). Military personnel must also excel in adaptive decision-making and flexible action execution to respond to emerging threats. A key concern is whether current training theories can adequately support the development of military personnel CR that are not only procedurally ready but also cognitively prepared. In response to this challenge, this study highlighted the role of the military leader effect the development of CR through military training. A theoretical framework designed to guide the development of CR for Tactical Cognitive Readiness (TCR). Therefore, this study aims to examine the framework proposed by Alim et al. (2024) by investigating the effect of the military leader on the CR of military personnel through the process of military training in the Malaysian Army (MA). Previous studies have highlighted the significance of the military leader in enhancing various aspects of military personnel performance, yet the specific pathways through which military leader contributes to the development of CR are less understood. This paper posits that the role of the military leader to their subordinates in preparing military personnel readiness especially CR is a crucial mechanism in this through the process of military training.

*Cognitive Readiness of Military Personnel*

The concept of military cognitive readiness (CR) comprises three interconnected constructs strategic, operational, and tactical levels of military organizations that need to be established for military personnel readiness (; Fletcher & Wind 2013; Kluge & Burkolter, 2013; Grier, 2012; Grier, 2011). Each level necessitates distinct cognitive performance in complex, uncertain, and stressful military operations, with the nature of performance varying across the levels. CR holds significant potential for predicting individual and team performance in complex, dynamic, and resource-constrained environments. However, the existing literature on CR remains fragmented and inconsistent, with varied and often conflicting theoretical frameworks proposed by leading researchers. This lack of cohesion has created a confusing and challenging landscape for those seeking to apply CR in a practical setting. In military contexts, CR focuses on preparing individuals to manage complexity, adapt rapidly, and maintain high performance under pressure.

Etter (2002) introduced the concept of CR, highlighting its importance for military personnel in managing stress, and sleep deprivation, and utilizing advanced technologies such as augmented reality and real-time monitoring. CR is crucial for ensuring that personnel perform effectively in high-pressure environments. This involves exploring methods to enhance cognitive performance by reviewing existing studies and outlining future directions for the continued development of CR in support of national security. CR is influenced by four key domains of science and technology research. Sociology and personnel cover issues related to family, group dynamics, selection, classification, and leadership. Health and welfare focus on mental acuity, fatigue, physiological readiness, quality of life, and morale. Human systems integration addresses human-centered design, decision aids, and dynamic function allocation, while education and training emphasize the use of new technologies to develop specific tasks, skills, and procedures (Etter, 2002).

The primary purpose of a nation's armed forces is to safeguard the society they serve (Shields, 2020). This comprehensive framework highlights the broad spectrum of challenges that military organizations face in modern military operations. The Department of Defense (DOD) United States (US) adopts a multidisciplinary approach to enhance this dimension within joint warfighting capabilities, ensuring that research focuses on critical areas such as mental readiness, optimal performance, and the affordability and effectiveness of tools and techniques for warfighters. As the military landscape continues to evolve, the emphasis on CR has become increasingly important. Various factors, including diverse threats, shifting missions, budget constraints, and the growing complexity of military technologies, shape this readiness. The importance of CR in national security highlighted key research to ensure military personnel are cognitively and physically prepared for their missions (Etter, 2002).

The military invests substantial resources in recruiting, training, and equipping each military personnel to ensure deployment readiness (Travis & Brown, 2023; Beckley, 2010). Each military personnel represents a critical investment for both the military organization and the nation. Military service, particularly in deployed environments, places high physical and cognitive demands on military personnel, requiring optimal performance to ensure mission success. Therefore, reintegrating highly trained and combat experience is beneficial for mission success, morale, and unit cohesion. However, existing assessments are fragmented, lacking an integrated approach to capture the multifaceted demands of the military leader roles (Lee, 2020).

Lee (2020) posits that U.S. Department of Defense strategies, including joint all-domain operations, multi-domain operations, and distributed maritime operations, necessitate that U.S. forces perform with greater efficiency, effectiveness, and speed compared to adversaries. However, China, as the primary strategic competitor, is continuously evolving and developing a military "system of systems" designed to surpass U.S. capabilities across all domains. While it is relatively straightforward to assess the performance of tangible components within the People's Liberation Army (PLA), evaluating the intangible elements such as leadership effectiveness and decision-making processes presents a greater challenge. These leadership and cognitive elements are crucial, as they function as the "operating systems" governing the overall performance and cohesion of the PLA. The lack of a standardized metric to measure these dimensions not only complicates the assessment of military readiness but also hinders the development and validation of effective CR models. This underscores the urgent need for a structured framework that emphasizes the role of the military leader in shaping CR and optimizing operational readiness.

Military personnel demand proficiency across physical, cognitive, and emotional domains, requiring military personnel to make rapid, precise decisions while executing physically strenuous tasks in high-stress environments. This gap makes it challenging to assess and quantify the complex nature of military duties accurately. In response to the need for objective and comprehensive development of military readiness using effective concepts for enhancing military personnel readiness especially the concept of CR.

CR has garnered increasing attention as researchers seek to define and measure it concerning an individual's preparedness for complex tasks. While existing studies offer various perspectives, many converge on common principles that underscore the role of stable KSAs in determining CR. CR has been defined in many ways. For this study, we define CR refers to the military personnel who are cognitively ready with the necessary military KSAs required to perform effectively to sustain competent performance in complex environments of military operations. Table 1 presents the definitions of CR provided by prominent researchers in the field.

**Table 1**. Definition of Cognitive Readiness

| **Definition of Cognitive Readiness** | |
|---|---|
| Etter (2002) | Military personnel must be prepared not only in terms of physical readiness but also in cognitive readiness. |
| Morrison & Fletcher(2002) | Cognitive readiness refers to the mental preparation, encompassing skills, knowledge, abilities, motivations, and personal dispositions, that individuals require to establish and sustain competent performance in the complex and unpredictable environments typical of modern military operations. |
| Cosenzo et al. (2007) | The optimization and enhancement of human cognitive performance a crucial factors for effective operational success, particularly in enabling individuals to perform multiple functions and adapt to diverse, rapidly evolving threats. |
| Bolstad et al. (2008) | Cognitive readiness is defined as the possession of psychological (mental) and sociological (social) knowledge, skills, and attitudes (KSAs) necessary for individuals and teams to maintain competent professional performance and mental well-being in the dynamic, complex, and unpredictable environments of military operations. |
| Grier (2012) | Tactical cognitive readiness refers to a state of mental acuity that ensures an acceptable level of performance during assigned missions. Operational cognitive readiness, as defined by Grier (2012), draws on Morrison and Fletcher's (2002) work. Strategic cognitive readiness pertains to an individual's potential to perform cognitive tasks effectively in the complex and unpredictable environment of modern military operations. |

In modern warfare, military personnel face significant challenges as their KSAs are pushed to the limit by increasingly complex missions and heightened operational tempo. While personnel are essential to managing these demands, additional stressors such as time pressure can impair team performance, necessitating rapid coordination adjustments like redistributing tasks and resources. These shifting demands often exceed individual cognitive capacities, increasing the risk of errors, especially without adequate equipment, training, or leadership. In such dynamic environments, where poor performance can have catastrophic consequences, commanders must assess the CR of both individuals and teams, with a focus on developing CR to navigate the unpredictable nature of military operations.

CR represents a dynamic measure of cognitive preparedness essential for establishing and sustaining competent performance levels during military operations. This readiness is shaped by both stable traits and emergent states cognitive, affective, and physiological that fluctuate in response to task demands. Rather than being viewed as a fixed state, CR is influenced by a combination of KSAs, personality, and external factors. The KSA framework, as outlined by Bolstad et al. (2008, 2014), O'Neil et al. (2014), and Preddy et al. (2019), plays a critical role in supporting CR to achieve task success during military operations, as demonstrated in Table 2.

**Table 2**. Cognitive Readiness Components.

| Cognitive Readiness Components | | | |
|---|---|---|---|
| | **Component** | **Description** | **Function** |
| Bolstad et al. (2008)<br>Bolstad et al. (2014)<br>O'Neil et al. (2014)<br>Preddy et al. (2019)<br>Crameri et al. (2021) | Knowledge | Understanding of facts, concepts, and processes essential for task performance | Enables informed decision-making and navigation through complex military scenarios. |
| | Skills | The ability to apply knowledge through practiced tasks and procedures. | Ensures efficient task execution and adaptability to changing operational environments. |
| | Abilities | Inherent traits or capacities influencing task performance. | Supports effective problem-solving, situational awareness, and decision-making under pressure. |

The KSA framework is essential for understanding cognitive readiness in military operations. Knowledge refers to the understanding of essential facts, concepts, and processes, which allows personnel to make informed decisions in complex situations. Skills involve the practical application of knowledge through practiced tasks and procedures, enabling military personnel to execute missions efficiently and adapt to dynamic conditions. Abilities are the inherent cognitive and physical traits that influence how well individuals can perform tasks, such as problem-solving, situational awareness, and decision-making under pressure. Together, these KSA components ensure that military personnel are mentally and physically prepared to maintain high performance in the unpredictable environments of modern warfare.

As highlighted by Etter (2002), CR is influenced by four key domains, military training must prioritize the development of CR in conjunction with physical preparedness. This requires a structured focus on developing the KSA of military personnel to ensure they can sustain high performance in complex, unpredictable environments. Military training programs should emphasize situational awareness, adaptive decision-making, and the ability to operate effectively under stress and time pressure. These elements are critical in preparing personnel to navigate the cognitive demands of modern warfare. By integrating CR into training, military organizations ensure that military personnel are equipped not only to meet immediate operational challenges but also to adapt and perform in the evolving landscape of military operations.

*Military Training*

Military operations encompass a wide range of human performance skills and depend heavily on various cognitive abilities (Tait et al., 2024). The importance of effective military training cannot be overstated, as commanders are responsible not only for their performance but also for preparing their personnel to ensure readiness and effectiveness. Given the cognitive demands of military operations, military training holds significant potential to enhance operational readiness and warfighter performance. Yoon et al. (2024) highlighted that when training is effectively tailored, it can significantly enhance human performance in military operations, especially in situations demanding rapid and precise decision-making.

The best military training methods often discuss the general viability of training under ideal experimental conditions. However, incorporating these practices into active-duty military populations presents significant challenges. Some methodological concerns become more critical, while others may lessen in importance, but all must be addressed with the specific goal of enhancing human performance in military operations, rather than focusing on theoretical scenarios. The aim is to evaluate these training initiatives specifically for military purposes, with a focus on developing and improving operational skills to achieve tangible benefits from military training (Koltun et al., 2023). The successful implementation of military training to enhance performance will require a collaborative effort from military leaders.

In the early 21st century, military training gained widespread attention in both basic and applied research, with a focus on enhancing specific and broad operational skills through cognitive training. Various methods, such as simulation training, working memory (WM) training, meditation, brain stimulation, and physical conditioning, have been explored for their potential to improve military performance in real-world operations. A critical consideration in applying cognitive training to military outcomes is task analysis, which identifies the knowledge, skills, and abilities required for specific tasks. This is essential, as military operations often demand the integration of multiple cognitive abilities, making tailored training crucial (Harris et al., 2023 Havenetidis et al., 2023). By prioritizing real-world applications, expert feedback has been used to shape training regimens, rather than adapting pre-designed programs to fit operational needs (Travis, 2023).

Vrijkotte et al. (2016) mentioned that the COE of military operations is inherently unpredictable, and chaotic, and imposes a significant cognitive load, particularly on working memory (WM), which is known to be capacity-limited. Combat leaders must constantly monitor, update, and discard mission-relevant information under stressful conditions. Specialty roles, like medics and forward observers, often require rapid shifts between different tasks, while all personnel must maintain enough cognitive control to avoid friendly fire and civilian casualties. In complex environments such as urban combat, military personnel rely heavily on visuospatial attention and rapid decision-making to identify threats and execute appropriate actions. Additionally, these tasks are made even more challenging by distractions, psychological stress, and physical fatigue. Given the high cognitive demands placed on service members, there is a critical need for the development of CR of military personnel to enhance their capabilities and KSA in these areas.

When applying military training to real-world contexts, such as with military personnel, it is crucial to consider not only the range of transfer but also other key components of training. Learning theories emphasize that both the content the knowledge and skills practiced and the context the environment and conditions of learning are vital to the learner's outcomes (Gagne, 1962). Content overlap between training tasks and real-world tasks largely dictates the degree of transfer, while context influences factors like motivation and compliance. The interaction between content and context, especially in military settings, introduces complexities, such as the difference in training with simulators versus live ammunition. While simulators can provide valuable practice, they lack the full realism and psychological stress of live combat, making meaningful transfer of skills critical for ensuring performance in life-or-death situations.

To maximize the transfer of military training across different contexts, it is essential to target the underlying cognitive mechanisms, underscoring the importance of cognitive training. In military settings, although it is impossible to prepare personnel for every possible scenario, cognitive training can sharpen the critical skills most likely to be used in combat. This approach can be likened to improving a vehicle's performance even when the exact driving conditions are unknown. Cognitive improvements, driven by neural plasticity, occur when there is a mismatch between environmental demands and the brain's cognitive resources. Effective training should strike a balance between difficulty and manageability, utilizing adaptive paradigms that maintain engagement without overwhelming the participant. These training-induced changes in cognitive representations or processes enhance performance, yet the greatest challenge remains in fully understanding the links between cognitive processes such as working memory and their impact on military operations.

Military training operates within a well-defined scope, allowing for a more precise evaluation of its effectiveness. Rather than addressing a broad spectrum of tasks, cognitive training targets specific, high-impact areas. This focused approach, particularly in the development of CR among military personnel, ensures that training efforts are directly aligned with the unique demands of military operations. Consequently, cognitive training serves as a strategic investment in cultivating CR, enhancing operational readiness, and improving overall effectiveness.

Achieving this goal requires rigorous experimental design and careful evaluation of efficacy. Practical considerations, such as strict training schedules and the high stakes of combat preparedness, make it crucial to ensure that cognitive training methods are effective and do not waste valuable time. In military contexts, ineffective training could lead to less-prepared units and increased battlefield casualties. Drawing from the suggestions of Simons et al. (2016) and other experts, consider individual differences like baseline performance and motivation. Blacker et al. (2019) discuss methods to evaluate cognitive training, workarounds for limitations in empirical controls, and potential strategies to enhance the effectiveness of traditional cognitive training approaches. Standard military training designs must distinguish between simple practice or placebo effects and genuine improvements due to cognitive enhancement. This is equally important for military training, where the goal is to determine whether improvements in warfighter performance are significant enough to justify military investment.

Military training offers a promising avenue for enhancing operational readiness and effectiveness among military personnel. In such settings, where individuals work closely together, the role of military leaders is pivotal in ensuring that every participant has an equal chance of being assigned to any training group. This randomization is crucial for achieving equivalent baseline performance across groups and for accurately evaluating the efficacy of training interventions. Such rigor is particularly vital in developing CR, ensuring that training outcomes are both equitable and aligned with the operational needs of the military. The ability to perform operational tasks under diverse conditions underscores the essential role of military leaders, who are instrumental in fostering readiness and enhancing overall effectiveness.

*The Role of Military Leader*

Modern warfare is rapidly evolving with the emergence of new technological, biological, and nuclear threats. As these threats intensify, military personnel will face increasing cognitive demands across diverse operational environments. Vrijkotte et al. (2016) mentioned that cognitive performance is critical during military operations, as impaired cognition is believed to contribute significantly to accidents in combat. Combat scenarios expose personnel to extreme physical and cognitive stress, arousal, danger, sleep deprivation, and high-stress incidents. Additionally, extended periods of inactivity between high-intensity situations make maintaining alertness challenging, pushing personnel to the limits of human capability. This underscores the vital role of military leaders in designing training programs that adequately prepare personnel for these extreme conditions.

To navigate this evolving landscape, military leaders must adopt strategic approaches that prioritize the development of CR in personnel, with a focus on higher-order cognitive skills. Moreover, military organizations face operational demands that necessitate the creation of instructional technologies designed to address these growing training needs. Efficient, deployable training in advanced cognitive skills is crucial for enhancing the ability of military personnel to operate effectively in complex, high-stakes environments. Given the frequent need for military personnel to make rapid, life-or-death decisions with strategic implications, comprehensive pre-deployment training is essential to prepare them for the challenging and ambiguous situations they will encounter.

In the context of deployable training systems, military leaders play an essential role in ensuring their effective implementation and maximizing operational benefits (Gagné & Hewett, 2024; Stothard & Drobnjak, 2021). A key responsibility of military leaders involves making informed decisions regarding system selection and assessing practicality, transportability, and usability to align with the unit's specific needs and operational goals. This process includes evaluating the system's ability to develop CR by equipping personnel with the necessary military KSAs. A deployable system's ease of transport and setup is critical to mission success and the development of cognitive capabilities, as systems that are overly complex or require excessive manpower can undermine overall operational efficiency.

Military leaders are also tasked with overseeing the logistical aspects of transporting, setting up, and maintaining these systems in the field. The ability to deploy systems quickly and efficiently without requiring excessive personnel or setup time is crucial. Effective resource allocation and logistical management help prevent delays, ensuring that training systems are accessible and ready to use in time-sensitive environments (Scott & Deuster, 2024). In high-stakes operational settings, these efficiencies not only save time and resources but also develop CR by providing personnel with opportunities for rapid training engagement that sharpens decision-making and problem-solving skills.

Facilitating training and adapting systems to meet both operational and cognitive needs is another critical aspect of leadership. Leaders ensure that personnel are proficient in utilizing new training technologies designed to enhance their CR, while also adapting training regimens in response to real-time challenges (Fautua & Schatz, 2012; Schatz et al., 2012). This flexibility ensures that training remains relevant to the specific operational demands personnel will face in the field, further developing their CR and ensuring they possess the KSAs necessary for success in complex environments.

Military leaders also serve as the primary troubleshooters and system maintainers in the field. While technical support may be available, leaders must have a functional understanding of the system to address minor technical issues and ensure the continuity of training. Addressing disruptions swiftly, such as replacing faulty components or managing system failures, ensures that training can proceed without interruption, maintaining the flow of cognitive skill development and operational readiness.

Motivating personnel to engage regularly with deployable training systems is another responsibility of military leaders. Leaders cultivate a culture of continuous learning and readiness, encouraging personnel to take advantage of the system's accessibility for impromptu training sessions (Saul et al., (2024). This proactive engagement helps ensure personnel remain cognitively sharp and prepared for the unpredictable challenges of modern warfare. By monitoring progress and providing feedback, leaders can further enhance the effectiveness of these systems in honing the cognitive and operational skills of their teams.

Leaders also play a vital role in evaluating the overall efficiency and adaptability of training systems in operational environments. Ensuring that a system is self-contained, easy to use, and adaptable to varying field conditions is essential for sustained success. When a system proves ineffective or cumbersome, military leaders must assess and recommend modifications or alternatives, continuously aligning training resources with the evolving needs of their units. Through this evaluation process, leaders maintain a focus on developing CR and enhancing overall operational effectiveness.

**Conceptual Frameworks**

The conceptual framework of this study highlights the effect of the military leader on the development of CR) among military personnel. It posits that an effective military leader plays a crucial role in shaping the cognitive abilities required for personnel to perform efficiently in complex and high-stakes operational environments. Figure 1 illustrates the conceptual framework for this study.

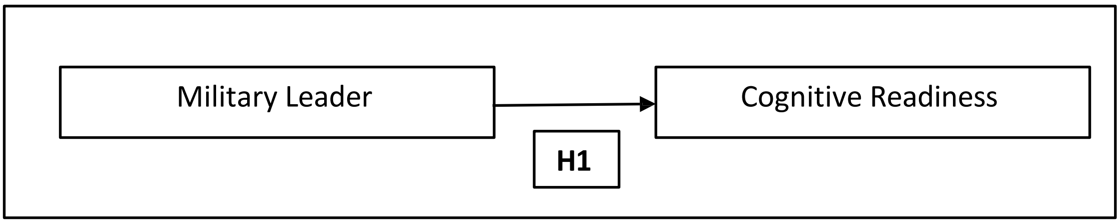


Figure 1. Conceptual Framework

*Study Hypothesis*

Hence, the study hypothesizes that the Military Leader has a significant influence on the CR of military personnel.

**H1**: Military leader has a significant effect on the CR of military personnel.

This hypothesis highlights the crucial role of the Military Leader in cultivating the essential knowledge, skills, and abilities (KSA) that drive the development of CR in military personnel.

The military leader is instrumental in sharpening the cognitive capabilities required for decisive and effective decision-making, particularly under high-stress conditions (McInerney et al., 2024; Crameri et al., 2021; Martin et al., 2020). Through clear guidance and a steadfast reinforcement of training objectives, the Military Leader fosters mental agility, heightened situational awareness, and critical thinking all of which are vital for military personnel to navigate complex and rapidly evolving tactical environments.

The Military Leader's influence ensures that the cognitive competencies instilled during training are not only internalized but also seamlessly translated into real-world operations. Their leadership enhances the decision-making acumen of their teams while instilling the confidence needed to tackle high-pressure challenges with a heightened state of CR (Ladson, 2024). Military Leaders play a transformative role in equipping their teams to anticipate, adapt, and overcome operational hurdles with precision and poise.

Moreover, Military Leaders directly shape the evolution of CR by modeling exemplary decision-making and fostering an environment that encourages continuous learning and cognitive growth. By creating a culture of constant intellectual development and mental preparedness, leaders ensure that their personnel are not only tactically adept but also cognitively primed to confront unpredictable and volatile situations head-on. Therefore, the study posits that the Military Leader's influence is a pivotal determinant in the CR of military personnel. By imparting the mental tools and fostering an environment of continuous cognitive advancement, Military Leaders empower their teams to excel in dynamic, high-stakes environments, ensuring superior readiness and operational effectiveness in the face of uncertainty.

## Methodology

*Overview*

This study utilizes Structural Equation Modeling-Partial Least Squares (SEM-PLS) to examine the relationships between variables within the proposed conceptual framework. SEM-PLS is selected for its robustness in managing complex models and its capability to assess both direct and indirect effects among latent constructs (Hair et al., 2017 Henseler et al., 2015). Data has been collected from military personnel within the Royal Malay Regiment (RMR), Royal Ranger Regiment (RRR), and Border Regiment (BR) of the Malaysian Army, focusing specifically on those who have undergone 24 months of training.

*Participant*

A total of 2,261 military personnel from the Royal Malay Regiment (RMR), Royal Ranger Regiment (RRR), and Border Regiment (BR) participated in the study as shown in Table 3. Table 3 presents the distribution of study participants across different ranks and units. These personnel, having completed 24 months of training, provided valuable insights into how the military leader affects on CR of military personnel.

Table 3
*Participant of Study*

| **Rank** | **Royal Malay Regiment** | **Unit Royal Ranger Regiment** | **Border Regiment** | **Total** |
|---|---|---|---|---|
| Lance Corporal | 307 | 83 | 130 | 520 |
| Corporal | 584 | 173 | 172 | 929 |
| Sergeant | 198 | 54 | 81 | 333 |
| Staff Sergeant | 87 | 30 | 26 | 143 |
| Warrant Officer II | 36 | 10 | 6 | 52 |
| Warrant Officer I | 10 | 6 | 2 | 18 |
| Lieutenant | 62 | 24 | 38 | 124 |
| Captain | 40 | 10 | 6 | 56 |
| Major | 44 | 12 | 16 | 72 |
| Lieutenant Colonel | 7 | 3 | 4 | 14 |
| **Total** | 1375 | 405 | 481 | 2261 |

*Procedure*
The data collection procedure involved distributing a structured questionnaire within the Malaysian Army, specifically targeting personnel from combat branches. The participants selected had completed the Malaysian Army Training System, which consists of a 24-month training cycle, ensuring they possessed adequate experience and exposure to military training. The questionnaire was designed to measure the effect of the military leader on CR, focusing on how leadership influences CR through military training. Before distribution, participants were thoroughly briefed on the study's objectives and were assured of the confidentiality of their responses to encourage honest and accurate feedback. The collected data was systematically analyzed to identify trends, patterns, and relationships among the variables, contributing to a comprehensive understanding of the study's focus. Table 4 presents the detailed constructs and corresponding questionnaire items.

Table 4
*Detail Construct and the Questionnaires*

| **Section** | **Variable** | **Questions** |
|---|---|---|
| A | DEMOGRAPHIC OF RESPONDENTS | 2 |
| B | *Unit military training* | *2* |
| C | *Factor Influence* | |
| | Military leader | 7 |
| | Cognitive Readiness of military personnel | 6 |
| **TOTAL** | | 17 |

*Validity*
To ensure the validity of the questionnaire, several steps were undertaken during its development. Content validity was established by consulting subject matter experts in military training and Combat Readiness to ensure that the questions adequately represented the

constructs being measured. The questionnaire was designed to capture factors related to the effect of the military leader on CR through military training, ensuring comprehensive coverage of the study's focus. Table 5 presents the list of experts involved in validating the questionnaire design.

Table 5
*List of Expert Panel*

| Expert Panel | Qualifications | Area of Expertise |
|---|---|---|
| **Military Expert** | | |
| Military Expert A | Ph.D in Human Resources | Training and Management |
| Military Expert B | Ph.D in Management | Training and Management |
| Military Expert C | Ph.D in Management | Training and Education |
| Military Expert D | Ph.D in Human Resources | Military Strategy |
| **Academic Expert** | | |
| Academic Expert A | Ph.D in Education | Training and Education |
| Academic Expert B | Ph.D in Education | Leadership |
| **Language Expert** | | |
| Language Expert A | Master in Education | Language |
| Language Expert B | Master in Education | Language |

A detailed validation assessment form was utilized to evaluate the questionnaire's effectiveness across multiple dimensions, ensuring its rigor before full-scale distribution. The form included criteria such as clarity, relevance, and appropriateness of each question, with a Likert scale for expert reviewers to rate these aspects. Each question was reviewed for its ability to accurately measure specific variables, such as the influence of the military leader on CR. The form also assessed the logical flow and language simplicity to ensure that the questions were easily understood by the military personnel using both languages English and Bahasa Malaysia. Experts provided qualitative feedback, recommending modifications where necessary to enhance precision and reduce ambiguity. After receiving the expert evaluations, a final review was conducted to implement any necessary revisions. The summary of the validity assessment from the expert panel is shown in Table 6. This comprehensive validation process ensured that the questionnaire met high standards of validity, increasing the robustness of the study's findings.

Table 6
*Summary of Validity Assessment from Expert Panel*

| Expert Panel | Mean Score | Comments/Suggestions |
|---|---|---|
| **Military Expert** | | |
| Military Expert A | 4.50 | Overall, the survey design is appropriate for distribution to the relevant respondents. However, since the respondents consist of various ranks, including officers and non-officers, some questions need to be restructured to facilitate understanding and meet the research objectives. |
| Military Expert B | 3.66 | Suggest citing a study that makes use of the same structure such as a military trainer, training environment, or training design. |
| Military Expert C | 3.88 | Based on the conceptual framework, it is suggested that although there is less empirical evidence to support to prediction of the four endogenous variables directly to CR, it is suggested that researchers find other similar exogenous equal/have a certain degree of CR. It is also suggested that conceptually there are direct relationships between the four endogenous variables with the CR as the exogenous variable. |
| Military Expert D | 2.77 | Some modifications needed to improve questionnaire validity |
| **Academic Expert** | | |
| Academic Expert A | 4.94 | The questions are generally relevant, and appropriately constructed except for 1 item (for individual characteristics either to be replaced, rephrased, or omitted. Only several items need to be refined to ensure clarity. |
| Academic Expert B | 3.83 | Good but needs a minor improvement |

*Score 1= Not acceptable (Major correction needed) 2= Below expectations (some modifications needed) 3= Exceeds expectations (A few minor modifications are needed) 4= Above expectations (No modifications needed but could be improved with minor changes) 5= Exceeds expectations (No modifications needed)

*Reliability*

Construct validity was further verified through a pilot test with a small sample of military personnel, which helped in refining the questions to ensure they accurately measured the intended constructs. Additionally, feedback from participants in the pilot test was used to enhance the clarity, relevance, and overall effectiveness of the questionnaire. These measures ensured that the instrument was both reliable and valid, providing accurate and meaningful data for the study.

A pilot test was conducted with 81 military personnel from the 7th Battalion of the Royal Malay Regiment to evaluate the questionnaire before the full-scale study as shown in Table 7. This small-scale preliminary study aimed to assess the feasibility of the questionnaire and ensure that it was reliable and clearly understood by the respondents.

Table 7
*The Involvement of Military Personnel in the Pilot Test*

| Rank | Pilot Test Military Personnel Frequency | Percent |
|---|---|---|
| Lance Corporal | 30 | 37% |
| Corporal | 21 | 25.9% |
| Sergeant | 10 | 12.3% |
| Staff Sergeant | 6 | 7.4% |
| Warrant Officer II | 1 | 1.2% |
| Warrant Officer I | 1 | 1.2% |
| Lieutenant | 7 | 8.6% |
| Captain | 2 | 2.5% |
| Major | 2 | 2.5% |
| Lieutenant Colonel | 1 | 1.2% |
| **Total** | 81 | 100% |

Table 8 presents the results of a reliability analysis conducted using SPSS version 25. The analysis demonstrated that all measured constructs exhibited satisfactory internal consistency, as indicated by their Cronbach's alpha values. Specifically, the Military Leader variables achieved a Cronbach's alpha of 0.883, confirming that the items effectively captured the intended dimensions and affirmed the reliability of these scales within a military context. Similarly, the CR variable displayed strong reliability, with a Cronbach's alpha of 0.885. The high internal consistency across these variables suggests that respondents' views were stable and coherent, reinforcing confidence in the data's validity and reliability for the actual study.

**Table 8**
*Reliability Analysis (Cronbach's alpha Values*

| Section C | Variable | Questions (Items) | Reliability Analysis |
|---|---|---|---|
| | Military leader | 7 | 0.883 |
| | Cognitive Readiness | 6 | 0.885 |

**Result**
*Unit Training Analysis*
Unit training in the military is a structured and systematic process aimed at enhancing both individual and unit proficiency to achieve mission readiness by combining individual and collective training. Individual training focuses on developing the fundamental KSA required for each service member to perform their specific duties effectively through a combination of classroom instruction, hands-on training, and practical application in controlled environments. Collective training, on the other hand, emphasizes unit-level performance by involving complex scenarios that simulate real-world missions, requiring teamwork, coordination, and integration of various military capabilities.

This approach ensures that personnel are not only proficient in their roles but also capable of operating cohesively in joint and combined arms operations, where success depends on seamless execution and collaboration under high-pressure conditions. Through the integration of these training elements, military units refine their ability to respond dynamically to operational demands, ultimately achieving a high level of readiness and effectiveness in accomplishing their missions. Tables 9 and 10 present the involvement of military personnel in individual and collective training activities.

Table 9
*Individual Training*

| Involment in Invidual Training | Frequency | Percent |
|---|---|---|
| 1 Involvement | 94 | 4.2% |
| 2 Involvement | 420 | 18.6% |
| 3 Involvement | 461 | 20.4% |
| 4 Involvement | 726 | 32.1% |
| More than 5 Involvement | 560 | 24.8% |
| **Total** | 2261 | 100% |

Table 10
*Collective Training*

| Involment in Invidual Training | Frequency | Percent |
|---|---|---|
| 1 Involvement | 176 | 7.8% |
| 2 Involvement | 446 | 19.7% |
| 3 Involvement | 525 | 23.2% |
| 4 Involvement | 620 | 27.4% |
| More than 5 Involvement | 494 | 21.8% |
| **Total** | 2261 | 100% |

Tables 9 and 10 provide an overview of the frequency of military personnel involvement in individual and collective training activities. For individual training, 32.1% of personnel reported four training sessions, while 24.8% had more than five involvements, reflecting substantial participation across these categories. Similarly, in collective training, the highest engagement was observed at four sessions (27.4%), followed by more than five sessions (21.8%), indicating a consistent pattern of participation. Overall, the results reveal that military personnel are actively engaged in both training formats, demonstrating a commitment to continuous development and operational readiness through regular involvement in these training activities.

*Structural Equation Modeling (SEM)*

Structural Equation Modeling (SEM) using Partial Least Squares (PLS) was employed to analyze the relationships between the variables. The SEM-PLS analysis evaluated both the measurement model and the structural model. The measurement model demonstrated strong reliability and validity, confirming that the constructs were measured accurately. The structural model results revealed significant paths between military leader variables and CR, supporting the hypothesis that the military leader has a significant effect on CR through military training. These findings underscore the critical role of leadership in developing CR in a military context. Figure 2 illustrates a PLS-SEM reflective measurement model.

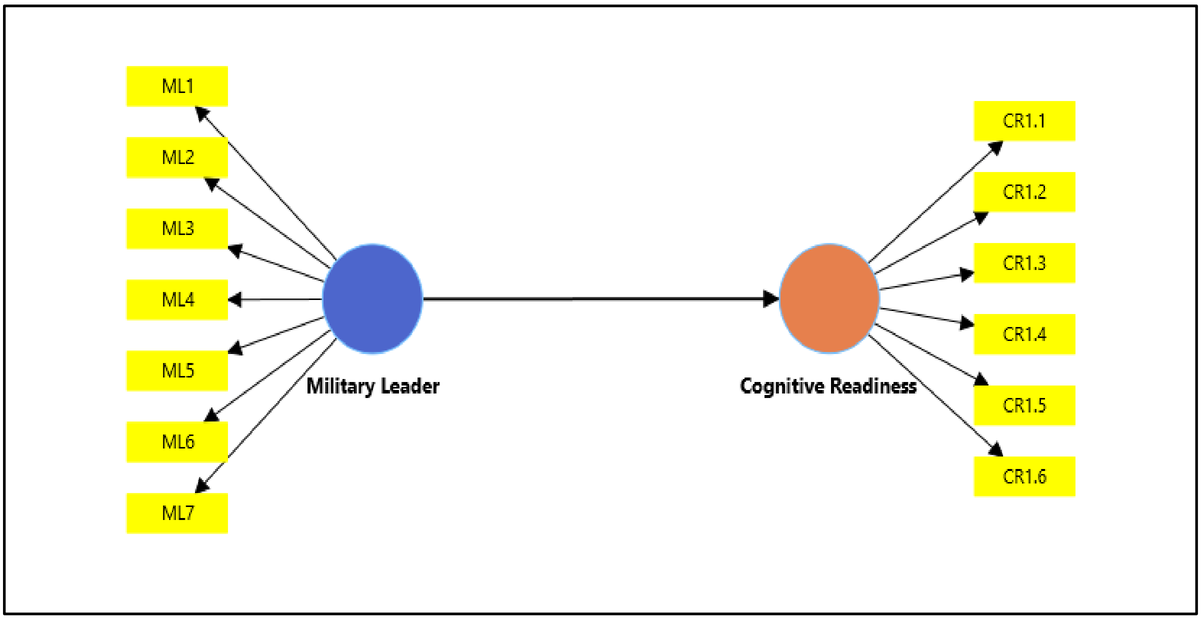


Figure 2.Conceptual Framework

*Evaluation of Reflection Measurement Model*

In PLS-SEM, a reflective measurement model is employed to assess latent constructs through multiple indicators that represent an underlying concept. To ensure the model's reliability and validity, a systematic evaluation process is followed. The initial step is assessing internal consistency reliability, which examines the extent to which the indicators of a latent construct are consistently measuring the same concept. The subsequent step involves evaluating convergent validity, which verifies that the indicators accurately capture the intended construct. This ensures that the indicators are both reliable and effectively represent the latent concept, establishing a solid foundation for the construct's measurement. This study follows the guidelines for evaluating reflective measurement models, as proposed by Hair et al. (2019).

Reflective measurement models are utilized to evaluate military leader effect on the CR of military personnel. This model offers an in-depth approach to understanding how the military leader factor contributes to CR. The thorough evaluation process ensures that the model effectively captures the relationships between the constructs. In this study, the reflective measurement model was evaluated to ensure the reliability and validity of the constructs. The model assessed the relationships between the observed indicators and their respective latent variables (Military Leaders and Cognitive Readiness). The evaluation of the measurement model involved testing for internal consistency reliability, indicator reliability, convergent validity, and discriminant validity. By validating each construct, the measurement model confirms that each indicator correctly represents its underlying theoretical concept. Figure 4.3 illustrates a PLS-SEM reflective measurement model. Figure 3 illustrates the results of assessing internal consistency reliability, convergent validity, and discriminant validity. Figure 3 illustrates the results of assessing internal consistency reliability, convergent validity, and discriminant validity based on data collected from 2,261 military personnel within the Malaysian Army.

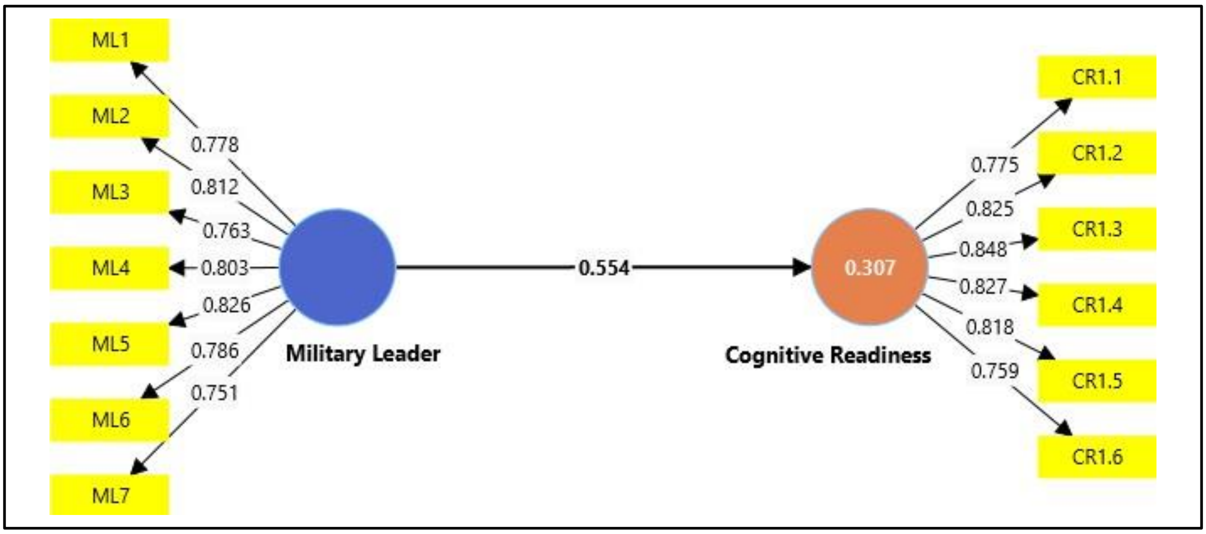


Figure 3: Reflective measurement model

*Internal Consistency Reliability*

The initial criterion for evaluation is internal consistency reliability. Table 9 displays the values for both Cronbach's alpha and composite reliability. Traditionally, Cronbach's alpha has been used to estimate internal consistency by assessing the intercorrelations among observed indicators. In PLS-SEM, composite reliability is typically reported alongside Cronbach's alpha to assess internal consistency reliability.

Table 9
*Cronbach's Alpha and Composite Reliability Value*

| | **Cronbach's alpha** | **Composite reliability (rho_a)** |
|---|---|---|
| **Cognitive Readiness** | 0.894 | 0.897 |
| **Military Leader** | 0.899 | 0.899 |

This table presents the reliability values for the key constructs in the model. The values of Cronbach's alpha and composite reliability exceed the acceptable threshold of 0.7, indicating strong internal consistency and reliability for both constructs. The reported values of Cronbach's alpha and composite reliability confirm that the internal consistency of the model is adequate, supporting the measurement model's validity in testing the study hypotheses.

*Convergent Validity*

Convergent validity refers to how well different indicators measure the same construct, demonstrating a strong correlation among them and confirming that they effectively capture a shared underlying concept. It is typically assessed using the Average Variance Extracted (AVE), which quantifies the proportion of variance in the construct relative to variance attributed to measurement error. A high AVE indicates that the construct captures the majority of variance across its indicators, ensuring consistency and accuracy. Establishing convergent validity is crucial for reinforcing the distinctiveness of each construct, ultimately enhancing the reliability and credibility of the overall measurement model.

Table 10 displays the outer loadings and average variance extracted (AVE) values for the reflective measurement model. Following PLS-SEM guidelines, all criteria for convergent validity were fully satisfied.

Table 10
*Outer Loading and Average Variance Extracted Value*

| Indicators | Outer Loadings | Average Variance Extracted (AVE) |
|---|---|---|
| **CR1.1** | 0.775 | |
| **CR1.2** | 0.825 | |
| **CR1.3** | 0.848 | 0.655 |
| **CR1.4** | 0.827 | |
| **CR1.5** | 0.818 | |
| **CR1.6** | 0.759 | |
| **ML1** | 0.778 | |
| **ML2** | 0.812 | |
| **ML3** | 0.763 | |
| **ML4** | 0.803 | 0.622 |
| **ML5** | 0.826 | |
| **ML6** | 0.786 | |
| **ML7** | 0.751 | |

The table above presents the outer loadings and Average Variance Extracted (AVE) values for each indicator, which are critical metrics for evaluating the measurement model's convergent validity. All indicator loadings exceed the recommended threshold of 0.7, suggesting that each indicator has a strong relationship with its corresponding construct. Furthermore, the AVE values for both CR and Military Leader constructs are above 0.5, indicating that each construct explains a sufficient amount of variance in its indicators, thereby supporting adequate convergent validity within the measurement model.

*Discriminant Validity*

Discriminant validity ensures that a construct measures its intended concept without overlapping with other constructs. One method to assess this is through cross-loadings, where each item should load higher on its designated construct compared to others, confirming the construct's uniqueness. Additionally, the Heterotrait-Monotrait Ratio (HTMT) serves as a more rigorous criterion, evaluating the ratio between inter-construct correlations and intra-construct correlations. A low HTMT value indicates that the constructs are empirically distinct from one another, thereby reinforcing the model's discriminant validity.
Evaluating discriminant validity is essential in verifying that the constructs in the measurement model are differentiated from each other. Table 11, Table 12, and Figure 4 demonstrate that both the cross-loading values and the Heterotrait-Monotrait Ratio (HTMT) fulfill the necessary criteria, confirming that the model meets the requirements for discriminant validity. The findings indicate that all discriminant validity criteria were fully met, thereby reinforcing the confidence in the distinctiveness and separation of the constructs within the reflective measurement model. This comprehensive adherence strengthens the credibility of the model's structure and measurement.

**Table 12**. Heterotrait-Monotraut Ratio (HTMT)

| | **Heterotrait-monotrait ratio (HTMT)** |
|---|---|
| **Military Leader <-> Cognitive Readiness** | 0.613 |

**Table 12**. The Summary Result of the Reflective Measurement Model

| Indicators | Outer Loadings | Composite Reliability | Average Variance Extracted (AVE) | Discriminant Validity |
|---|---|---|---|---|
| **CR 1** | 0.775 | **0.897** | **0.655** | **Yes** |
| **CR 2** | 0.825 | | | |
| **CR 3** | 0.848 | | | |
| **CR 4** | 0.827 | | | |
| **CR 5** | 0.818 | | | |
| **CR 6** | 0.759 | | | |
| **ML1** | 0.778 | **0.899** | **0.622** | **Yes** |
| **ML2** | 0.812 | | | |
| **ML3** | 0.763 | | | |
| **ML4** | 0.803 | | | |
| **ML5** | 0.826 | | | |
| **ML6** | 0.786 | | | |
| **ML7** | 0.751 | | | |

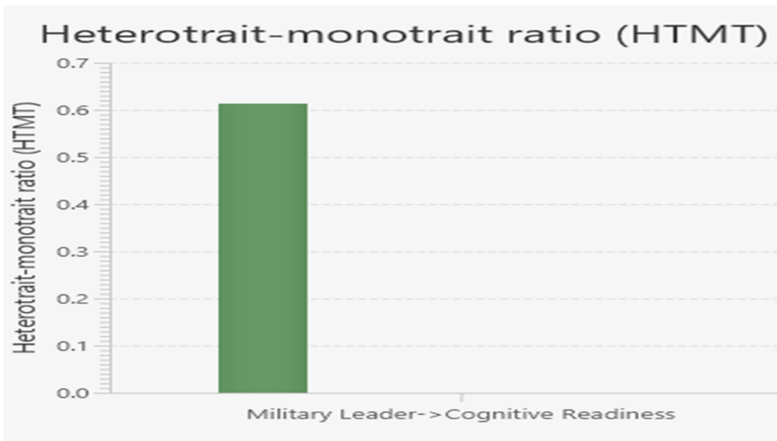


Figure 4. Heterotrait-Monotraut Ratio (HTMT)

The successful evaluation of discriminant validity confirms the distinctiveness of the constructs within the reflective measurement model, ensuring that each construct is accurately represented and does not overlap with others, thereby enhancing the model's overall reliability and validity.

Table 12 illustrates that the reflective measurement model results for both Cognitive Readiness (CR) and Military Leader (ML) constructs exhibit strong reliability and validity. All indicator loadings exceed 0.70, with composite reliability values of 0.897 for CR and 0.899 for ML, indicating high internal consistency. The Average Variance Extracted (AVE) values of 0.655 for CR and 0.622 for ML confirm convergent validity, while discriminant validity is achieved for both constructs. These results demonstrate that the measurement model is robust and suitable for subsequent analysis.

**Measurement Structural Model**

Following the validation of the measurement model, the subsequent step involves evaluating the structural model to assess its predictive power and the interrelationships between latent constructs. The objective is to ensure that the empirical data is consistent with the theoretical framework developed from the literature and the stated hypotheses. In PLS-SEM, this evaluation process requires fitting the model to the sample data to derive optimal parameter estimates by maximizing the explained variance of the endogenous latent variables. This study follows the rules for assessing the PLS-SEM structural model provided by Hair et al. (2019). A rigorous structural model assessment involves adhering to a systematic procedure encompassing several key criteria: (a) Collinearity Assessment, which identifies multicollinearity issues that could distort path coefficient estimates; (b) Structural Model Path Coefficients, which examines the significance and strength of the hypothesized relationships;

(c) Coefficient of Determination ($R^2$ Value)**,** which quantifies the model's explanatory power for the endogenous constructs; (d) Effect Size ($f^2$)**,** which determines the impact of each predictor on the target variables; (e) Predictive Relevance ($Q^2$)**,** which measures the model's predictive accuracy; and (f) PLSpredict Analysis**,** which assesses out-of-sample predictive power. Implementing these criteria ensures a robust evaluation of the structural model, thereby validating the theoretical assumptions with empirical data.

Figure 5 represents a Structural Equation Modeling (SEM) framework using Partial Least Squares (PLS) analysis, showcasing the relationship between the constructs of the militaryleader and CR based on data collected from 2,261 military personnel within the Malaysian Army. The arrows connect the latent variables to their respective indicators (ML1 to ML7 for the military leader and CR1.1 to CR1.6 for CR

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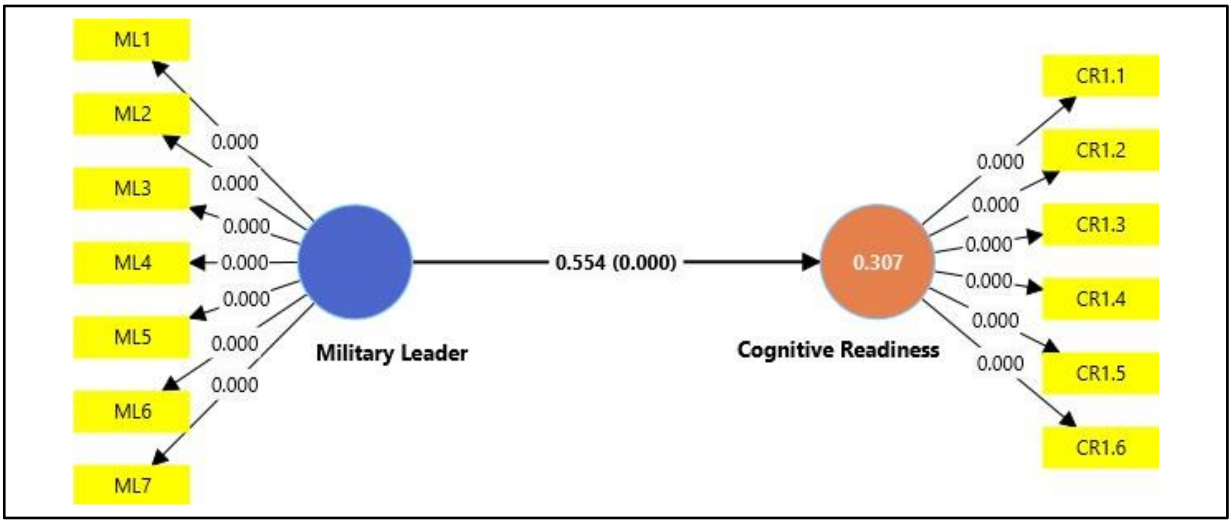


Figure 5. Measurement Model

*Collinearity Assessment* (Variance Inflation Factor- VIF)
Prior to analysis, it is essential to assess the structural model for collinearity, as path coefficient estimation relies on Ordinary Least Squares (OLS) regression for each endogenous latent variable with its respective antecedent constructs. Collinearity statistics, such as the Variance Inflation Factor (VIF) and Tolerance, evaluate the extent of correlation between predictors to identify multicollinearity. This assessment ensures the reliability of coefficient estimates and prevents model distortion. Table 13 presents the collinearity statistics, illustrating the degree of correlation among the predictor variables.

Table 13
*Collinearity Values (Variance Inflation Factor - VIF)*

| Variables | Collinearity Statistics (VIF) |
|---|---|
| CR1.1 | 2.058 |
| CR1.2 | 2.518 |
| CR1.3 | 2.552 |
| CR1.4 | 2.368 |
| CR1.5 | 2.224 |
| CR1.6 | 1.876 |
| ML1 | 1.930 |
| ML2 | 2.246 |
| ML3 | 1.765 |
| ML4 | 2.261 |
| ML5 | 2.496 |
| ML6 | 2.120 |
| ML7 | 1.839 |

Collinearity was assessed using the same criteria as for reflective and formative models, ensuring VIF values are between 0.20 and 5. Hair et al. (2014) note that VIF below 0.20 is acceptable, but values ≥5 indicate collinearity issues. Table 13 confirms that collinearity criteria are met, allowing structural path coefficients to be estimated through bootstrapping.

*Structural Model Path Coefficients*
Bootstrapping is utilized in PLS-SEM to evaluate the significance of path coefficients, which represent the estimated relationships between latent variables in the structural model. It is recommended that the minimum number of bootstrapping samples matches the number of valid observations; however, ideally, this should be increased to 10,000 samples for more robust results.

Bootstrapping analysis was conducted to test the direct effect of the Military Leader on Cognitive Readiness (CR), as outlined in hypothesis H1. The results are presented in Table 14.
**H1**: Military leader has a significant effect on the CR of military personnel.

Table 14
*Result Hypothesis H1*

| Hypothesis | Path Coefficients β | t value | *p*-value |
|---|---|---|---|
| Military Leader -> Cognitive Readiness | 0.554 | 26.855 | 0.000 |

Note: * Significant at t > 1.96; **t >2.58; ***3.29 (Two Tailed Test)

The results in Table 14 show that the Military Leader has a significant effect on CR among military personnel, with a path coefficient (β) of 0.554, a t-value of 26.855, and a p-value of 0.000. The high t-value and p-value below 0.001 confirm a strong and statistically significant relationship, thereby validating the hypothesized effect These findings suggest that strong and effective leadership is essential for fostering CR in military settings. The results underscore the pivotal role of the military leader in shaping and enhancing personnel readiness, highlighting the need for leadership strategies that focus on developing the cognitive capabilities necessary for effective deployment in military operations.

*Examine the Coefficient of Determination ($R^2$ Value)*

The Coefficient of Determination ($R^2$) is a statistical metric that evaluates the goodness-of-fit of a regression model by indicating the proportion of variance in the dependent variable xplained by the independent variables. An $R^2$ value ranges from 0 to 1, with values closer to 1 suggesting a stronger model fit, as a larger proportion of variance is accounted for by the predictors. Conversely, lower $R^2$ values indicate a weaker fit, signifying that a smaller proportion of the variance is explained. Table 15 presents the $R^2$ values derived from the PLS-SEM analysis conducted in this study.

**Table 15**. $R^2$ Value

| | Original sample (O) $R^2$ | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values |
|---|---|---|---|---|---|
| **Cognitive Readiness** | 0.307 | 0.308 | 0.023 | 13.413 | 0.000 |

The results show that the Coefficient of Determination ($R^2$) for CR, with military leader as the independent variable, is 0.307, indicating that 30.7% of the variance in CR is explained by the effect of military leader. The sample mean (M) is 0.308, with a standard deviation (STDEV) of 0.023. The T-statistic value of 13.413 and a P-value of 0.000 signify a highly significant relationship, confirming that the effect of a military leader has a meaningful effect on CR. While the $R^2$ value suggests a moderate level of explanatory power, it also indicates that other factors not captured by this model may contribute to CR.

*Examine effect size $f^2$*

Effect size $f^2$ is a statistical measure used to assess the impact or contribution of an independent variable on the dependent variable within the context of a multiple regression model. It provides additional insight beyond the $R^2$ value by quantifying the individual effect of a predictor variable in explaining the variance of the outcome variable. Specifically, $f^2$ evaluates how much $R^2$ changes when a particular independent variable is included or excluded from the model. Table 16 presents the effect size ($f^2$) for the relationship between the military leader and CR

Table 16
*$f^2$ value*

| | Original sample (O) $f^2$ | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | **P values** |
|---|---|---|---|---|---|
| **Military Leader** | | | | | |
| **Cognitive Readiness** | 0.443 | 0.447 | 0.048 | 9.200 | 0.000 |

The effect size ($f^2$) is used to evaluate the contribution of the independent variable, Military Leader, to the variance in Cognitive Readiness within the regression model. The results indicate that the effect size of the military leader on CR is $f^2$=0.443, which represents a substantial effect based on Cohen's guidelines, where values greater than 0.35 indicate a large effect. The sample mean (M) is 0.447, and the standard deviation (STDEV) is 0.048, resulting in a T-statistic value of 9.200 ($p < 0.001$). These findings highlight the significant effect of the military leader on CR, emphasizing its critical role in contributing to the development of CR among military personnel.

*Assessment of predict relevance ($Q^2$)*
The assessment of predictive relevance ($Q^2$) is an important criterion in evaluating the predictive accuracy of a structural model. Unlike $R^2$, which measures the explained variance, $Q^2$ focuses on the model's ability to predict the data points of the dependent variable. A $Q^2$ value greater than zero indicates that the model has predictive relevance for a given endogenous construct, suggesting that the independent variables have predictive power in estimating the outcomes of the dependent variable. Table 17 presents the $Q^2$ value for CR, demonstrating the predictive relevance of the model.

Table 17
*$Q^2$ Value*

| **Assessment of predictive relevance** | **$Q^2$predict** |
|---|---|
| **Cognitive Readiness** | 0.305 |

The assessment of predictive relevance ($Q^2$) for CR yielded a $Q^2$ value of 0.305, indicating that the model has strong predictive relevance for this construct. A $Q^2$ value greater than zero suggests that the independent variables, such as the military leader, have meaningful predictive power in estimating CR. This result highlights that the model is capable of accurately predicting the outcomes of Cognitive Readiness, further supporting the robustness and validity of the proposed structural model in this study.

*PLSpredict*
PLSpredict is a vital tool in PLS-SEM for assessing a model's predictive performance on unseen data, thereby providing an out-of-sample evaluation of predictive accuracy. It utilizes metrics such as root mean squared error (RMSE) and mean absolute error (MAE) to quantify prediction errors, enabling a clear classification of predictive power as low, medium, or high. This approach enhances the model's assessment by examining its ability to predict outcomes accurately for new data, ensuring robustness and generalizability. Consequently, PLSpredict offers valuable insights into the practical utility and decision-making applicability of the PLS-SEM model. Table 18 provides the RMSE values for the CR indicators using the PLSpredict method.

Table 18
*PLSpredict*

| Items | $Q^2$predict | PLS-SEM_RMSE | LM_RMSE | PLS-SEM RMSE – LM RMSE |
|---|---|---|---|---|
| **CR1.1** | 0.206 | 0.763 | 0.762 | 0.001 |
| **CR1.2** | 0.193 | 0.802 | 0.803 | -0.001 |
| **CR1.3** | 0.212 | 0.784 | 0.780 | 0.004 |
| **CR1.4** | 0.216 | 0.763 | 0.758 | 0.005 |
| **CR1.5** | 0.220 | 0.799 | 0.794 | 0.005 |
| **CR1.6** | 0.144 | 0.809 | 0.800 | 0.009 |

These results demonstrate that the PLS-SEM model has strong predictive accuracy for CR, confirming its reliability in estimating future outcomes for new data. The slight differences in RMSE values further validate the robustness of the PLS-SEM approach in practical applications.

**Discussion**
The results for Hypothesis 1 (H1) indicate that a Military Leader has a significant effect on the Cognitive Readiness (CR) of military personnel. The path coefficient ($\beta = 0.554$), with a high t-value of 26.855 and a P-value of 0.000, confirms that the relationship is statistically significant at the 99% confidence level ($t > 3.29$, $p < 0.001$), thereby supporting H1. This strong effect suggests that Military Leader is a critical determinant in enhancing Cognitive Readiness, emphasizing the pivotal role of leadership in military training settings.

The Coefficient of Determination ($R^2$) value for Cognitive Readiness is 0.307, indicating that Military Leader accounts for 30.7% of the variance in Cognitive Readiness, suggesting a moderate explanatory power. This finding highlight that while leadership is a major factor in shaping Cognitive Readiness, other variables outside the current model also contribute to its development. Moreover, the effect size ($f^2$=0.443) indicates a large effect based on Cohen's criteria, demonstrating that military leader exerts a substantial and meaningful effect on CR.

The predictive relevance analysis using PLSpredict further validates the robustness of the model. All $Q^2$ values are positive, confirming strong predictive power for Cognitive Readiness. Specifically, CR1.5 and CR1.4 show the highest $Q^2$ values (0.220 and 0.216, respectively), indicating that the model is highly effective in predicting these indicators. The consistency of RMSE values between the PLS-SEM and linear models supports the stability and accuracy of the PLS-SEM model, establishing its capability to forecast outcomes related to CR.

Overall, these results underscore the critical role of the Military Leader in shaping Cognitive Readiness through military training, suggesting that leadership development should be a primary focus in training programs to ensure that personnel are cognitively equipped to respond effectively to complex operational scenarios. Integrating leadership enhancement initiatives within the training environment will likely contribute to the cognitive readiness of military personnel, thereby supporting mission success and operational effectiveness.

**Limitation**

Although this study provides valuable insights into the effect of the military leader on CR, several limitations should be considered. The research model incorporated only one independent variable, the military leader, which accounted for 30.7% of the variance in CR. This suggests that other critical factors contributing to CR were not included in the analysis. Incorporating additional variables such as training environment, individual characteristics, and training design could enhance the explanatory power and offer a more comprehensive understanding of the determinants of CR in military contexts.

The study utilized a cross-sectional research design, capturing data at a single point in time. This approach limits the ability to examine changes in CR over time, potentially overlooking how the effects of the military leader may evolve throughout different stages of training and operational assignments. Longitudinal research would provide a more dynamic view of how leadership impacts CR as personnel gain experience and encounter varied operational challenges. Such studies could help identify temporal trends and developmental pathways that are crucial for military training and readiness programs.

The study was conducted exclusively within the Malaysian Army, focusing on personnel from three specific combat branches. This limited sample scope may affect the generalizability of the findings to other military branches or international military settings. To address this limitation, future research should aim to include a more diverse sample, encompassing personnel from various military branches, ranks, and multinational contexts. Such an expansion would help validate the results across different military environments, enhancing the study's external validity and applicability to broader military populations.

The reliance on self-reported data introduces the possibility of response bias, where participants may overestimate or underestimate their cognitive capabilities and leadership influence due to social desirability or subjective perceptions. While self-reports are valuable for capturing personal experiences and attitudes, integrating objective measures of Cognitive

Readiness, such as performance-based assessments or behavioral observations, would provide a more balanced evaluation. Addressing these limitations in future studies will contribute to a more robust understanding of the interplay between the military leader and CR, ultimately supporting the development of effective training interventions.

## Conclusion

Cognitive Readiness (CR) is a complex and evolving concept, with significant variations across military organizations due to their unique operational demands. These distinct requirements highlight the need for not only the development of advanced technologies but also a deep understanding of the specific needs and constraints at each organizational level, all aimed at enhancing CR. One of the key challenges is the design of adaptable, modular training systems that can accommodate diverse environments and operational scenarios while balancing the use of cutting-edge technological solutions with traditional training methods. Furthermore, there is an urgent need to bridge the gap between theory and practice in military training, particularly in recognizing the crucial role of the military leader in cultivating CR among military personnel. By employing Structural Equation Modeling-Partial Least Squares (SEM-PLS), this study offers a rigorous analysis of the military leader's effect on the CR of military personnel. The findings are expected to make significant contributions to the existing literature on military training, leadership, and CR, providing practical insights that can enhance military training programs across various branches. Effective Military Leaders play a pivotal role in enhancing personnel's cognitive abilities by fostering environments that promote critical thinking, decision-making, and adaptability. Conversely, ineffective leadership can lead to a decline in CR, resulting in poor performance under high-stress conditions. The intricate psychophysiological interplay triggered by the extreme demands of warfare further highlights the importance of this research. Ultimately, it underscores the necessity of investing in high- quality leadership training to ensure that military personnel are cognitively equipped to meet the challenges of modern warfare. As military operations continue to evolve, the future of military training research will focus on advancing CR, ensuring that all personnel are fully prepared to navigate the complexities of modern warfare.

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