



SRI LANKA MILITARY ACADEMY JOURNAL

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MESSAGE FROM THE COMMANDER OF THE SRI LANKA ARMY

As the Commander of the Sri Lanka Army, I take immense pride and pleasure in extending my warmest wishes for the launch of the 6th consecutive SLMA Journal, which coincides with the 99th Commissioning Ceremony of the Sri Lanka Military Academy.

Research serves as the cornerstone of academic progress and development, fundamentally shaping our understanding of the world and inspiring innovative solutions. The research process is characterised by both significant challenges and substantial rewards, as it continually pushes the boundaries of our knowledge. This pursuit not only facilitates progress but also advances our position within an ever-evolving social landscape.

A research journal is more than just text on a page; it portrays the insight and stature of scholars. Each article in the SLMA Journal is a testament to these scholars' commitment to sharing their rich knowledge and experience, fostering the growth of academic understanding and strengthening the bond between civil and military scholars.

In today's dynamic security landscape, marked by rapid evolution of threats and challenges with the technological advancement and continuous flow of information, research on defence and security has become increasingly crucial. Recognising this, the Sri Lanka Military Academy plays an essential role in laying the foundation for military professionalism within the Army. This edition of the SLMA Journal emphasises critical discussions on National Security, Military History, International Relations, Language and Reconciliation, Military Technology, Psychology, and more, opening avenues for new perspectives and advancements.

We must fully commit our intellectual acumen to ensure the effectiveness in executing the role of the Army; that is to deter our adversaries and fight against threats and challenges to our Nation. As the Sri Lanka Military Academy produces proficient and strong junior leaders to the Sri Lanka Army, it is vital they acquire a solid academic foundation for lifelong learning, aiming at producing strategic leaders in the future. I believe this annual journal significantly contributes to reinforcing the Sri Lanka Army's vision; **"Victorious Army through Professionalism, Credibility, and Respect"**.

With heartfelt congratulations on this milestone, I take this opportunity to express my gratitude to the Commandant and dedicated staff of the Sri Lanka Military Academy, authors, reviewers, and the Editorial Board of the SLMA Journal for their unwavering commitments. Let us continue to support such academic endeavours, embracing the spirit of military scholarship.

H L V M LIYANAGE RWP RSP ndu
Lieutenant General
Commander of the Army



MESSAGE FROM THE COMMANDANT OF THE SRI LANKA MILITARY ACADEMY

As the Commandant of the SLMA, it is an honour and a privilege to extend my heartfelt congratulations on the release of the 6th consecutive edition of the SLMA Journal, alongside the prestigious 99th Commissioning Ceremony. This publication continues to serve a perfect platform for both civil and military scholars to share their insights, experiences, and research skills. The SLMA Journal intends to foster a legacy of intellectuals, enriching their quality and organisational performance to provide much higher contribution in multiple approaches.

In my belief, in the modern age, the Sri Lanka Army has dearly entangled periodic transformation with forward-thinking, aligning its approach in different perspectives, deviating from traditional frameworks. Its mission by today has inclined shaping a future-ready force and the professional advancement of its members has given the highest priority. Recognising this evolution, it has actively standardised its practices to novel approach and fostering a culture of continuous learning and development. The Army, to build its path, military research and scholarly publications appear as a beacon to confront tomorrow's challenges with farsighted vision and resilience to overcome the obstacles on its way.

In current academic landscape, research has succeeded in broadening its boundaries to a wide range of fields, encouraging exploration into new knowledge, theories, and potential research directions. This interdisciplinary approach is crucial, not only in disclosing emerging trends and patterns of any organisation, and the world, but also in identifying promising areas for further investigations with application of innovative research methods. Research serves as a critical indicator of intellectuals' stamina within higher educational institutions, elevating their standards. Reflecting this commitment, the Journal brings together research in military disciplines, including National Security, Military History, International Relations, Language, Reconciliation, Military Technology, Psychology and so on. This Journal publication underscores the scholar strength of the military personnel, saturating their academic proficiency in collaboration with the locally recognised higher educational institutions.

This dynamic publication serves as a platform that not only supports the intellectual growth of military and civilian scholars, but also enhances their research skills, critical thinking, and analytical capabilities. By nurturing a community of thinkers, the Journal contributes to achieve the broader national objectives of formulating a highly skilled, professional cadre within the Army, expanding their academic horizons and contribution to the Army.

In conclusion, I extend my heartfelt gratitude to the Editorial Board for their unwavering dedication, professionalism, and remarkable teamwork in bringing the 2024 Journal to life. Their efforts in coordinating with both military and civilian authors, as well as scholars and academics from local universities, have ensured a publication of the highest standard. I wish all these stakeholders, continued success and look forward to their collaboration, and mutual support in the years to come to navigate the SLMA Journal to a greater height.

U L J S PERERA RSP USP psc
Major General
Commandant - SLMA

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PREVALENCE AND CORRELATES OF AGGRESSION IN THE SRI LANKA ARMY; A DESCRIPTIVE STUDY

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ABSTRACT

Introduction: There are stressors unique to the military, resulting in maladaptive behaviour such as aggression. Violence stemming from aggression is a common problem among serving and veteran population. There are significant correlates (demographic and mental health factors) associated with aggression.

Objective: The study aimed to describe the prevalence and correlates of aggression in the Sri Lanka Army.

Methodology: This was a descriptive cross-sectional study, conducted in the SF HQ East, in 2019, and the total sample was 3365. The Other Ranks (ORs) were selected by multistage extension of cluster sampling, whereas officers were selected by systematic sampling. A standard questionnaire with validated screening tools was used to obtain data on demographic, psychological and behavioural factors. SPSS 20 was used for the analysis. The chi-square test was applied to determine the significance of

factors associated with depression and multiple logistic regression was used to adjust the ORs and exclude confounders.

Results: The prevalence of aggression in terms of verbal, physical, and vandalism was 23.4% (95% CI 22%–24.8%), 9.6% (95% CI 8.7%–10.6%), and 17.6% (95% CI 16.3%–18.9%), respectively. Single status, exposure to child abuse, serving in the Elite units, alcohol use, smoking, cannabis use, depression, fatigue, Post-traumatic stress disorder, and lack of unit cohesion were significantly associated with aggression.

Conclusion: Aggression has significant ties with mental health factors and the use of psychoactive substances. Further, genetic makeup and past scars (childhood negative experiences) in life increase aggressive tendencies, while unit cohesion declines aggression. Awareness raising and screening for mental health issues can reduce aggression in the Army.

KEYWORDS: *Aggression, Alcohol, Cohesion, Depression, Fatigue, Military.*

INTRODUCTION AND LITERATURE REVIEW

At any time, all military personnel are expected to be ready for military operations. Hence, in addition to physical robustness, psychological stability is pivotal. However, stressors unique to the military, such as poor service conditions, inability to avail leave at the required time, early retirement ages, frequent and long separation from family, inadequate family and social support, communication gaps with superiors, and exposure to trauma (Bhat PS, 2017; Lenhart MK & Ritchie EC, 2011), may give rise to mental and behavioural issues such as aggression (Turgoose D & Murphy D, 2018).

Aggression is a behaviour directed towards harming or injuring another living being who is motivated to avoid such treatment (Blair RJR, 2016). Empirical evidence highlights that serving on active duty and deployment with high levels of combat experience are strong predictors of problematic anger followed by aggression and violence (MacManus D et al., 2013; Adler AB et al., 2020; Gallaway MS et al., 2012). In general, younger age, lower educational attainment, exposure to childhood abuse and witnessing violence between parents were shown as strong associates of future aggression (Adler AB et al., 2020); (Elbogen EB et al., 2014). Moreover, veterans with post-traumatic stress disorder, depressive disorder and alcohol abuse were evinced as significant risk factors for aggressive behaviour (Adler AB et al., 2020; Korpel POJ et al., 2019; Elbogen EB et al., 2014).

Aggression is demonstrated as a risk factor for violent offences, a common mental health problem observed among the UK and the USA veterans who took part in Iraq and Afghanistan operations (Institute of Medicine,

2010). Furthermore, intimate partner violence (Romero-Martínez Á et al., 2013) and suicide (Romanov K et al., 1994) are shown to be strongly associated with aggression. Globally, violence consequent to aggression is the leading cause of death among people between the ages of 15 to 44 years and results in millions of non-fatal injuries that require emergency medical care (Butchart A et al., 2015; Krug EG et al., 2002).

The Sri Lanka Army was exposed to a protracted civil war of low to moderate intensity, engaged in riot control duties, intervened in natural disasters, and took part in overseas missions with possible combat exposure; hence, aggression could be a mental health problem among the serving personnel. Therefore, this study aims to explore the prevalence and correlates of aggression in the Sri Lanka Army.

METHODOLOGY

Study Setting and Participants

This descriptive cross-sectional study was conducted in 2019, within a designated area of troop distribution (i.e. a Security Force Headquarters). Serving personnel with a period of service not less than two years below the rank of Lieutenant Colonel (Lt Col) were eligible for the study, whereas serving civilians and armed personnel above the rank of Lt Col were excluded. Since the male-to-female ratio of the study population was 1 into 0.009 (0.95% of the total population), gender was not considered as a variable. The ORs were chosen from 71 clusters using a multi-stage extension of the cluster sampling, whilst officers were chosen via systematic sampling from the officers' seniority list (Figure 1). The sample size was estimated to be 3343 (i.e., 140 officers and 3184 ORs), which was calculated according to the formula described by (Lwanga & Lemeshow, 1991) (Figure 2).

Data Gathering and Outcome Measures

With permission from the authors, aggression was assessed by the questions used on the US combat troops (Thomas et al., 2010). The socio-demographic data were collected by adopting standard questions used by two local military studies with the permission of the authors (Semage & Sivayogan, 2010); (Hanwella R et al., 2014).

The correlates of aggression were screened, namely, depression with the locally validated Patient Health Questionnaire (PHQ-9) (cutoff value at or above ten) (Hanwella, Ekanayaka, et al., 2014), post-traumatic stress disorder (PTSD) with the PTSD Checklist Military Version (PCL-M) (cutoff value at or above 45.5) (Semage & Sivayogan, 2010), alcohol-related disorders with the WHO Alcohol Use Disorder Identification Test (AUDIT) for high-risk drinking (HRD) (which includes hazardous, harmful, and dependent use with a cutoff value at or above 8) (P. De Silva et al., 2007), binge drinking (BD) (i.e., five or more drinks in a row) (Barry AE et al., 2013), and fatigue with the 13-item Chalder Fatigue Scale for fatigue (with a cutoff value at or above four) (Hanwella, Jayasekera, et al., 2014). The functional impairment was determined by the tenth question of the PHQ-9, as it has been used similarly by a previous study (Thomas et al., 2010). In addition, standard questions used by studies were applied to determine the level of unit cohesion, smoking cigarettes and cannabis use, exposure to childhood and family history of psychiatric disorder (Hanwella R et al., 2014; Mulligan K et al., 2010; V. De Silva et al., 2009; de Silva VA et al., 2016).

Statistical Analysis

Data were analysed with SPSS-20, and with the chi-square test, the significance of the sociodemographic and mental health correlates associated with aggression was extrapolated.

The Mann-Whitney U test was used to explore the significance of the association between unit cohesion and aggression. All associations that had a probability value ≤ 0.05 were considered significant. Logistic regression was applied to adjust the odds ratios (OR) with 95% confidence limits (95% CI), to exclude confounders, and to determine the significance of the predictiveness of the correlates over aggression.

Ethical Clearance

Ethical approval was obtained from the Ethics Review Committee of the Faculty of Medicine, Kotelawala Defense University (RP/2018/04). Written informed consent was obtained from all participants. Anonymity of the respondents was maintained, participation was voluntary, and steps were taken to reduce the duress (i.e., the principal investigator was dressed in civils, participants were well explained about the study and were allowed to refrain from partaking at any time).

RESULTS

A total of 3665 were included in the sample, comprising 146 officers and 3665 ORs, and among them, 50.4% ($n = 1845$) (i.e., 75 officers and 1772 ORs) were exposed to battle. The mean age was 31.78 years (SD 6.686), 66.1% were married, 56.7% had not passed the GCE O/L, 4% were officers, and 20.5% had five or fewer years of service.

Prevalence

The prevalence of aggression in terms of verbal, physical, and vandalism was 23.4% (95% CI 22%–24.8%), 9.6% (95% CI 8.7%–10.6%), and 17.6% (95% CI 16.3%–18.9%), respectively (Table 1).

Association of Sociodemographic Correlates

At least one mode of aggression (i.e., either verbal, physical, or vandalism) was significantly associated with younger age, lower education, being an OR, remaining single (i.e., unmarried, divorced, or widowed), and fewer years of service, while all modes of aggression saw a significant association with the type of employment (Elite units), exposure to child abuse, and family history of mental illness (Table 2). After adjusting the ORs, age and period of service were excluded as significant correlates of aggression (Table 3).

Association with Mental Health Correlates

All modes of aggression (verbal, physical, and vandalism) were significantly associated with HRD, smoking, cannabis use, probable depression, PTSD, and fatigue (Table 2), which remained significant even after adjusting the ORs (Table 3).

Association of Cohesion

Unit cohesion was significantly associated with all modes of aggression (Table 4), indicating that the expression of aggression is inversely proportional to unit cohesion.

DISCUSSION

As members of the military have access to weapons, it is pertinent to fathom the prevalence and correlates of aggressive behaviour in the military.

Prevalence

This is the first-ever study that explored the extent of aggression and its correlates in the Sri Lanka Army. Modes of aggression (i.e., verbal, physical, and vandalism) were separately dealt with for exposition. The highest mode of expression of aggression was verbal [23.4%

(95% CI 22.1%- 24.9%)], while the lowest mode of expression of aggression was physical [9.6% (8.7%- 10.5%)], and vandalism stood at a modest phase [17.6% (16.4% - 18.9%)] (Table 1).

According to international military literature, the prevalence of aggression varied between 10% to 32% (Elbogen EB et al., 2014; Voorhees EE et al., 2018; Hellmuth JC et al., 2012), and most of the reported cases of aggression were non-severe (Elbogen EB et al., 2014). Intimate partner violence (IPV), an implication of aggression, in military populations, ranges from 13.5% to 58%, with considerably lower rates obtained among samples not selected based on psychopathology (Marshall AD et al., 2005). The prevalence of IPV in Sri Lanka ranged from 24% to 34% (Guruge S et al., 2015). Therefore, as the prevalence of IPV in the international militaries and the general community of Sri Lanka is considerable, we propose to explore the extent of IPV in the Army in the future.

Sociodemographic Correlates of Aggression

We identified that in terms of adjusted ORs, all modes of aggression were significantly associated with exposure to childhood abuse, family history of mental illness, and employment in Elite units, while lower education, lower rank, and remaining single were observed to be significantly associated with only one mode of aggression (Table 3). Nonetheless, the latter three factors, along with the other four factors, we infer these as significant correlates of aggression, which will be explained with empirical underpinnings in the following paragraphs. Further, unit cohesion saw a significant inverse association with all modes of aggression (Table 4), implying the protective role of cohesion against aggression.

There were no studies that substantiated the association between civil status and the

expression of aggression in soldiers or veterans. Nevertheless, anger a precursor of aggression was revealed to be associated with poor social support (Turgoose D & Murphy D, 2018). Thus, we contend that, as marriage provides companionship, emotional gratification, and interpersonal closeness, which are key elements of social support (Hajek & König, 2020), marriage may act as a buffer against the vulnerability to express aggression.

Stress has been shown as a risk factor for aggression (Naseem A & Ahmed M, 2014; Wei, Z et al., n.d.), which is explained by the stress diathesis model; stressful situations can activate predispositions into the presence of psychopathology and/or negative behavioural outcomes (Monroe SM & Simons AD, 1991). Hence, arguably, as lower-rankers experience more stress than their higher-ranking counterparts (Harbertson et al., 2013), they should be more likely to engage in aggression. Further, a meta-analysis study demonstrated that aggression is significantly more prevalent among the junior rankers because they are younger, remain single and have a lower economic status, as extrapolated by our study (Kwan J et al., 2020).

According to local and international community studies, people with lower educational attainment are more likely to face aggression (Guruge S et al., 2015; Tiruye TY et al., 2020). Similarly, a prospective study highlighted that low education has a modest association with future violence in war-era veterans (Elbogen EB et al., 2013). The literature demonstrates that education level can modulate the development of psychopathology responsible for aggression (Kim J et al., 2015), expounding the protective role of education against aggression.

Community and military studies have demonstrated the robust association between exposure to abuse and adversity during

childhood and later life aggressive behaviour (Turgoose D & Murphy D, 2018; Adler AB et al., 2020; Elbogen EB et al., 2014; Guruge S et al., 2015; Kwan J et al., 2020; Tiruye TY et al., 2020). When children are exposed to adversity or abuse, the brain structures responsible for aggression—the amygdala (which causes impulsive aggression), the medial prefrontal cortex (which inhibits the aggressive impulses of the amygdala), and the hypothalamic-pituitary-adrenal axis (which mediates stress response)—may undergo enduring structural and functional changes, increasing their vulnerability to aggression in adulthood (Blair RJR, 2016; Anda RF et al., 2006). Furthermore, repeated exposure to abuse in childhood may change the knowledge structure related to aggression, increasing the tendency to aggression later in life (Baron RA & Branscombe NR, 2012).

According to the social learning perspective, aggression is acquired either by direct exposure or by observing the behaviours of others, and repeated exposure to aggressive stimuli serves to strengthen knowledge structures related to aggression (which means beliefs, attitudes, schemas, and scripts relevant to aggression) (Baron RA & Branscombe NR, 2012; Aronson E et al., 2016). Taking these facts into account, we contend that, since the personnel in elite forces are exposed to repeated aggression in their training and operational duties (Lenhart MK & Ritchie EC, 2011), they become more liable to aggression than their non-elite counterparts.

The relationship between aggression and psychiatric disorders is well-known in the military (Turgoose D & Murphy D, 2018; Elbogen EB et al., 2014), nevertheless, the association between aggression and a family history of a psychiatric disorder has not been described. However, the association between committing deliberate self-harm (i.e., aggression internalizing towards self)

and a history of familial psychiatric disorder is empirically shown (Ballard ED et al., 2019). Similarly, certain aberrant personality traits can be inherited from a kin who is diagnosed as having a psychiatric disorder (Stark L et al., 2019; Fanous AH & Kendler KS, 2004). Thereby, based on our findings and the latter premise, we assume that aggressive tendencies could be vertically transmitted independent of a psychiatric disorder.

Although in our study, younger age was not observed as a significant correlate of aggression (i.e., after adjusting the ORs) (Tables 3), in militaries, aggression was extrapolated to be significantly more prevalent among younger personnel (Elbogen EB et al., 2014), which is also seen in the general community (Stark L et al., 2019). Contrastingly, the UK military saw lifetime violent offences steadily rising with age but prevailed under 30 years of age (MacManus D et al., 2013). We suggest that more studies should be done in the future to determine the effects of age on aggression/ violence.

Mental Health Correlates of Aggression

We extrapolated that, after adjusting the ORs, probable depression, PTSD, HRD, fatigue, cannabis use, and smoking significantly correlated with all modes of aggression (Table 3). These findings can be substantiated with the following empirical evidence.

The co-occurrence of depression and irritability or agitation mounting to aggression is scientifically evinced (Stringaris et al., 2013). Aggression in depression may have a biological perspective owing to the empirical evidence indicating that lower cholesterol level is associated with aggression and impulsivity in depression (Braconnier & Jeanneau, 1997; Vilibić et al., 2014). Further, some studies suggest aggression in depression occurs due to sociocultural factors, personality traits, cognitive vulnerability, and comorbid

psychiatric conditions (Meyrueix et al., 2015; Angkaw et al., 2013; Kim & Capaldi, 2004; Verhoeven et al., 2011; Berg et al., 2019; Braconnier & Jeanneau, 1997), however, even after excluding early environmental, genetic and other factors still, aggression was shown as a modest outcome of depression (Fazel et al., 2015).

There was no empirical evidence corroborating the association between fatigue and aggressive behaviour. Nevertheless, as depicted above, if aggression is associated with stress, fatigue can be posited to be directly or indirectly associated with aggression owing to its reciprocal relationship with stress (Robert, 2013).

Military studies have demonstrated that PTSD is a significant risk factor for aggression (Elbogen EB et al., 2014; Orth U & Wieland E, 2006; Miles SR et al., 2020) even after controlling age, sex, and substance use (Miles SR et al., 2016). According to the survival mode theory, perceived threats trigger increased arousal, hostile appraisals, and aggressive behaviours, and although this is protective in a combat situation, it becomes maladaptive when individuals are no longer in danger (Novaco R W et al., 2012). Consistent with this theory, many service members with PTSD have trouble distinguishing between safe and potentially unsafe people and places, particularly when they encounter stressful situations (Weber DL, 2008), becoming liable to aggression.

Scientific literature illustrates, that alcohol increases aggression by impairing the cognitive functions necessary to regulate emotions and behaviour (Liang W & Chikritzhs T, 2015; Giancola PR, 2000), and, similarly, when the self-control mechanism is compromised after inebriation, the suppressed anger may unleash violence (Liang W & Chikritzhs T, 2015; Giancola PR, 2003). Furthermore, alcohol impairs higher-

order cognitive functions such as evaluation of stimuli and memory, and as a result, one can misperceive others' intentions (hostile or non-hostile) and behaviours, resulting in aggression (Baron RA & Branscombe NR, 2012). Concordantly, cannabis shares many properties with alcohol (Ashton CH, 2001), and thereby, the mechanism of aggression explained under alcohol could be applied to cannabis. In addition, the neurobiological, structural, and functional changes associated with cannabis are shown to give rise to aggression (Sorkhou M et al., 2021). Similarly, studies have linked nicotine to aggression, which may be due to two factors: first, the impulsive personality trait that increases the tendency to smoke and the expression of aggression (al'Absi, M et al., 2007), and second, irritability that occurs during the nicotine withdrawal phase (Aboelsaad M et al., 2022).

We could not find empirical evidence upholding our observation that strong unit cohesion reduces the inclination to aggression, nevertheless, a US military study has demonstrated that strong unit cohesion before troop deployment reduces the ideation of harming self, which is a form of aggression, but, directed towards self (Anderson et al., 2019).

Finally, as indicated, scientific research reiterates that aggression as a personality disposition is attributed to dysfunction in many interpersonal domains (e.g., parent-child, family and peer) (Baron RA & Branscombe NR, 2012; Azevedo J et al., 2020; Wilson S et al., 2017), leading to impairment in social and occupational functions as highlighted in this study.

The Limitations

The data were solely dependent upon a questionnaire, which included screening tools, and hence, recall bias, unacceptability bias (i.e., reluctance to expose perceived sensitive

information), and misinterpretation bias should be anticipated. As only serving personnel were included, a selection bias known as the healthy worker effect could have affected the outcome of the study (Abramson JH & Abramson ZH, 1999). Finally, the clusters for the sample should have been from all military establishments in the country to increase the generalizability of the results. Nevertheless, as SF HQ-East proportionally represents that of the entirety of the Army (i.e., in terms of officers, ORs and regiments), our sample population can be contended to reflect the total population of the Army.

CONCLUSION

Aggression should not be overlooked in the Army as the prevalence is considerable, and the inability to cope with stress is implicated in aggression, which may stem from past exposure to childhood adversities, low education, low rank, depression, PTSD and fatigue. Furthermore, alcohol, smoking and cannabis use may impede the cognitive functions necessary to contain aggressive impulses. Marriage and unit cohesion buffer from aggressive impulses. The nature of the training and the duties may be attributed to the higher prevalence of aggression in the elite units.

RECOMMENDATIONS

Awareness raising on mental health should be frequent and disseminated throughout the Army. Concommittingly, screening for mental health issues should be regularly implemented, hence, the number of mental health professionals and related facilities should be increased. Finally, a more parsimonious stance should be taken regarding the availability and use of alcohol and cigarettes within the Army.

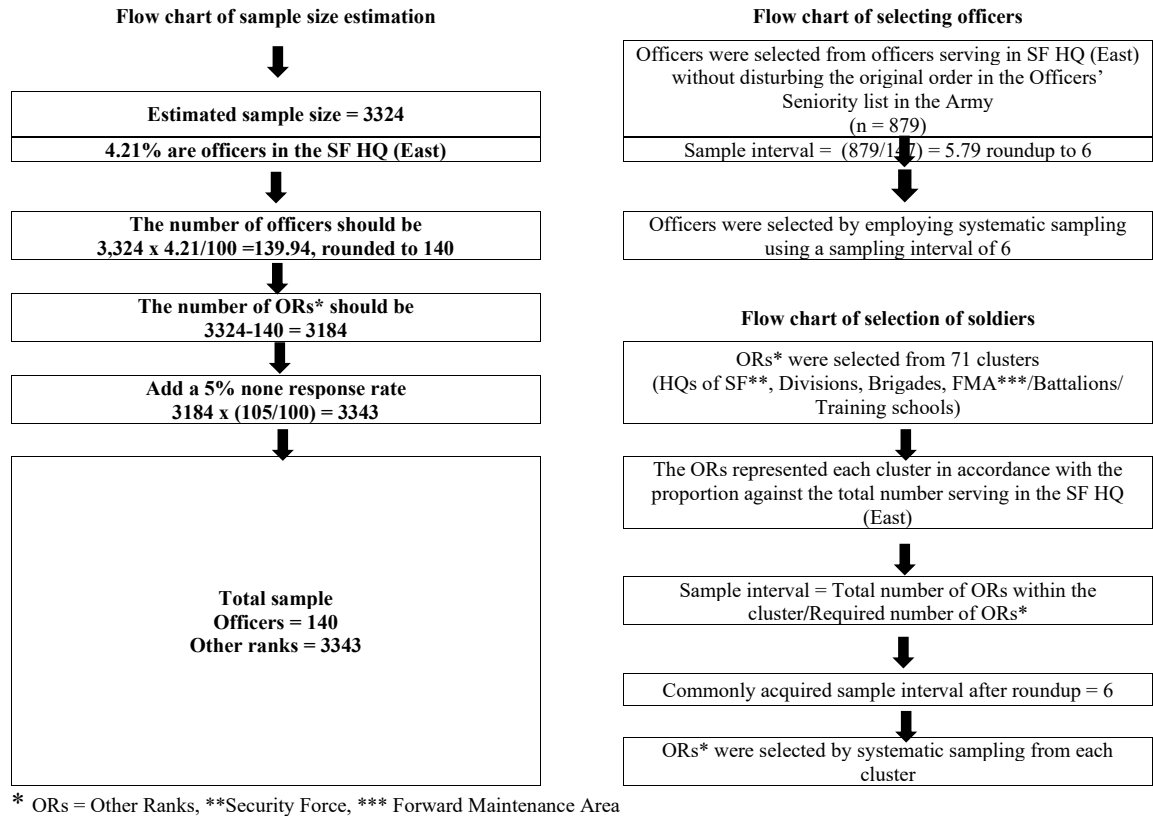


Figure 1: Steps for Determining Sample Size and the Sampling Method Process

The sample size was calculated using the following formula: (Lwanga and Lemeshow 1991)(49)

$$n = z^2 p (100-p) / d^2$$

n = calculated sample size
z = z value corresponding to the required level of confidence (1.96)
p = expected prevalence of mental health indices
As the prevalence of psychiatric disorders is still unexplored it is assumed to be 50%
d = desired level of precision
To enhance the accuracy, the precision value on either side of the normal distribution was reduced to 1.7%, which is usually considered 5%. And thereby the sample size was calculated as indicated below.

$$n = (1.96)^2 \times 50 (100 - 50) / 1.72$$

Figure 2: Determination of the Sample Size

Table 1: The prevalence of modes of expression of aggression

Mode of aggression	Number (n)	Percentage	95% Confidence Interval
Vandalism	646	17.6%	16.4% - 18.9%
Verbal expression	858	23.4%	22.1%- 24.9%
Physical expression	352	9.6%	8.7%- 10.5%

Table 2: The Association between Expression of Aggression and Demographic and Mental Health Correlates

	Expression of aggression			Significance		
	Verbal (%)	Physical (%)	Vandalism (%)	Verbal	Physical	Vandalism
Age						
≤ 26	23.3	88.9	22.4	$X^2= 4.809$, $df = 4, p = 0.307$	$X^2= 7.822$, $df = 4, p = 0.098$	$X^2= 25.718$, $df = 4, p = 0.000$
27-29	25.2	89.2	18.1			
30-33	24.8	90.3	17.9			
34-38	22.8	91.3	15.0			
≥39	20.6	92.7	13.1			
Level of education						
GCE OL Passed	25.7	9.4	17.9	$X^2= 8.353$, $df = 1, p = 0.004$	$X^2= 0.142$, $df = 1, p = 0.707$	$X^2= 0.151$, $df = 1, p = 0.697$
GCE OL Not passed	21.6	9.8	17.4			
Rank						
Other Ranks	23.2	9.7	17.9	$X^2= 3.095$, $df = 1, p = 0.079$	$X^2= 0.751$, $df = 1, p = 0.386$	$X^2= 5.661$, $df = 1, p = 0.017$
Officers	29.5	7.5	10.3			
Civil status						
Married	22.9	8.9	16.5	$X^2= 1.018$, $df = 1, p = 0.313$	$X^2= 3.919$, $df = 1, p = 0.048$	$X^2= 6.615$, $df = 1, p = 0.010$
Single (Unmarried/widowed/divorced)	24.4	11.0	19.9			
Type of employment						
Elite regiments	33.0	15.1	23.3	$X^2= 15.407$, $df = 1, p = 0.000$	$X^2= 10.329$, $df = 1, p = 0.001$	$X^2= 6.690$, $df = 1, p = 0.010$
All other regiments	22.6	9.2	17.2			
Period of service (Years)						
≤5	23.5	10.6	22.3	$X^2= .005$, $df = 1, p = 0.945$	$X^2= 1.135$, $df = 1, p = 0.287$	$X^2= 14.324$, $df = 1, p = 0.000$
≥6	23.4	9.3	16.4			
High-risk drinking (HRD)*	32.5	14.6	24.6	$X^2= 82.210$, $df = 1, p = 0.000$	$X^2= 50.945$, $df = 1, p = 0.000$	$X^2= 59.477$, $df = 1, p = 0.000$
Currently smoking	26.1	11.4	20.4	$X^2= 15.462$, $df = 1, p = 0.000$	$X^2= 13.594$, $df = 1, p = 0.000$	$X^2= 19.766$, $df = 1, p = 0.000$
Cannabis use	35.0	20.1	32.4	$X^2= 31.344$, $df = 1, p = 0.000$	$X^2= 52.379$, $df = 1, p = 0.000$	$X^2= 62.213$, $df = 1, p = 0.000$
Probable depression	31.9	34.4	35.9	$X^2= 92.664$, $df = 1, p = 0.000$	$X^2= 47.215$, $df = 1, p = 0.000$	$X^2= 117.101$, $df = 1, p = 0.000$
Fatigue	46.0	50.0	47.4	$X^2= 106.270$, $df = 1, p = 0.000$	$X^2= 60.190$, $df = 1, p = 0.000$	$X^2= 88.855$, $df = 1, p = 0.000$
Post-traumatic stress disorder (PTSD)**	59.0	33.3	43.6	$X^2= 27.964$, $df = 1, p = 0.000$	$X^2= 26.909$, $df = 1, p = 0.000$	$X^2= 23.363$, $df = 1, p = 0.000$
Exposed to child abuse	27.3	12.5	19.4	$X^2= 17.656$, $df = 1, p = 0.000$	$X^2= 19.208$, $df = 1, p = 0.000$	$X^2= 4.648$, $df = 1, p = 0.031$
Family history of mental illness	31.7	11.0	25.2	$X^2= 10.124$, $df = 1, p = 0.001$	$X^2= 0.571$, $df = 1, p = 0.450$	$X^2= 10.427$, $df = 1, p = 0.001$
Absent without leave (AWOL)	25.4	11.3	19.3	$X^2= 2.022$, $df = 1, p = 0.155$	$X^2= 3.297$, $df = 1, p = 0.069$	$X^2= 1.828$, $df = 1, p = 0.176$
Psychosocial dysfunction	39.4	18.4	35.4	$X^2= 46.280$, $df = 1, p = 0.000$	$X^2= 99.355$, $df = 1, p = 0.000$	$X^2= 92.520$, $df = 1, p = 0.000$

* HRD includes hazardous, harmful and dependent use of alcohol.

**The Chi-square test was done only on combat-experienced respondents

Table 3: Factors that were predictive of aggression after adjusting the odds ratios

Verbal Expression of Aggression	Adjusted OR (95% CI)*	P value
Level of education	1.319 (1.128-1.543)	0.001
Employed in elite units	0.595 (0.457-0.775)	0.000
Family history of mental illness	1.536 (1.158-2.038)	0.003
Exposed to childhood abuse	1.443 (1.230-1.692)	0.000
High-risk drinking	2.018 (1.722-2.366)	0.000
Currently smoking	1.374 (1.176-1.606)	0.000
Cannabis use	1.819 (1.443-2.293)	0.000
Probable depression	2.184 (1.828-2.610)	0.000
Fatigue	2.182 (1.859-2.561)	0.000
PTSD	5.099 (2.641-9.845)	0.000
Psychosocial functional impairment	2.040 (1.740-2.391)	0.000
Physical Expression of Aggression	Adjusted OR (95% CI)**	P value
Single (unmarried/divorced/widowed)	1.271 (1.011-1.598)	0.040
Employed in elite units	0.577 (0.406-0.820)	0.002
Exposure to childhood abuse	1.667 (1.334-2.084)	0.000
Family history of mental illness	1.099 (0.723-1.670)	0.659
High-risk drinking	2.091 (1.671-2.615)	0.000
Currently smoking	1.491 (1.190-1.868)	0.001
Cannabis use	2.470 (1.856-3.287)	0.000
Probable depression	2.046 (1.605-2.609)	0.000
PTSD	4.845 (2.512-9.344)	0.000
Fatigue	2.228 (1.780-2.789)	0.000
Psychosocial impairment	1.998 (1.589-2.511)	0.000
Vandalism	Adjusted OR (95% CI)***	P value
Younger age	1.345 (0.992-1.824)	0.570
Single (unmarried/divorced/widowed)	1.026 (0.828-1.271)	0.815
Employed in elite units	0.677 (0.504-0.909)	0.009
Being an Other Rank	1.728 (1.003-2.978)	0.049
Period of service	1.138 (0.831-1.557)	0.420
Exposed to childhood abuse	1.211 (1.015-1.445)	0.034
Family history of mental illness	1.594 (1.176-2.159)	0.003
High-risk drinking	1.886 (1.582-2.248)	0.000
Currently smoking	1.710 (0.992-2.949)	0.054
Cannabis use	2.394 (1.886-3.038)	0.000
Probable depression	2.675 (2.211-3.236)	0.000
PTSD	4.868 (2.524-9.390)	0.000
Fatigue	2.210 (1.853-2.636)	0.000
Psychosocial impairment	2.249 (1.885-2.683)	0.000

*Odds ratio adjusted for level of education, elite units, family history of mental illness, and exposure to childhood abuse.

**Odds ratio adjusted for civil status, elite units, family history of mental illness, and exposure to childhood abuse.

*** Odds ratio adjusted for age, civil status, elite units, rank, period of service, family history of mental illness, and exposure to childhood abuse.

Table 4: The Association between Expression of Aggression & Cohesion

Modes of Aggression	The mean rank of cohesion	Mann -Whitney U	Z	p
Vandalism				
No	1,878.73	837,086.500	-5.691	0.000
Yes	1,619.30			
Verbal Aggression				
No	1,879.21	1,074,497.500	-4.812	0.000
Yes	1,681.83			
Physical Aggression				
No	1,857.38	502,325.00	-4.306	0.000
Yes	1,603.56			

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ANALYSING AK BULLET IMPACT AREA FOR ANGLE OF INCIDENCE

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ABSTRACT

Identifying a shooter's location during a shooting incident is crucial for the accurate scene reconstruction. Bullet holes and their characteristics can significantly assist in tracing bullet paths back to their origin. Various methods currently exist to estimate the angle of incidence of fired bullets based on bullet holes, yet each has limitations. Multiple factors affect the accuracy of trajectory estimates. This study selected AK-family rifles and 1 mm zinc-coated sheet metal due to their frequent involvement in reported incidents.

The analysis focused on examining the area of impact marks from AK bullets to determine the incident angle. Using experimental measurements, the impact areas were correlated with incident angles through mathematical modeling to establish an inverse relationship. Findings revealed this relationship between the impact mark area and the incident angle, allowing incident angles ranging from 10° to 90° to be approximated based on the

bullet impact area on zinc-coated 1 mm sheet metal, providing valuable insights for real crime scene applications.

KEYWORDS: 1 mm sheet Metal, 7.62 x 39 mm ammunition, Bullet Holes, Image Processing, Shooting Incident Reconstruction.

INTRODUCTION

Analysing bullet impact marks on targets can be used to reconstruct shooting incidents (Haag & Haag, 2011a). Observing the impact sites produces crucial details about the bullet, the firearm, intervening objects, origin direction, firing sequence, and other related factors.

In some instances, it's feasible to determine the path of the fired bullet, aiding in pinpointing the possible shooting location. This subsequently leads to the identification of additional forensic evidence such as spent shell casings and other suspected weapons.

Bullet path determination is traditionally done by drawing an imaginary line between the bullet entry and exit points. However, determining the bullet's path becomes impractical when only one bullet hole (entry hole) is present. In these instances, assessing the physical characteristics, such as the shape and size of the bullet impact mark, becomes essential for inferring trajectory or incident angle.

Whether there are two bullet holes or just one, specific properties of bullet impact marks on entry holes are essential. Consequently, this research suggests an image-processing approach for determining the incident angle by analysing the characteristics of single bullet impact marks.

Among the various bullet types and target surfaces encountered in shooting incidents worldwide, AK-family rifles firing 7.62 x 39 mm BALL ammunition at zinc-coated 1 mm sheet metal surfaces are frequently observed, including in cases reported in Sri Lanka (Why Did the AK-47 become so popular?, 2016). Therefore, this study focuses on analysing single bullet holes on zinc-coated 1 mm sheet metal surfaces caused by shots from an AK-47 assault rifle (Figure 1).



Figure 1: An AK-47 firearm (Type 56 Assault Rifle, 2022) and steel-cased ammunition in the caliber 7.62 x 39 mm (7.62 x 39 Mm, 2022, p. 62)

While prior studies have documented deformation marks on 1 mm metal surfaces (B. Nishshanka et al., 2021; L. C. B. Nishshanka

et al., 2021), no research has yet analysed the area of a bullet impact mark specifically to determine incident angles. Based on evidence from previous studies, it was hypothesised that a relationship exists between the area of the bullet impact mark and the incident angle, due to the consistent material properties of the sheet metal and bullets.

Digital methods were employed to provide more precise analysis to address this gap. This study aims to establish a reliable method for estimating the angle of incidence of AK bullets based on the impact area on zinc-coated 1 mm sheet metal, thereby offering a practical tool for forensic trajectory analysis in real-world crime scenes.

LITERATURE REVIEW

Literature on bullet trajectory often emphasises the shape of bullet holes and how impact angles can be determined from elliptical deformations. Using trigonometric calculations on the bullet hole's major and minor axes can provide accurate impact angles, essential for reconstructing a shooter's position relative to the target surface. This approach is common in forensic analysis, where even small deflections, as documented in bullet trajectories through materials like glass or sheet metal, are meticulously measured to reconstruct shooting incidents and determine the shooter's location relative to the target (*Education Interactive. Bullet Trajectory Analysis Teacher Resource*, 2019; Power et al., 2018).

Studies have also explored how surface type affects bullet trajectory and deflection angles. For instance, materials like zinc-coated sheet metal used in impact tests exhibit distinct deformation patterns. Analysing these patterns provides valuable insights into the trajectory and angle of the incident force, ultimately improving the understanding of shooter positioning in real-world scenarios (Haag & Haag, 2011a).

A notable discovery from one of the early studies revealed a correlation (illustrated in Figure 2) between manually measured full lengths of AK bullet holes on 1 mm sheet metal and incident angles (B. Nishshanka et al., 2020). Ricochet phenomena of AK bullets with sheet metal had been documented in this study from 3° to 20° degree impacts. A complete ricochet had been observed between 3° and 5°, while a partial ricochet or partial penetration phenomenon reported from 5° to 20°.

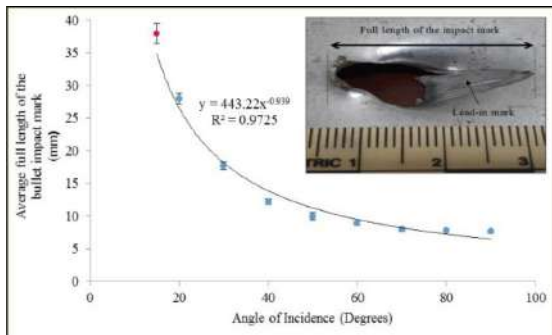


Figure 2: The Correlation between the Length of AK Bullet Impact Marks on 1 mm Sheet Metal and the Incident Angle (B. Nishshanka et al., 2021; L. C. B. Nishshanka et al., 2021)

The study highlighted a clear relationship between the incident angle and various measurements related to ricochet phenomena, including the lead-in crease length, the length of the first head in the double-headed mark, and the overall length of the bullet impact mark. Figure 3 illustrates the double-headed impact mark and lead-in crease observed on 1 mm sheet metal during the above mentioned study.

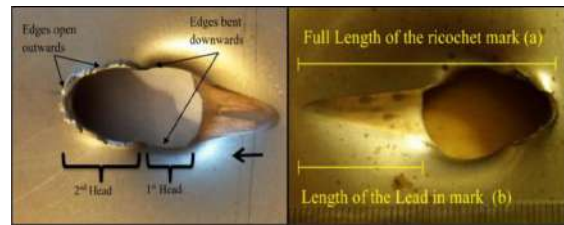


Figure 3: Illustration of Lead-in Crease and Dual-Headed Impact Marks Observed on 1 mm Sheet Metal (B. Nishshanka et al., 2020)

Based on the identified relationships, the authors developed a software solution based on the correlations identified between the lengths of bullet holes, the lengths of the first head of double-headed impact marks, and the incident angles of AK bullets. This desktop application proved effective in quickly estimating the incident angles of AK bullets that either penetrated through or ricocheted off 1 mm sheet metal surfaces.

All the research highlighted above relied on manual measurements of lengths on metal surfaces or measurements taken from images of single bullet impact marks. Furthermore, capturing these images requires photographs taken at a perpendicular 90° angle to the surface. Errors can arise from manual measurements or if the pictures are not perfectly perpendicular, low resolution, or blurry. Additionally, at higher incident angles above 60°, minor measurement errors can significantly affect accuracy (B. Nishshanka et al., 2021; L. C. B. Nishshanka et al., 2021).

Another study (Walters & Liscio, 2020a) introduced the use of the 2D Ellipse method for determining incident angles in crime scene reconstruction, particularly for single bullet impact marks found in drywall panels, especially at lower incident angles. Figure 4 illustrates a practical example of using the Ellipse app to determine the impact angle from a single bullet hole.



Figure 4: Determine the Incident Angle Utilizing the Ellipse Application in Cloud Compare Software (Walters & Liscio, 2020b)

The primary limitation of the 2D Ellipse method is its sensitivity to minor measurement errors in the underlying Sine function, particularly noticeable at high incident angles (between 70° to 90°). These errors can also lead to significant differences in accuracy and consistency in calculation repeatability. Furthermore, the method requires photographs to be taken precisely at a 90° angle to the surface. Any deviations from this perpendicular alignment and issues, such as low resolution or blurriness in the images, can induce further errors.

In addition, fired bullets create impact marks of varying shapes and sizes on sheet metals as the incident angle changes. Figure 5 provides a visual representation of the alterations in bullet holes and the distinctive deformation characteristics observed as the incident angle increases gradually from 10° to 90° in a previous study (B. Nishshanka et al., 2021).

As previously noted, determining the trajectory or angle of incidence becomes challenging when only an entry hole is present, unlike cases with both entry and exit holes where methods like using rods, strings, or laser beams are effective. Physical properties such as the shape and size of a single bullet impact mark are relied upon to tackle this challenge. However, drawbacks and potential errors arise because different bullet-target combinations

and ballistic characteristics produce varied bullet hole shapes on various surfaces (Haag & Haag, 2011a).

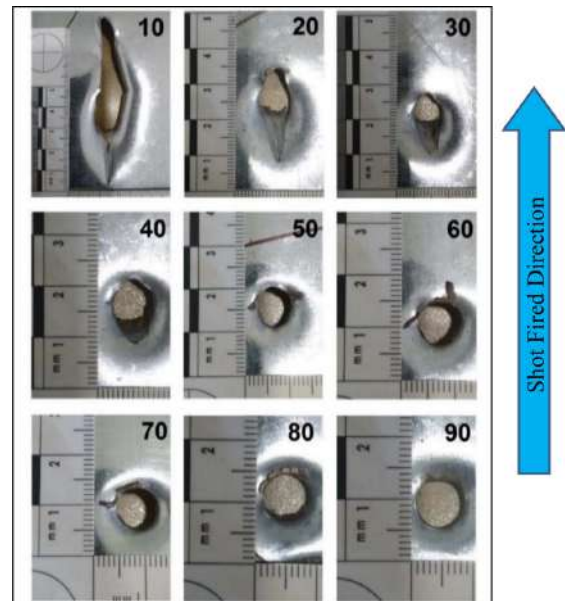


Figure 5: Variations in Bullet Hole Characteristics and Emergence of Distinct Deformation Features with Incident Angles Ranging from 10° to 90° (The Arrow Indicates, Shot Fired Direction for Each Angle)

Additionally, many other studies in the existing literature have attempted to determine incident angles based on single bullet impact marks found at crime scenes. The 2D Ellipse method (Walters & Liscio, 2020b) proves accurate for lower angles, its reliance on the Sine function makes it sensitive to minor measurement errors, particularly at higher incident angles (60° to 90°), impacting accuracy and repeatability.

Recent research studies (B. Nishshanka et al., 2021; L. C. B. Nishshanka et al., 2021) have identified an inversely proportional relationship between incident angles ranging from 90° to 15° and the total lengths of AK bullet holes on 1 mm sheet metal, measured manually on the target surface. This manual

measurement process can introduce potential human error into angle determination.

Moreover, methods for determining incident angles typically require photographs taken at a perpendicular 90° angle to the surface. Errors can arise from deviations from this ideal angle, low image resolution, blurriness, or surface noise, all of which can lead to inaccuracies in results used by the judicial system.

METHODOLOGY

DATA COLLECTION

For this study, single bullet holes on zinc-coated 1 mm sheet metal surfaces due to the shots fired from the AK-47 assault rifle with 7.62 x 39 mm BALL ammunition were used.

EXPERIMENTAL ARRANGEMENT

Shot-fired 45 cm x 45 cm metal sheets were placed in a target tray that allowed adjustments for 10° to 90° incident angles. The rifle was secured on a stable platform and at a range of 10 m, ensuring each shot was fired horizontally. The height and alignment of the barrel were precisely maintained using a masonry level and checked regularly. Ten shots were fired at each angle from 90° down to 10° . An inclinometer ensured precise angle settings, with adjustments locked before firing. The experimental arrangement is shown in Figure 6.

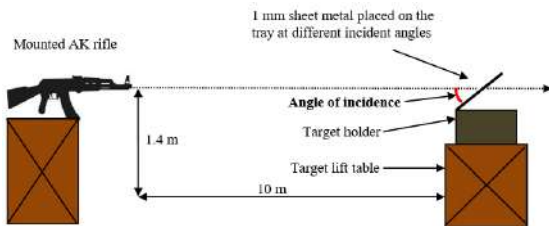


Figure 6: Experimental Arrangement

ANALYSIS OF DATA

All firing data samples ranging from 10° to 90° incident angles were captured photographically and digitised. A Forensic ruler (Forensic Rulers and Scales, 2024) was positioned near each bullet impact mark during photography to provide scale reference. The photographs were taken using a Canon EOS 90D camera (DSLR | EOS 90D | Canon USA, 2024) and they are stored for subsequent analysis. Figure 7 represents a digitised firing data sample from a 30° incident angle.



Figure 7: A Digitised Firing Data at a 30° Incident Angle, with a Forensic Ruler Positioned Adjacent to the Bullet Impact Mark

SOFTWARE IMPLEMENTATION

Before calculating the area, the boundary or outermost contour of the bullet impact mark is extracted from an image using the GrabCut algorithm. GrabCut is an interactive algorithm designed for precise foreground extraction (GrabCut for Automatic Image Segmentation [OpenCV Tutorial], 2022). The process involves applying GrabCut to segment the bullet impact mark from the background, effectively delineating its boundary. This segmented area is then used to calculate the precise area of the impact mark. Figure 8 depicts a flow diagram illustrating the

steps for extracting the outermost contour of the impact mark and subsequently computing its area.

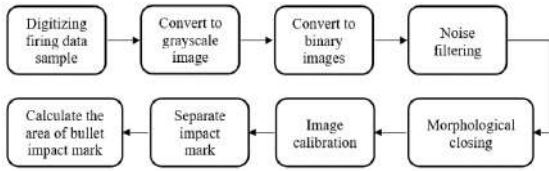


Figure 8: Flow Diagram of Methodology to Determine the Bullet Impact Area from Firing Data Samples

The software application was developed using Microsoft Visual Studio Community Edition 2013, utilizing the inbuilt Visual C# 2013 package (*Visual Studio*, 2024) and relying on the Microsoft .NET Framework 4.5 (*.NET Framework 4.5*, 2024). It incorporates Emgu CV (*Emgu CV: OpenCV in .NET (C#, VB, C++ and More)*, 2024), an open-source, cross-platform .NET wrapper for the OpenCV (*OpenCV*, 2024) image processing library. This integration facilitates the invocation of OpenCV functions from within .NET-compatible languages.

After digitising the firing data samples by positioning a forensic ruler near each bullet impact mark and capturing images with a Canon EOS 90D camera, the software processes each image through seven major steps.

Step 1: Transforming Color Images into Grayscale

To simplify color complexity and improve visualization, digitised images are first transformed into grayscale images (The 6 Reasons You Should Convert RGB to Grayscale in Image Editing – C4RE.GR, 2024). This is achieved by loading the Digitised images into the image processing component using "Image<Gray, Byte>," (*Types of Morphological Operations - MATLAB & Simulink*, 2024) which converts the input images to grayscale.

An example of the resulting output is illustrated in Figure 9.

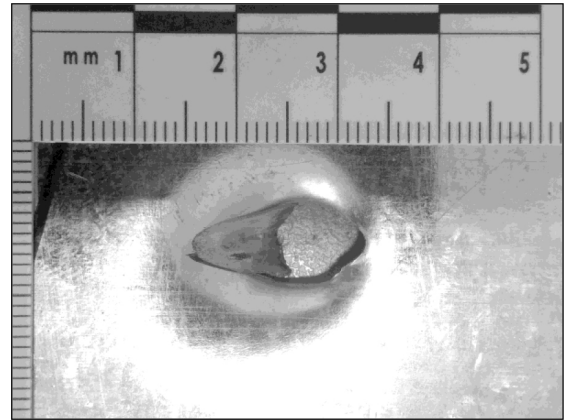


Figure 9: Produced Grayscale Image of a Bullet Impact Mark at a 30° Incident Angle

Step 2: Converting Grayscale Images into Binary Format

The grayscale images are then converted into binary images using the "ThresholdBinary" method from the Emgu CV library (*Image (TColor, TDepth)*. ThresholdBinary Method, 2020), as illustrated in Figure 10. This process involves applying a threshold value. An additional feature allows the adjustment of this binary threshold value to produce the optimal binary image, which maximises the visibility of the outermost boundary of the bullet impact mark.

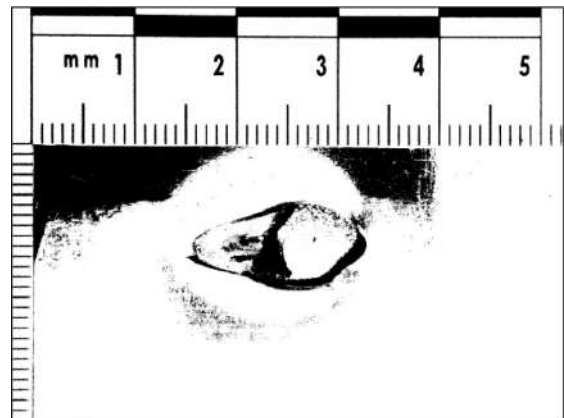


Figure 10: Produced Binary Image of a Bullet Impact Mark at a 30° Incident Angle

Step 3: Cleaning Noise from Binary Images Generated

The binary images produced often contain unwanted noise around the bullet impact mark, identified as Salt and Pepper noise, which appears as black dots on a white background (*Salt-and-Pepper Noise*, 2022). A median filter is a well-known tool for effectively removing Salt and Pepper noise (Gonzalez & Woods, 2008). This filter replaces the center pixel in a window with the median value of the surrounding pixels within the neighborhood. Since the noisy black pixels significantly differ from the median pixel value, this method eliminates the noise.

To reduce the noise, the "SmoothMedian" method from the Emgu CV library (*Image(TColor, TDepth).SmoothMedian Method*, 2015) is employed, using a 3 x 3 median filter. The resulting image, with reduced Salt and Pepper noise, is shown in Figure 11.



Figure 11: Noise Filtered Binary Representation of a Bullet Impact Mark at a 30° Incident Angle

Step 4: Implementing Morphological Closing Operation

After applying the median filter, the outer boundary of the impact marks becomes more distinct. Still, small gaps between the black pixels along the perimeter of the bullet impact mark may remain. A morphological closing operation is used to address these gaps. This operation helps to fill the small gaps in the noise-filtered image while preserving the shape and size of the object of interest (*Types of Morphological Operations - MATLAB & Simulink*, 2024).

Morphological closing involves a dilation followed by an erosion operation using the same structuring element for both steps. The "Dilate" method (*Image(TColor, TDepth).Dilate Method*, 2015) is used for dilation, and the "Erode" method (*Image(TColor, TDepth).Erode Method*, 2015) is used for erosion. Both operations apply a 3 x 3 rectangular structuring element once. The changes in the boundary of the bullet impact mark during the morphological closing are shown in Figures 12 and 13.

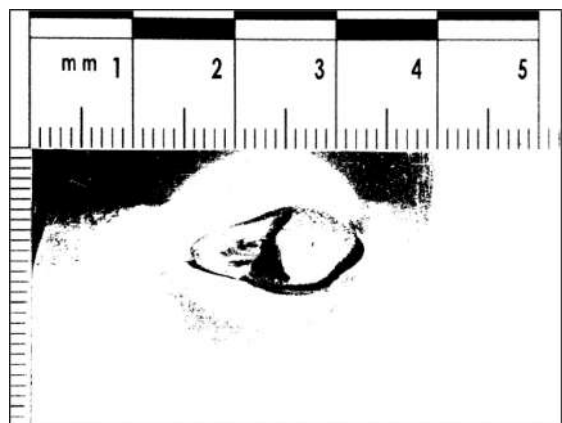


Figure 12: Dilated Binary Representation of a Bullet Impact Mark at 30° Incident Angle

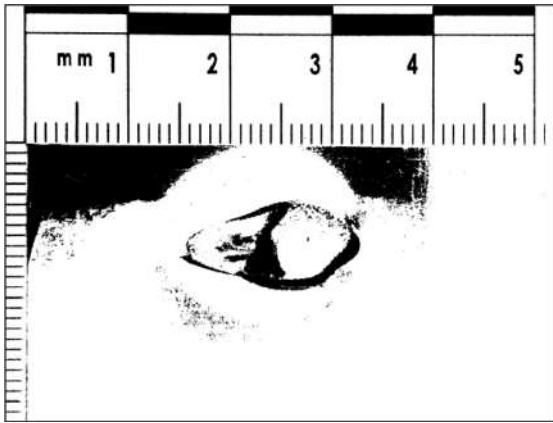


Figure 13: A Binary Image after Morphological Closing Operation

Step 5: Image Calibration for Distance Measurement or Area Calculation

Before calculating the area, it's crucial to establish the relationship between image pixels and real-world distances. This process, known as "Image Calibration," is essential to the software application. Real-world distances are incorporated into the images during the initial digitisation of the firing data samples. Each photo is taken using a Canon EOS 90D Camera, with a standard photomacrographic scale (commonly referred to as a forensic ruler) (ABFO No. 2 Photomacrographic Scale, 2024) placed near the bullet impact mark.

Once the binary images are pre-processed, they are calibrated for further analysis to measure known distances. The calibration process starts by identifying a visible distance on the image and inputting that distance value into the software in millimeters. The same distance is then marked on the image along the forensic ruler, appearing as a yellow straight line. The software provides simple instructional messages to guide users through the process. Figure 14 shows a representation of the final calibration data from the developed software.

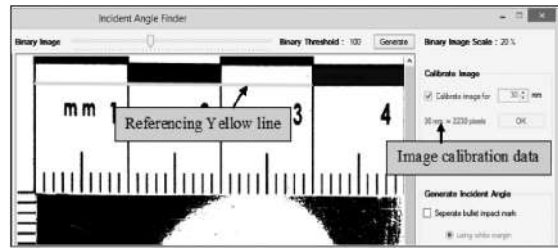


Figure 14: Display of Image Calibration Data within the Developed Software

The software calculates the pixel distance of the yellow reference line by extracting the edge points' pixel coordinates and applying the Pythagorean theorem (*Pythagoras Theorem (Pythagorean) - Formula, Proof, Examples, 2021*). Since this distance is known and marked on the image, the final calibration data is displayed in the top right area of the application window, as shown in Figure 14. This identified relationship between the image pixels and real-world distances is used for all subsequent distance measurements and area calculations of the bullet impact marks.

Before extracting the boundary of the bullet impact mark on 1 mm sheet metal, it's essential to ensure there are no disconnected pixel elements along the potential outermost boundary, as illustrated in Figure 15. If disconnected pixels are along the perimeter, incorrect results will be generated, as the outline of the bullet impact mark will not be accurately defined. This issue is shown in Figure 16, where the foreground extraction fails to occur correctly.



Figure 15: Distribution of Disconnected Pixels along the Boundary of an Impact Mark



Figure 16: Erroneously Marked Outline (Highlighted in Red) Caused by Disconnected Pixels Along the Impact Mark's Boundary

Step 6: Isolating Bullet Impact Mark from its Surroundings

This issue is resolved by introducing an additional option called "Separate bullet impact mark." This feature allows users to draw smooth arc regions in black and white on top of the binary image along the probable outermost boundary of the impact mark. The implementation is achieved by enabling antialiasing rendering of the lines and curves through the `Graphics.SmoothingMode` Property of the Microsoft .NET Framework 4.5 (*Graphics.SmoothingMode Property (System.Drawing)*, 2024). The resulting image, which features smooth lines and arcs to highlight the possible outermost boundary, is shown in Figure 17.

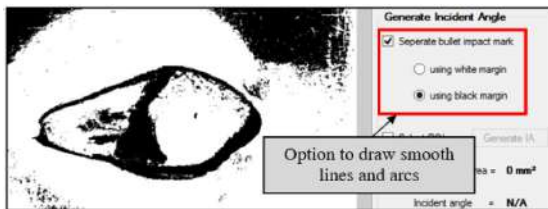


Figure 17: Potential Outer Boundary of the Impact Mark with External Addition of Smooth Black and White Lines and Arcs

Step 7: Determine the Area of the Bullet Impact Mark

After completing all the pre-processing steps, the image is prepared to identify the outermost boundary of the bullet impact mark and calculate the area within it. The GrabCut algorithm is utilised to extract the primary contour of the bullet impact mark, yielding significantly improved results on binary images (*GrabCut for Automatic Image Segmentation [OpenCV Tutorial]*, 2022). This implementation of the GrabCut algorithm follows an interactive process. As illustrated in Figure 18, the user has to mark the partial segmentation by drawing a rectangle around the region of interest containing the bullet impact mark.

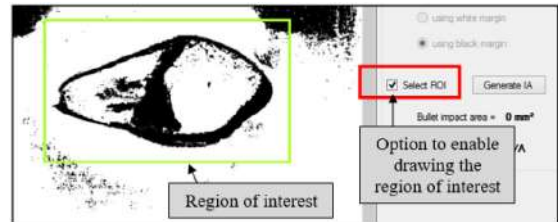


Figure 18: Initiating Partial Segmentation by Drawing a Green Color Rectangle Around the Region of Interest

Next, the "GrabCut" method (*Image(TColor, TDepth).GrabCut Method*, 2020) is applied specifically to the selected region of interest to perform background and foreground segmentation. Following this, the *CvInvoke. FindContours Method* (*CvInvoke. FindContours Method*, 2019) is used to extract contours from the segmented binary image, returning the total number of contours found. Among these, the largest contour with the greatest area is identified using the *CvInvoke. ContourArea Method* (*CvInvoke. ContourArea Method*, 2020) and is then drawn using the *CvInvoke. DrawContours Method* (*CvInvoke. DrawContours Method*, 2020), as shown in Figure 19. Finally, the area of the identified largest contour is converted to square millimeters (mm^2) based on the previously calculated image calibration data.



Figure 19: Identified Largest Contour (Highlighted in Red) Enclosing the Bullet Impact Mark

All digitised firing data samples from 10° to 90° were processed using the developed software application following the seven major steps outlined above. The area of each bullet impact mark was calculated in square millimeters (mm^2) and saved separately for further evaluation.

RESULTS AND DISCUSSION

RESULTS OF WORK

All digitised firing data samples from 10° to 90° were processed using the developed software application, following the seven major steps outlined earlier. The area of each bullet impact mark was calculated in square millimeters (mm^2) and saved separately. A summary of the mean area of each bullet impact mark in relation to the angle of incidence is presented in Table 1. Additionally, an exponential curve fitting was performed on this dataset using MATLAB R2015a (MATLAB - MathWorks, 2024). The analysis reveals a tightly coupled, inversely proportional mathematical relationship between the angle of incidence and the average area of the bullet impact marks.

To apply this relationship to practical problems, it is necessary to identify unknown incident angles based on the presence of a bullet impact mark. Utilising the same dataset and

the built-in curve fitting features of MATLAB R2015a, Figure 20 shows the relationship between the average areas of bullet impact marks and the incident angle. The software application has been implemented by incorporating this exponential equation to conduct the analysis.

Table 1: Mean of the Calculated Impact Mark Area and Incident Angles of Bullets Ranging from 10° to 90°

Given Angle of Incidence	Number of processed data samples	Mean area of the impact mark (mm^2)
10°	10	669
20°	10	161
30°	10	99
40°	10	77
50°	10	67
60°	10	58
70°	10	54
80°	10	50
90°	10	49

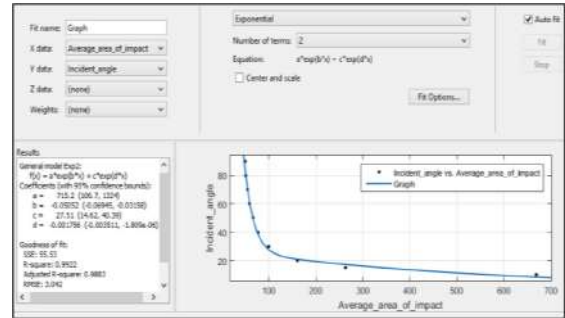


Figure 20: Mathematical Correlation Between the Mean Area of Bullet Impact Marks and the Incident Angle

EVALUATION

A new firing dataset was collected using a 1 mm sheet metal van door to evaluate the practical applicability of the identified relationship between the area of bullet impact marks and the incident angle. A different AK

rifle, using the same steel core ammunition, was employed to fire at the van door, positioned 10 meters away at various angles from the shooter's position. In this setup, seven 7.62 x 39 mm AK rounds were fired at each angle, with increments of 10° from 10° to 90°. The images captured of the van door are shown in Figure 21.



Figure 21: Firing Data Samples on a Van Door Manufactured from 1 mm Zinc-Coated Sheet Metal

After digitising the actual firing data samples by placing a forensic ruler near the bullet impact mark and using a Canon EOS 90D camera, each image is processed according to the seven major steps outlined in Figure 8. Ultimately, this allows for calculating the impact area for each shot fired, followed by the computation of the angle of incidence. All results generated based on the impact mark areas are summarised in Table 2.

Table 2: Mean of the Calculated Incident Angles Based on the Area of the Bullet Impact Mark

Given Angle of Incidence	Number of processed data samples	Mean of the computed angles
10°	7	8.86°
20°	7	21.14°
30°	7	28.43°
40°	7	39.43°

50°	7	48.86°
60°	7	61.71°
70°	7	69.43°
80°	7	80.86°
90°	7	87.29°

Alongside the new relationship between the average area of bullet impact marks and the incident angle, previously established full-length relationship (*B. Nishshanka et al., 2021; L. C. B. Nishshanka et al., 2021*) and the commonly used 2D Ellipse method (*Walters & Liscio, 2020b*) were utilised to estimate the angles of incidence using the same dataset from the van door. The estimated values were recorded, and the average angle of incidence was calculated for all estimated angles under the Ellipse method, full impact length method, and impact area-based approach. The differences between the average and actual incident angles were then computed. Figure 22 illustrates the comparison of these differences across the three methods relative to the actual angles of incidence for the fired AK bullets.

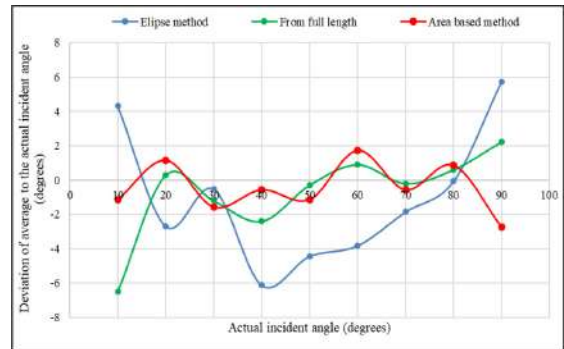


Figure 22: Comparison of Deviations from the Mean in Estimated Angles of Incidence using Three Methods, Compared to Actual Angles of Incidence of Fired AK Bullets

Using the same dataset related to Figure 22, the Root Mean Square Error (RMSE) was calculated for all estimated angles derived from the Ellipse method, full impact length

method, and impact area-based approach, as summarised in Table 3. RMSE provides a measure of how closely the computed angle data aligns with the actual incident angles (RMSE, 2024).

Table 3: Root Mean Square Error (RMSE) Calculated for All Computed Angles using the Ellipse Method, Full Impact Length Method, and Impact Area-Based Approach

Method	RMSE
Ellipse method	3.857 ^o
Full impact length-based method	2.489 ^o
Impact area-based approach	1.415 ^o

Different estimated results may arise for a specific incident angle due to slight deviations in the bullet trajectory as it approaches the surface. Factors such as yaw, precession, and nutation can lead to various impact angles (Haag & Haag, 2011b). Additionally, the uneven curvature of the van door may contribute to the differing results for the same fired angle. To address these potential errors, a $\pm 5^\circ$ cone is aligned coaxially with the estimated trajectory during the bullet trajectory estimation process.

It is noteworthy that the computed incident angles, derived from the new mathematical relationship between the average area of bullet impact marks and incident angles, exhibit the lowest Root Mean Square Error (RMSE) compared to results from the traditional 2D Ellipse method. Furthermore, the new method's results align closely with those obtained from the established full-length relationship (B. Nishshanka et al., 2021; L. C. B. Nishshanka et al., 2021).

Overall, the findings indicate that the new mathematical relationship can serve as a viable solution, producing significant results with high accuracy to narrow down and identify the probable incident angle for fired 7.62 x 39 mm AK ammunition.

ERROR CALCULATION AND UNCERTAINTY ANALYSIS

To assess the reliability and accuracy of the method, error calculations were performed to quantify the uncertainties associated with determining incident angles from bullet impact marks.

Sources of Error

Impact Surface Variability: Structural properties and curvature of the 1 mm Zinc-coated sheet metal (e.g., on the van door) may introduce inconsistencies, especially at high angles where surface deformation could vary. Surface curvature is estimated to cause a deviation of approximately $\pm 2^\circ$ in angle estimation.

Bullet Dynamics: Bullet dynamics such as yaw, precession, and nutation may influence the incident angle, creating minor trajectory deviations. For this analysis, these dynamics introduce an estimated additional $\pm 0.5^\circ$ uncertainty.

Uncertainty Quantification

Root Mean Square Error Comparison: Using the RMSE values in Table 3, the impact area-based approach demonstrated the lowest RMSE at 1.415^o, compared to the Ellipse method at 3.857^o and the full impact length method at 2.489^o. This lower RMSE signifies higher consistency of the impact area method, reducing deviation from actual angles.

Error Propagation and Total Uncertainty: The cumulative uncertainty in angle estimation, combining RMSE and deviations from bullet dynamics and surface properties, was estimated to be approximately $\pm 2^\circ$ for most angles using the impact area-based approach. This error range provides a realistic boundary for the accuracy of angle estimates in practical applications.

The method's low RMSE, coupled with the quantified uncertainties from bullet dynamics and impact surface variability, supports the impact area-based approach as a reliable solution for incident angle estimation. The inclusion of a $\pm 5^\circ$ tolerance cone around the estimated trajectory further addresses potential variations, enhancing the practical applicability of this method.

CONCLUSION

This study investigated the use of bullet impact area to determine the incidence angle for 7.62 x 39 mm AK rounds on Zinc-coated 1 mm sheet metal, a novel approach not previously utilised in shooting incident reconstruction. Testing across angles from 10° to 90° revealed a tightly coupled, inversely proportional relationship between the angle of incidence (10° to 90°) and the impact area, enabling a mathematical model for angle estimation that demonstrates accuracy and consistency. Additionally, a comprehensive set of image pre-processing steps was established to extract the outer boundary and calculate the area of a bullet impact mark.

A thorough error calculation and uncertainty analysis were conducted to assess the reliability of this method. Measurement uncertainties in the impact area and bullet trajectory variability were quantified, with an overall angle estimation uncertainty of approximately $\pm 2^\circ$. Additionally, the method's low Root Mean Square Error of 1.415° compared to traditional methods underscores its precision, further validated through a practical field test.

The field test, conducted on a 1 mm zinc-coated van door, confirmed the method's applicability in realistic conditions, demonstrating that the impact area-based approach reliably estimates incident angles. This

study thus establishes a viable, high-accuracy alternative for bullet trajectory reconstruction, offering a significant tool for understanding probable incident angles in forensic contexts involving 7.62 x 39 mm AK ammunition on zinc-coated sheet metal.

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AFANASY NIKITIN SEAMOUNT: THE NEW GEOPOLITICAL COMPETITION IN THE INDIAN OCEAN

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ABSTRACT

The discovery of the Afanasy Nikitin Seamount (ANS), a resource-rich seamount in the Indian Ocean Region (IOR), now makes it a theatre of fierce geopolitical competition. Named after a historical Russian traveller, the ANS is located in the Central Indian Basin, 400 km in length and 150 km wide. Petrochemical data reveals that the main plateau of this seamount was formed on young oceanic crust during the Late Cretaceous and is highly enriched in critical minerals such as cobalt, nickel, manganese, copper, platinum group elements, and gold. The research undertaken indicates the geopolitical importance of the IOR, increasingly determined by China's economic dependence, the advantageous location of India. Added to that is the geopolitical game played by India in view of China's influence and interest. This ANS has emerged as a bone of contention between Sri Lanka and India, each claiming its right to explore and exploit the resources, because of such increasing geopolitical influences. Sri Lanka has made claims of the ownership of the seamount's territory through

the United Nations Convention on the Law of the Sea (UNCLOS), while India has forwarded an application to mine the seamount. The following study will undertake an exploration into the dynamic geopolitical environment of the IOR under the prism of ANS resource rivalry among regional member states. It will identify geopolitical strategies adopted by IOR member states that have staked a claim to the ANS and examine how India and Sri Lanka plan to navigate competition between major powers for its interest in the region. The research is aimed at deepening an understanding of the complex geopolitical dynamics currently unfolding in the IOR and hence thinking about strategies for the maintenance of peace and stability in the region.

KEYWORDS: *Afanasy Nikitin Seamount, India, Indian Ocean Region, Sri Lanka, United Nations Convention on the Law of the Sea.*

INTRODUCTION

The Indian Ocean Region (IOR) is known to be a vast oceanic region with multiple resources and minerals. The oceanic region is also considered as a place of strategic interest in maritime sea routes, maritime trade and logistics, as well as for its location. Further, many significant and influential states share the maritime boundary in the Indian Ocean which is of utmost importance. In the following context, having vast resources in IOR, the geopolitical competition to claim some of the resources in the region has the capability to spark geopolitical tensions.

'Afanasy Nikitin Seamount (ANS)' is known to be a region which has drawn the attention of the IOR states. The name of the seamount derives from the historical Russian traveller 'Afanasy Nikitin, as he travelled, explored and researched across South Asia, especially Ceylon (Sri Lanka) and India. He described the South Asian continent as a strategic place within the IOR, especially with regard to on Ceylon as he describes in his journal 'Afanasii Nikitin's Journey Across Three Seas' which is published by the Russian Information Centre (2009) as "And Ceylon – not an unimportant port on the Indian ocean, and there, on a high peak, lies the forefather Adam. And near that peak one finds precious stones – rubies, fatis, agates, garnets, crystal, and corundum 73. Elephants are born there, and they are priced by size 74, and cloves are sold by weight"(Afanasy Nikitin – Russinfo, 2009).

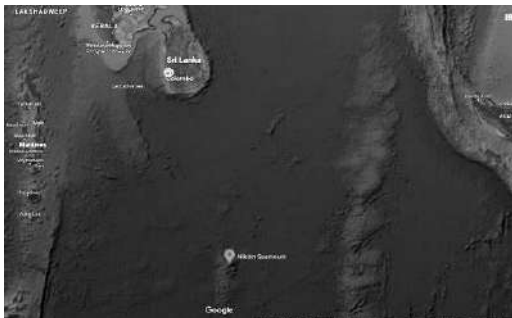


Figure 1: Afanasy Nikitin Seamount ('Google Maps', 2024)

As depicted in the above figure, in reference to Krishna et al. (2014), the Afanasy Nikitin seamount (ANS) is a prominent structural feature in the Central Indian Basin, measuring 400 km in length and 150 km in width. It is located at the southern end of the 85°E Ridge in the Indian Ocean. Subsequently, Krishna et al, (2014), referred ANS's petrochemical data indicates that the primary plateau of the seamount, composed of basalts and picrite-basalts, was formed on fresh oceanic crust during the late Cretaceous period. More importantly, according to Banakar, Hein, Ramesh, & Chodankar (2007), the ANS is abundant in several minerals, including cobalt, nickel, manganese, and copper, as well as platinum group elements and gold.

The Indian Ocean Region has solidified its position as a new, emerging area of geopolitical clout. This pivotal region has become the focus of major powers seeking to add depth to their influence on strategic issues in the international system. In reference to Babar (2024), China's Belt and Road Initiative has greatly increased its presence within the region, developing key infrastructure projects and military installations. Hence, countries such as India, the United States, and Japan have channelled on the increasing influence to counteract China's growing influence against Sri Lanka through various methods of diplomacy, economics, and military influence. Again, with growing geopolitical competition, the global geopolitical environment has turned extremely complex and volatile to engage with for a country like Sri Lanka. While stronger countries compete for their influence and resources, smaller states like Sri Lanka are hosts of many crossfires of techno-geopolitical interests. In accordance to Babar (2024), all this rising geopolitical tension really affects economic growth, diplomatic relations, and regional strategic positioning for Sri Lanka.

According to the The Hindu (2024), India applied to the International Seabed Authority (ISBA), Jamaica, for rights to explore two vast tracts in the Indian Ocean seabed that aren't part of its jurisdiction. One of these vast tracts that it applied is the ANS region. This application has sparked a new geopolitical tension, as the rights to the region have already been claimed by Sri Lanka under a separate set of laws. This has caused a new geopolitical tension and competition between Sri Lanka and India in terms of the claim on ANS region. Therefore, due to the following tensions, the IOR is facing a new geopolitical competition in terms of resource and territorial claims.

The recent discovery of the Afanasy Nikitin Seamount, which is abundant in critical minerals like cobalt, has generated new geopolitical tensions in the region. Sri Lanka has claimed the seamount's ownership through the United Nations Convention on the Law of the Sea (UNCLOS), while India has submitted an application stating that the territory belongs to it. This has led to significant geopolitical tensions in the region and has the potential to cause bilateral tensions between Sri Lanka and India, as well as sparking new geopolitical competition in the Indian Ocean Region (IOR). This research aims to investigate how countries in the IOR, particularly Sri Lanka and India, can analyse and navigate this complex geopolitical landscape, which is shaped by historical trade routes, contemporary resource competition, and the evolving interests of major powers such as China and the United States of America. Therefore, the objective of this research is to investigate the Indian Ocean's shifting geopolitical landscape, with a specific focus on the rivalry for resources found in the ANS among regional member states of the IOR, as well as to identify the geopolitical strategies employed by IOR member states that have staked a claim to the ANS. This research further questions on how the Indian Ocean's shifting geopolitical landscape, with a specific focus on the rivalry for resources found in the ANS

among regional member states of the IOR?, as well as to analyse what are the geopolitical strategies employed by IOR member states that have staked a claim to the ANS?.

LITERATURE REVIEW

The IOR is widely recognised for promoting maritime peace and security. In fact, the United Nations Office for Disarmament Affairs (1983) reported that the idea of establishing a zone of peace in the Indian Ocean was first introduced to the General Assembly's agenda in 1971. Further, it was further enhanced "under an item entitled 'Declaration of the Indian Ocean as a zone of peace', at the request of Sri Lanka, later joined by the United Republic of Tanzania"(United Nations Office for Disarmament Affairs, 1983). Therefore, because of the following declarations, the IOR is assumed as a region that has lesser military conflicts, excluding maritime piracy and sea-based terrorist activities. However, the geopolitical dynamics and implications of the IOR has increased during the last few decades. As Frans-Paul van der Putten (2014) has stated, the IOR is comprised of sea lines of communication (SLOCs), specifically those that pass through strategic choke points in the Strait of Hormuz and the Strait of Bab-el-Mandeb. It is accepted that the European Union (E.U.) and its member states, China, India, the United States of America (U.S.A.), Japan, and Australia are increasing their naval strength and military presence in the Indian Ocean itself and along its periphery. Smaller naval powers, particularly Pakistan, Malaysia, Singapore, and South Korea, are also augmenting their activities there. Therefore, such activities have contributed to increase geopolitical implications in the IOR.

Although, maritime boundary claims were not significant within the IOR, as many states have settled their maritime boundary issues to a certain extent, in reference to Frans-Paul van der Putten (2014), the rise of new naval powers in the Indian Ocean is

seen. The two main issues that are high and pertinent have to do with this rivalry. One is the maritime competition that heightens rivalry between India and China. These tensions have continued to exist between these two Asians since the Dalai Lama fled into India in the year 1959 and the Sino-Indian border war of 1962. Into this already complex situation was added the linkage of China's growing security partnership with Pakistan, traditionally with a very tenuous relationship with India. As their growing power expands, so could the Indian Ocean be the erstwhile Pandora's box of ever-possible contention between India and China — a widely recognized potential source of conflict in the present context affecting the member countries of the IOR.

'Deep sea mining' plays a crucial role in geopolitics. According to Sanchez (2023), the extraction of critical minerals as well as rare earth elements from the seabed, often referred to as deep seabed mining or deep-sea mining involves more than just environmental protection. Geopolitical factors, such as great power rivalries, must also be carefully considered. As in reference to Sidhu (2023), this process differs from conventional mining, which entails extracting minerals from the earth's crust. In contrast, deep-sea mining involves the collection of nodules, crusts, and other deposits that have accumulated on the ocean floor over a long period of time. In terms of deep-sea mining, the International Seabed Authority (ISA), a UN affiliate organization plays a critical role in deep sea mining governance. According to Sidhu (2023), a Jamaica-based affiliate organisation of the United Nations is renewing interest in deep-sea mining—an emerging realm of geopolitical competition—by its move to accept applications. Further, disregarding the lack of scientific research and potential environmental damage, the global demand for "battery metals" such as cobalt, nickel, manganese, and Rare Earth Elements (REEs) to meet the complex supply chains for Electric Vehicles and clean energy infrastructure has increased interest in deep-sea mining. "At present, the industry's

most dominant players include Canada, China, Japan, South Korea, and Russia, with Norway emerging as a key investor within the space" (Sidhu, 2023). Moreover, Sanchez (2023) points out that the ISA has issued 31 license of exploration for seabed minerals. The dominance of a few countries in the deep-sea mining industry could exacerbate existing geopolitical tensions, particularly in areas where there are competing claims over maritime boundaries and resource rights. For instance, according to Burgers & Romaniuk (2023), the discovery of REE's in the South China sea has created a new geopolitical competition in terms of maritime boundary claims within the REE areas among China, Vietnam and the Philippines. Further, Vidal (2023), iterates that Russia's increasing ramifications on Arctic sea mining have sparked a new geopolitical competition within the Arctic region. Therefore, such measures and stakeholder activities within the seabed mineral mining industry have created a new form of geopolitics.

The ANS region has attracted a new geopolitical implication, which has also led to a significant geopolitical tension increase in the IOR due to the discovery of rich seabed minerals. This is mainly due to the controversial, as Abeysinghe (2024) points out that India approached the International Seabed Authority (ISA), to request permission to explore the cobalt-rich Afanasy Nikitin seamount, situated in the central Indian Ocean, east of the Maldives, which is approximately 1,350 kilometres away from the Indian coast. These moves come with a stark controversial, as Abeysinghe (2024), iterates that in 2009, Sri Lanka made an application to extend its jurisdiction beyond 200 nautical miles by submitting a request to the Commission on Continental Shelf Limits (CLCS), which has yet to respond. If the application is accepted, the Afanasy Nikitin Seamount would be incorporated within Sri Lanka's maritime boundaries. The underwater feature comprises of 150 blocks spanning an area of 3,000 square kilometres. Therefore, the following actions have sparked new geopolitical

tensions in the IOR, particularly the ANS region for a new geopolitical conflict. The question on how its implications will affect the IOR and the member states of IOR, as well as how the Island state of Sri Lanka will delve with the situation remains a problem to be uncovered.

METHODOLOGY

The methodology that has been used by the researcher is qualitative, and it has involved the use of existing literature; thus, no statistical analysis was done. Besides, the researcher has utilised primary data like government statements and ministry statements while relying on secondary data like newspaper articles, journal articles, conference proceedings, books and social media. Since the data to be used is classified, thus limiting access to resource persons, the researcher has faced limitations. In spite of this, the researcher has still been able to wade through the existing data that was available to conduct a critical and constructive analysis thereof, arriving at certain observations and providing recommendations.

RESEARCH LIMITATIONS

The ever-changing geopolitical landscape in the Indian Ocean has turned out to be a highly fluid situation, marked by shifting relationships between major powers and the forging of new regional alignments that makes any fixed assessment quite difficult to present with confidence and equally make forecasts about the futuristic events, and equally, it presents changing data against the current information.

Research on the Afanasy Nikitin Seamount and its geopolitical implications is still in its early stages, which restricts the amount of academic literature available for a comprehensive examination. Despite a growing scholarly interest in the Indian Ocean region, research specifically focused on this topic is scarce.

DISCUSSION AND ANALYSIS

The Shifting Geopolitics of the IOR and its Effects on ANS

As mentioned in the literature review, the Indian ocean was proclaimed as a 'Zone of Peace' as per the United Nations Office for Disarmament Affairs (1983), yet with the rise of new great powers, the IOR has being entailed into a unprecedented geopolitical competition, drawing along the states in the region to a new geopolitical competition. As per WARD (2017), the economic and geopolitical significance of Asia has been growing, and the Indian Ocean has served as the foundation for the trading systems that have facilitated Asia's economic rise. The geopolitics of IOR which known to be a region which has three geopolitical aspects of tangible criteria that are unique to the region. First and foremost is the China's economic dependency on the IOR is a crucial factor in geopolitical elements in the IOR. As the leading state of economic growth in the world, "China's imports from the Middle East, resources from Africa, and trade with Europe must transit the Indian Ocean in order to reach China"(JONATHAN D. T. WARD, 2017). China's economic growth and survival depends on the geopolitical dynamics of the IOR. As the second most importance, the region houses a flourishing India that boasts a more advantageous geographical location than China when it comes to maritime trade and security. In the latest maritime strategy, India explicitly stated that the Indian Ocean, encompassing the region between the Cape of Good Hope and the Lombok Straits, holds significant importance for the country. The final crucial geopolitical aspect of the IOR is in reference to WARD (2017), where the term "Indo-Pacific" is increasingly being incorporated into national strategy documents, where it is used to represent the 'Asia-Pacific' region in light of nations' global and regional strategic interests. This is considered to be a framework of enhancing Asian trade by connecting the

Pacific Ocean with the Indian ocean. However, the dynamics of geopolitics in the Pacific Ocean is difficult to encroach on the Indian Ocean, as a singular power domination within the Indian Ocean is impossible since it consists major geopolitical powers in the region, unlike the United States of America's domination in the Pacific Ocean. Thereby, paving the way for potential geopolitical competition within the IOR.

The Clauses of Claiming ANS and Extended Seabed Maritime Territory

The ANS is a resourceful region within the IOR, as the region consists of REEs. With the discovery of REEs in the ANS region, a new geopolitical competition has sparked in the interest of two states claiming it, which are Sri Lanka and India. Initially, in reference to Attanayake (2024), Sri Lanka has submitted an application to extend its continental shelf beyond the conventional 200 nautical miles, with the aim of claiming a larger portion of the seabed to the Commission on the Limits of the Continental Shelf (CLCS). However, this request, initially made in 2009, has yet to be sanctioned by the International Seabed Authority (ISA).

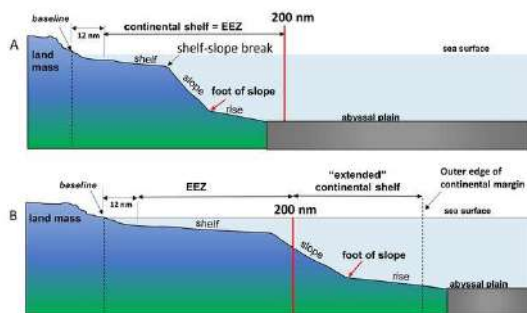


Figure 2: The concept of “Continental Shelf” according to Article 76 of UNCLOS (Madon, 2021)

As the figure above illustrates, according to Madon (2021), the continental shelf is determined at the 200 M line when the continental margin is narrower than the 200 nm limit (EEZ), as shown in image (A). Conversely, a wide geological continental margin may extend beyond 200 M, as depicted in image (B), and that portion of the seabed beyond 200 M may become part of an "extended" continental shelf. According to Linganna (2024), the claims to the continental shelf generally extend up to 350 nautical miles from the coast. Nevertheless, countries situated along the Bay of Bengal may apply different criteria to expand their claims beyond this limit. Therefore, as a result of such clauses, Sri Lanka has the ability to legally extend its maritime claim, which is depicted in the picture below.

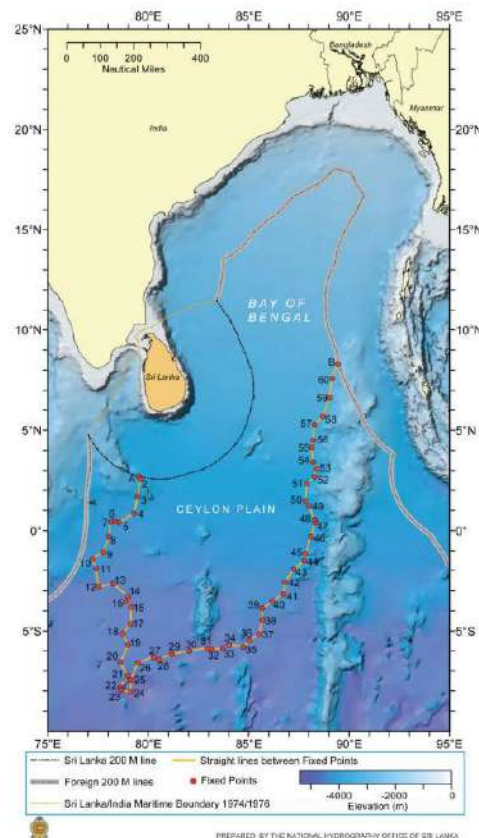


Figure 3: Extended continental shelf submission of Sri Lanka (Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations., 2009)

As in reference to Abeysinghe (2024), in the past, the CLCS granted several requests to extend the continental shelf's boundaries, which were submitted by countries such as Australia, Norway, and Pakistan. These countries have maritime territories that extend beyond 200 nautical miles from their shorelines.

India's Race for Claiming the ANS Region

Although Sri Lanka has claimed the following maritime territories under the UNCLOS framework, (Koshy, (2024), India has submitted an application to the International Seabed Authority (ISA) in Jamaica, requesting permission to explore two expansive areas in the Indian Ocean seabed that fall outside of its territorial jurisdiction, and one of these regions is the ANS region. This is clearly a geopolitical manoeuvre from India towards Sri Lanka, which has sparked the geopolitical competition.

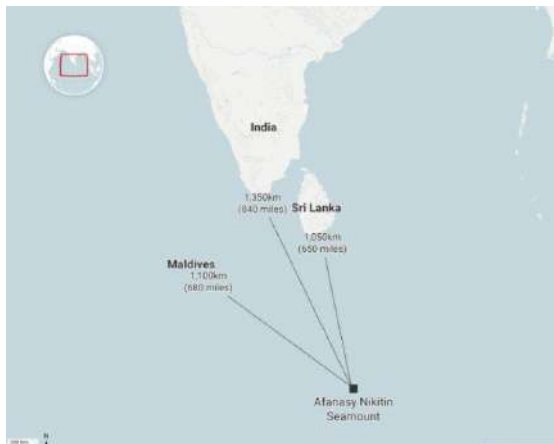


Figure 4: ANS Geographical location range from neighbouring countries (Selina Wijesooriya, 2024)

In reference to Attanayake (2024), there was no objection from India to Sri Lanka when claiming the extended seabed territory back in 2009. India's recent application for the contested ANS maritime territorial claim with Sri Lanka is mainly due to three reasons. First and foremost reason for India's claim of the territory is due to,

in reference to India's fear on potential growing influence of China on the Indian Ocean (Yang, 2024). China's recent increase in research vessel activities in the Indian Ocean has raised security concerns in India, as they fear that Beijing may deploy naval vessels to the region based on the insights gained from these activities. According to Abeysinghe (2024), India's claim on ANS is not directly aimed at seabed exploration and mine extraction, instead, it is a goal to establish a foothold in the area in order to deter the presence of the Chinese. More importantly, in reference to Koshy (2024), India's view on research vessels by China undertaking reconnaissance in the same region, Chinese research vessels docking in Sri Lanka and the growing security relations between China and Sri Lanka, has prompted India to execute this geopolitical manoeuvre, signifying a potential geopolitical competition within the ANS region. Secondly, India's race for deep sea resource exploration, cobalt exploration and REE's has also considered to prompt such decisions. Attanayake (2024) depicts that cobalt is a vital mineral in rechargeable batteries, which plays a crucial role in the global shift towards electric vehicles and renewable energy storage. Additionally, cobalt is utilised in batteries for various devices, such as laptops, smartphones, and electric vehicles, as well as in jet engines and gas turbines. As Sidhu (2023) explains, many states are vying for projecting geopolitical power in deep sea resource gaining. India's embark on deep sea mining is based on projecting geopolitical power and gaining economic benefits.

The final concern for India is on Sri Lanka gaining greater geopolitical strategic autonomy through gaining resource rights. Based on Attanayake's (2024) findings, Sri Lanka's potential wealth beneath its waters and the geopolitical influence it could gain through extraction have drawn Delhi's attention. Furthermore, Sri Lanka's strategic location often places Colombo in the midst of geopolitical

tensions between Beijing, Washington, and its allies, as evidenced by the presence of Chinese research vessels in the island's ports. Nevertheless, by asserting its resource claim, Sri Lanka can utilise its geopolitical strategic autonomy, enabling the country to use it as a bargaining chip for increased cooperation with more powerful geopolitical actors, a prospect that India views with some concern.

The Geopolitical Strategies on ANS by Claimed IOR States

As the geopolitical competition is brewing between Sri Lanka and India on claiming the ANS region, it is important to understand how the strategies by the following two states are on claiming the ANS region as part of their maritime territorial boundary. As following two countries are on a competition for the claim of the ANS region, the two countries have begun utilizing geopolitical strategies to implement their claim on the ANS region.

India's Geopolitical Strategies on Claiming the ANS Region

India's approach to Nikitin Seamount is expected to involve a blend of strategies, adapted to its broader geopolitical goals and the shifting circumstances in the Indian Ocean. Sustaining a balance between economic aspirations, environmental worries, and international relations is vital for India's accomplishments in this intricate setting. India's geopolitical strategy on claiming the ANS region is based on two aspects, which is the legal aspect and sociopolitical approach. The legal aspect of India's claim is based on the ISA framework, as Bhaumik (2024), points out the Earth System Science Organization (ESSO), an independent body governed by the Ministry of Earth Sciences in India's administration, presented a proposal to the Secretary-General of the International Seabed Authority (ISA) on January 18, 2024, aiming

to secure endorsement for a 15-year strategic plan. As for their application to the ISA, which is also known to be an institute that is governed under the UNCLOS legal framework, in accordance with Bhaumik (2024), the area that New Delhi intends to investigate encompasses 3,000 square kilometres and is divided into 150 blocks, none of which exceed 20 square kilometres in size. These blocks are organized into six groups, each comprising 12-50 blocks, and the region covering the six clusters is enclosed within an area measuring no more than 550 kilometres by 550 kilometres, as stated in an ISA document. Further, in reference to the report from the Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations (2009), despite knowing that Sri Lanka submitted its application to extend the limits of Sri Lanka's continental shelf to the CLCS, which is also a regulatory body under the UNCLOS, India took the legal manoeuvre through ISA to undermine the claim by Sri Lanka. The manoeuvre came into place when the Permanent Mission of India to the UN stated that, the consideration and qualification by the Commission of the submission made by Sri Lanka would prejudice the rights of India over the parts of the continental shelf, as India has the right to make further submissions under the Statement of Understanding. Therefore, in accordance with the Rules of Procedure of the Commission, the Government of India requests the Commission not to "consider and qualify" the submission made by Sri Lanka"(Permanent Mission of India to the United Nations, 2022). This legal manoeuvre is based on upholding its stronghold in geopolitical strategic autonomy within the IOR. However, although India is utilizing its geopolitical strategy through the legal front, the clash comes down to a legal dilemma, which Linganna (2024) points out that, India's exploration plans may face obstacles from CLCS, since it is the legal body that determines the boundaries of a country's continental shelf while ISA only focus on issuing deep-sea mining licensing.

According to Linganna (2024), the Indian government was requested by the International Seabed Authority (ISA) to address the issue of overlapping territorial claims. Nevertheless, India informed the ISA on March 12 that it was unable to respond in time for the 29th Session of the Legal and Technical Commission, which was evaluating India's application. As a result, the ISA note states that India's application has been "put on hold" and will be reviewed again once a response is provided.

The second geopolitical strategy on claiming the ANS region, which is employed by the social elements of the Indian society, is social disinformation. Although, the Indian state hasn't intervened in this manner, popular Indian media and social media platforms are claiming that the ANS region belongs to the Indian state. Although this is considered an inward-looking action, the Indian general mass of the society withheld India's foreign policy, since India is considered as the largest democracy in the world. Therefore, to raise awareness of its foreign policy and geopolitics, many Indian media platforms and social media platforms are effective mechanisms to raise such awareness. For instance, below figures depict how the average Indian social media showcase the geopolitics of ANS and its importance.



Figure 5: An Indian social media activist posting about ANS (@InsightGL), (2024)



Figure 6: A popular Indian youtuber publishing an educational video of ANS (StudyIQ IAS, 2024)

Therefore, as a result of such narratives, the general public of India tends to have a certain motivation and a sense of action to rally behind India's claim. Further, these disinformation narratives can give a certain narrative of the ANS claim to the world. As depicted in the above figures, many Indians tend to have the notion of India owing the ANS region. For instance, as a result of such disinformation, many Indians tend to do carry out disinformation through 'flooding' the information environment and 'Astroturfing'.

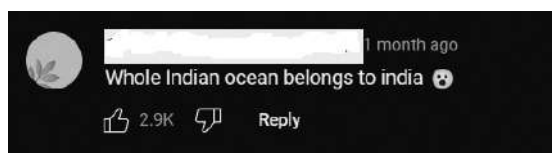


Figure 7: An 'Astroturfing' comment regarding ANS on a youtube video (StudyIQ IAS, 2024)



Figure 8: An 'Astroturfing' comment regarding ANS on a youtube video (StudyIQ IAS, 2024)



Figure 9: An Indian 'flooding' comment on google maps location of ANS (Google Maps [Nikitin Seamount], 2024)

Therefore, as a result of such disinformation campaigns, some of the majority of the Indian general public tend to support and stand with India's decision on claiming the ANS region, which can strengthen its geopolitical strategies.

Sri Lanka's Geopolitical Strategies on Claiming the ANS Region

Similar to India's stance, Sri Lanka's strategy is mainly based on legal aspects. According to Walakuluge & Abeysekara (2024), Sri Lanka's geopolitical strategies on the IOR are based on blue economic incentives. Therefore, as a result of that viewpoint, Sri Lanka seeks to enhance and utilise its maritime resources and territory, in order to gain and enhance its economic performance. In reference to Bhaumik (2024), Sri Lanka openly opposed India's move on claiming the ANS region. In claiming the ANS region, Sri Lanka's main geopolitical strategy is based

on utilising the legal aspects of the claim. For instance, in reference to the Colombo Gazette (2024), the Ministry of Foreign Affairs, Sri Lanka iterated that it is working on claiming an extended continental shelf beyond the 200 nautical miles Exclusive Economic Zone (EEZ), which lies the ANS region, in accordance with the Article 76 of UNCLOS. As the submission was "presented its technical and scientific data and other material to the UNCLCS to establish the outer limits of the continental shelf on 8th May 2009"(Colombo Gazette, 2024), relevantly, "Sri Lanka presented its submission under the special method contained in the Statement of Understanding (SoU), in respect of States in the Southern part of the Bay of Bengal"(Ministry of Foreign Affairs – Sri Lanka, 2024). Further, Sri Lanka iterates the fact that, in reference to Attanayake (2024), India was not against its submission for extending the maritime claim back in 2009. Furthermore, although the state of Sri Lanka is not involved, the domestic pressure to claim the ANS region has significantly risen in Sri Lanka. In reference to Kuruwita (2024), scholars and experts on the field are pressuring the government of Sri Lanka to secure its claim of the ANS region with the necessary protocols and actions. Along with the pressure from intellectuals, experts and scholars of the relevant field, the local media of Sri Lanka is reporting the criticality of claiming the ANS region.



Figure 10: A local news channel report on the ANS region (Newsfirst Sri Lanka, 2024)

As a result of such news reports, some of the general masses of the Sri Lankan society have begun pressuring and demanding the local government of Sri Lanka to ratify its action claiming the region through social media, of which an example is depicted in the figure below:



Figure 11: A social media post by a Sri Lankan advocating for claim & protection of the ANS region (Sanka Chandima Abayawardena [@SankaChandima], 2024)

Furthermore, as a result of such geopolitical agitations, similar to India, disinformation such as ‘flooding’ have been spiralled by Sri Lankans to counter Indian agitation, which is also depicted in the figure below:



Figure 12: A Sri Lankan ‘flooding’ comment on google maps (‘Google Maps’ [Nikitin Seamount], 2024)

As a consequence of these actions, many Sri Lankans put pressure on their government to assert control over the ANS region, which can lead to a heightened anti-Indian sentiment. This could potentially strain the bilateral relationship between India and Sri Lanka, while also presenting an opportunity for Sri Lanka to pursue geopolitical strategies.

CONCLUSION

Deep-sea mining and maritime boundaries are considered as the new causes for tension between states within the region. Similar to the South China sea crisis, a new maritime boundary dispute is brewing on the Indian Ocean based on continental shelf boundary claims and deep-sea mining. The Indian Ocean is a vast untapped region of resources which are spawn into competition between great powers. As a result, the ANS region, is the new proximity region for such competition due to its vast resources. The potential of a growing geopolitical tension between India and Sri Lanka through the clash of claiming the ANS region in the Indian Ocean has sparked a new geopolitical competition within the region. As the tensions impact bilateral relations between India and Sri Lanka, the concept of Indian ocean being a “Zone of Peace” has a chance of

deteriorating, causing a tension in the IOR. As both states utilise their geopolitical strategies in claiming the region, it is believed that the IOR is a potential zone for future geopolitical competition on claiming maritime resources.

FUTURE RESEARCH CONSIDERATION

To investigate the necessity of examining the possibilities for regional collaboration in overseeing the Afanasy Nikitin Seamount and its resources cannot be overstated. This involves researching methods for combined exploration, environmental safeguarding, and sharing of advantages.

To analyse how IOR member states other than India and Sri Lanka perceive on extending their continental shelves through the UNCLOS framework and the possible clashes that the following states will face.

To investigate how deep-sea mining and extended continental shelf other than the ANS region will affect the geopolitical landscape of the Indian ocean.

To further examine the progressing legal framework for deep-sea mining is essential. Research into the consequences of international law, especially the UNCLOS in relation to the Afanasy Nikitin Seamount is necessary.

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AN ANALYSIS OF SOCIAL INTEGRATING OF MASS-RETIRING SRI LANKAN ARMED FORCES INTO CIVIL CONTEXT THROUGH THE SECURITY LENS

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ABSTRACT

The research study investigates the multifaceted challenges and societal impacts created during the transition period of a veteran from military to civilian life by focusing through the security lens to identify factors to victimise and involve in criminal activities. Corollary, research employs the methodology desk research followed by exploratory analysis, which synthesizes empirical data, existing literature, government reports, published newspaper articles, media reports, and web information to provide a comprehensive outline of the issues confronting veterans. Thereby, collating information from various sources immensely aided in identifying key factors contributing to veterans' complications in social integration and the subsequent risk of attracting them to illegal activities. Accordingly, the socioeconomic pressure created due to financial constraints as a result of unemployment and underemployment was highlighted as the major factor contributing to the failure of social integration. Further, financial constraints would also have a significant influence to augment the other

factors such as psychological stress and social isolation. Moreover, findings underscored that untreated psychological issues, social isolation, and financial constraints would lead veterans to addiction to harmful substances and detachment from society. Finally, the study emphasises the role of social isolation and harmful peer influence in driving veterans toward negative behaviours and criminal networks. Therefore, based on the insights derived through a research study, it offers several recommendations and suggestions to mitigate the effect such as the establishment of targeted employment assistance programmes, providing psychological treatment and support, media campaigns targeting community reintegration, and creation of research encouragement on the subject in the Sri Lankan context to support veterans in their transition to enhance overall community well-being.

KEYWORDS: *Employment Issues of Veterans, Social Integration of Veterans, Sociocultural Effect of Veterans, Sri Lanka, Veterans' Transformation.*

INTRODUCTION

Sri Lanka is currently experiencing the recovery phase of the unprecedented economic turmoil since independence, but the rise of the cost of essential goods and services in comparison to the limited salary has caused severe consequences in the domestic life of the employees. It was evident that a significant number of officers and soldiers had left the Sri Lankan tri-forces prematurely with or without proper legal mechanisms. Mostly, personnel who are getting premature retirement or getting Absent Without Official Leave (AWOL) are anticipated to find jobs at both the local and international levels due to the economic situation of the country. Hence, the Government Forces of Sri Lanka (GFoSL) conducted mass recruiting campaigns from the year 2005 to 2009 to strengthen its capabilities to fight against the terrorist organisation, Liberation Tigers of Tamil Eelam (LTTE) a brutal terrorist organisation that fought for separatism, which ultimately enhanced the Sri Lankan Army (SLA) strength from 120,000 cadres in the year 2005 to 200,000 in the year 2009 (Layton, 2015). Accordingly, the Sri Lankan Navy and Sri Lankan Air Force also recruited a vast entity of ground role soldiers during the respective period and enhanced their cadre to cater to the requirements that arose during the war against the LTTE. Therefore, tri-forces will be facing a severe reduction of their battle-hardened cadre from the year 2027 to the year 2031 due to their completion of the 22-year service period.

Simultaneously, rising crimes in Sri Lanka have showcased the rising involvement of ex-military personnel acting as frontier action enablers in the recent past (Balasuriya, 2024a; Colombage, 2014; Kaviratne & Wickremasekera, 2010; Warakapitiya, 2024). Hence, as argued by the Blackburn (2016), some ex-military personnel would experience the adverse effects of the military to civil adaptation issues, which makes them undergo severe psychosocial issues

and personal problems such as homelessness, extreme levels of alcohol and drug addiction, lack of financial support, and unemployment. Further, this situation subsequently leads to committing suicide, being involved in criminal activities, and suffering from mental illness.

Concurrently, all military personnel enlisted to the tri-forces are to be retired on completion of the minimum service as per the legal agreement made with the respective service. However, it was noticeable that the deserters have more tendency of committing crimes rather than the legitimate leavers. Nevertheless, the dual effects of post-retirement complications' effect and the financial drawback of less pension compared to active pay have caused victimisation of the retired ex-military cadre to be recruited and smuggled as mercenaries, belligerence, and militias such as Ukraine-Russian war where the allegations were also raised against ex-military officials in human trafficking (Adaderana, 2024; Balasuriya, 2024b; Farzan, 2024; Newswire, 2024). Further, elaborations made by Blackburn (2016) emphasises that retired personnel would find it extremely difficult to adjust to the general society during the occasions of scarcity of resources and facilities due to lack of financial background where cognitive disturbances occur due to the mismatch between the current and previous status. Besides, the traditional acceptance of retirement is a withdrawal from the strains and rigours of the outside world to the relative safety and comfort of the family, but in the role of a revered elder, who is treasured, fed, and honored (Hinds et al., 1963). However, a military person who retired after completing 22 years of service would not have the luxury of resting, mostly he was just stepped into the fifth decade of his life.

Consequently, the psychological change required to adapt to the civil environment of the general community is challenging for a war veteran who sought all characteristics of their

specific in military career would have to change to suit the new way of life. Besides, during the pre-exit era from the military, worries about the individual's future goals as a civilian would become highly significant among the soldiers where the tri-forces are attempting to tackle the issue by providing pre-retirement training. Thereby, the personnel who retire from the service due to completion of their intended service are being provided with professional training in order to match the job market outside the military environment. Nonetheless, it is vital to identify that the psychological issues of ex-military personnel and the post-military retirement criminal behaviour are consequences of ineffective transition and alienation to match the social demand (Lamb, 2003).

Accordingly, it is a significant phenomenon that the retirement of a large number of well-trained war veterans of Tri forces within a short tenure, especially during an economic crisis, could raise alarming social issues in the country. Corollary, scholars have recognized a researchable area of "post-military employment" which concerns the study field of successful integration of ex-military cadre into the society. Accordingly, this paper conducts a descriptive analysis of how the Sri Lankan government and the tri-forces should attempt to successfully reintegrate the bulk of the cadre into civil society during the years 2027 to the year 2031 without making a national-level societal and security issue.

LITERATURE REVIEW

Post-retirement behaviour of employees has been a well-known and extensively researched subject area of multi-disciplinary scholars since the 1960s when pioneers on the subject such as Hinds et al., (1963) have enlightened the scholarly views by stating that retirement is a deeply personal and significant milestone of life, but many people are frustrated

with retirement change due to aging, declining health, and frequent changes in starting a new life (Hinds et al., 1963). Further, as highlighted by (Faires et al., 1998) strategical concern must be made to reconstruct the society through a successful reintegration plan for ex-military cadre to avoid social friction generated in ex-soldiers to society and vice versa. Following the argument, Gibert (1999) has mentioned the necessity of concentrating on the reintegration process by reforming the retirement plan of soldiers which could create a major impact on post-retirement behaviour.

However, as per the statistics provided by analysing the status of retired military soldiers through a research study, Lamb (2003) states that the majority of retired military personnel have successfully integrated into civil society, but some found it extremely difficult to cope with the complications generated in post-retirement. Moreover, Lamb (2003) highlights that, even though 90% of the ex-military cadre is employed, but getting selected for employment was highly difficult to match the pre-retirement status of veterans due to the non-availability of required qualifications and connections in the domestic businesses. Furthermore, as emphasised by the Lamb, (2003) considerable number of veterans, 30% of the study sample, employed in security agencies related to the profession of security provides evidence revealing that the economic integration of these retired cadre has a significant tendency to move to the known area of profession due to various reasons such as non-availability of other skills or qualifications, comfort, and preference to attire and type of duty.

Military Training in the Profession of Arms

A carefully planned pre-retirement training programme is paramount for the successful integration of ex-military cadres into civil society. Thus, as argued by Verma & Al-Imran (2020), military training received during

initial embarkation training and subsequent military training merely focuses on achieving the intended goals of the nation through military actions along with professionalism in arms and the understanding of the art of war. Hence, Verma & Al-Imran (2020) further elaborated that military personnel are enlisted to the respective armed services during their young adult stage of life and spend most significant tenure under strict disciplines, but the compulsion of leaving the service during middle age would be an ill-match of transformation to the civil society where the life highly depended on the sustainability and the survivability of their families under the societal cohesion (Verma & Al-Imran, 2020).

Systematical administration and strict disciplines are the fundamentals of military organizations that have a unique governance mechanism that provides precedence to preserve the strategic national objectives through means of military actions under a pristine environment (Laksmana, 2019). Further, as emphasised by the SL Army (2023), the motherland's sovereignty and territorial integrity are protected to dissuade threats against the nation where, if deterrence provided by the SL Army is ineffective, it must prevail in the continuous battle to restore order and peace. Thereby, military combatants are trained to unconditionally deter, deny, and destroy the enemy or potential adversaries in any circumstances. Accordingly, physical preparedness is a fundamental element of continuous military training where soldiers endure rigorous physical activities such as endurance training, strength building, and agility exercises to cater to the demands of combat while boosting cognitive status to act bravely in challenging circumstances (L. K. M. Taylor et al., 2008). Furthermore, as argued by the Friedl (2012) extensive training received by soldiers on numerous tactical skills developments, countless training programmes on weapons handling, and training on survival

under extreme conditions have augmented their competence level to accept the calculated risks in action (Friedl, 2012). Therefore, understanding the possession of skills required to handle the diversified challenges, soldiers bravely face danger and actively engage in life-threatening situations with a higher degree of confidence (L. K. M. Taylor et al., 2008).

According to the argument of Driskell et al., (2001), military training capitalises on the necessity of teamwork and comradeship among soldiers through group exercises, carefully planned activities to share hardships, and tasks to achieve collaborative problem-solving skills. Thereby, soldiers rely upon team members for both support and protection which ultimately creates an intellect of cohesiveness and mutual trust. Therefore, the camaraderie among the teammates enhances cohesive willingness to accept various risks by soldiers in anticipating the backing of peers (Driskell et al., 2001). Thus, the inter-dependency created among the military cadre on weapons, rations, and equipment necessary to conduct operations successfully during long-distance deployments has the effect of dealing with extremely difficult circumstances based on trust and coordination amongst each other (Lamb, 2003). Moreover, as emphasised by the Lamb (2003) specialised military cadres have extreme dependency and cohesiveness among their peers to conduct special or covert operations but the absence of such trustworthiness in the post-retirement augments the dissatisfaction.

Therefore, as argued by the Taylor (2013) criminals have a greater advantage of exploiting soldiers' valuable skill of combat proficiency and the skills developed in tactical planning to conduct various illegal activities and organized crimes by understanding the level of expertise leading to the attainment of the illegal operation. In the military, soldiers learn to assess risks and implement measures to mitigate them. Further, as emphasised by

the Bachman et al., (2016) criminal activities require risk management and transition skills to avoid detection and successful accomplishment of the operations in adverse conditions where criminal organisations find it beneficial for recruiting veterans to anticipate potential threats, contingency planning, and execution of crimes with precision by eliminating the chances of failure under minimal risk exposure. Moreover, as elaborated by Shaw (2013) extensive training provided in the military on various weapons, explosives and tactics would target criminal organisations to exploit veterans who are in a vulnerable state to engage in violent crimes, such as different armed robberies, gang fights, and domination amongst drug trafficking networks. Therefore, it is vital to recognise that ability of veterans in the profession of arms makes them vulnerable to violent criminal activities in the general society which requires successful military-to-civil transformation for successful management of sociocultural issues (Mugera, 2019).

Depreciation of Psychological Status on Post-Retirement of Veterans

Members of the tri-forces are retiring from the service during their middle age where both mental and physical health have deteriorated to a significant level during the occasion of discharge. As argued by Elbogen et al., (2014) many ex-military personnel are suffering from different levels of psychological issues including Post-Traumatic Stress Disorder (PTSD) due to the depression and anxiety generated as a consequence of exposure to violence during their service. Further, it was elaborated that PTSD conditions could lead to impaired decision-making by conducting destructive actions or involving in criminal activities (Elbogen et al., 2014). Moreover, as emphasised by the King et al., (2006) lack of social relationships during the long-term absence from society due to various service employment could cause a loss of social support

networks for successful reintegration. Hence, the absence of relative camaraderie and a sense of belongingness by the veteran to society would further enhance the issues of reintegrating into society which may further augment feelings of social isolation, alienation, and loneliness (King et al., 2006).

Supposedly, veterans transition methodology from military action to civilian life was studied during the Iraqi deployment of the United States (US) troops by Adler et al., (2009) where it was found that veterans undergo significant life changes and face numerous challenges such as finding suitable employment, readjusting to the new lifestyle without the used environment, and re-establishing the missed family roles. Accordingly, it was highlighted that these new challenges caused stress and anxiety to veterans by exacerbating existing psychological issues due to PTSD or triggering new mental issues (Adler et al., 2009). Further, as argued by the Kim et al., (2010) that the stigma of ex-military personnel on getting sufficient psychological treatments connected with inherent barriers such as long queues for treatment access, absence of specialised care for veterans, and geographical constraints have curtailed veterans from getting sufficient mental treatments (Kim et al., 2010).

Corollary, growing psychological issues could enhance the distancing of strained relationships. Accordingly, a study of growing family issues of war veterans by Sayers et al., (2009) found that veterans are withdrawing from social interactions more often following untreated mental stress and anxiety during the post-retirement leading to social isolation and worsened mental health conditions. Further, it was found that the worsening of mental health has caused damaged marital bonds, the creation of family conflicts, and difficulties engaging with the community to form relationships (Sayers et al., 2009). Consequently, as emphasised by Boscarino (2004) untreated

psychological issues of war veterans could lead to severe deterioration of their physical health such as chronic pains, sleeping disorders, and cardiovascular issues worsening the complete well-being of the individual. Accordingly, loss of benefits in post-retirement has been identified as another major traumatic condition of retired military personnel. As stressed by Verma and Al-Imran (2020) lack of medical facilities received by former service members who do not reside close to military hospitals have less attention on psychological health issues.

Ex-Military Unemployment and Financial Constraints

Generally, ex-military cadres possess extremely specialised combat skills that have greater potential in dealing with combat environments during the military context but the same would not easily be transformed into potential skills to cater to the demands of domestic job markets (Bahtic et al., 2008). Hence as argued by Stone & Stone (2015), stigma and the misconception generated in civil society to fear that veterans would act aggressively on civilians due to various mental or social issues due to mis-adaptation to the civilian workplace cultures has further limited job opportunities while creating additional barriers for employment.

Supposedly, retired military veterans have major dissatisfaction due to unemployment and its subsequent effects in financial recession and psychological disorientation (McGuffin et al., 2021). Even if they are useful, the abilities obtained during military duty might not always be readily applicable to civilian employment (McGuffin et al., 2021). Consequently, the negative effect of lack of experience and expertise in the domestic fields would provide precedence for civilians rather than the veterans during initial job opportunities where the same status level civilian would possess a significant quality of experience compared to the veterans

(Stone & Stone, 2015). Further, as highlighted by Blackburn (2016) the deficiency of experience in civilian jobs and the conversion of military qualifications to the civilian job market could worsen and exacerbate the challenging issue of finding a job that matches veterans' talents and skills.

Besides, as emphasised by Teachman (2011) deficiency in opportunities in the labour market would cause veterans to be inducted into low-paying, temporary, or part-time jobs which are not sufficient to cater to the financial requirements of their families. Moreover, Teachman (2011) states that both unemployment and underemployment would lead to significant financial constraints where veterans could struggle for scarcity of resources and to acquire essential needs such as housing, medicine, and education. Accordingly, as specified by the Widome et al., (2015) retired military cadres pose significant amounts of loans, mortgages, and debt which reduces their income to a certain extent while the reduction of active pay to the pension would affect the financial status of the domestic life.

Further, lack of financial literacy is also considered as a major issue among the ex-military cadre where the deficiency of non-cash benefits would cost them immense money (Shipherd et al., 2005). Thus, it is required to underscore that financial constraints coupled with a deficiency of pension and the reduction of non-cash benefits along with the non-availability of stable income would cause veterans to suffer from vulnerability to financial instability. Thus, extreme alcohol and drug addiction of veterans could worsen the financial stability that could occur as a result of social alienation, stress, and mismanagement of psychological issues (Bahtic et al., 2008). Therefore, all relevant stakeholders of the military have a strong propensity to view this problem that needs to be fixed.

Sociocultural Effect

Retirement is a significant milestone for a military veteran who often enjoys the initial stage of pleasing reunions with beloved relatives. However, Muger (2019) states that feelings of contentment of reunion would eventually fade away due to encountering numerous difficulties by the ex-military person in the long term. Further, as argued by the Faires et al., (1998), family reunification of veterans would be required on role transitions of both ends of veteran and the family but in the view of veterans, unacceptable family behavioural problems and rising inconsistent expectations of the family are major root causes for issues. Besides, ex-military personnel are highly depressed when numerous problems arise in the financial aspect which creates constraints on disruptions to routines (Faires et al., 1998). Hence, PTSD and the financial constraints would worsen the issue by growing the depression state, while creating an antagonistic behaviour and addiction to alcohol and drugs (Lamb, 2003).

Domestic violence behaviour including Intimate Partner Violence (IPV) and child assault of ex-military households could increase due to mental health issues. Following the risk factors analysis research conducted by Taft et al., (2005) the heightened level of aggression and accumulated frustration connected with societal revenge attitudes and untreated psychological issues of veterans could lead to domestic violence status. Accordingly, this aggressive behaviour of ex-military personnel risks the physical and emotional well-being of family members but also spreads a cycle of violence which has long-lasting effects on generations through children. During a research study conducted by Hogle (2013), it was exposed that the rate of IPV is reasonably high in veterans' circumstances than in general society. Further, general reporting of child assault has alarmingly risen due to nonadherence to likely behavioural patterns and disrespecting parents by children of veterans (Hogle, 2013).

On the other hand, as emphasised by Shaw (2013), these psychological degradations could result in societal revenge tendencies that might exhibit anti-social stigma of revengeful attitudes and behaviours, such as distancing from social relations, constant exhibiting of hostility towards the community, or involvement in destructive actions against society. Moreover, as highlighted by Boscarino (2004), growing anger and frustration of ex-military could be transferred into aggressive or criminal behaviour, including active participation in violence, drug trafficking, and attraction to organised crimes. Further, it was argued that criminal activities could be staged to facilitate the psychological status of betrayal and social anger by the ex-military cadre to express their revengeful behaviour (Boscarino, 2004).

METHODOLOGY

The research problem is how to integrate the mass ex-military cadres of tri-forces from 2027 onwards into society by reducing the negative sociocultural effect in order to safeguard social well-being and national security. This study entails the desk research methodology that used the exploratory analysis to understand the possible means and ways to integrate Sri Lanka Tri-Forces soldiers into civil society during post-retirement without creating sociocultural implications. The author used exploratory analysis of empirical data to recognise employment issues, and possible financial constraints, and understand the sociocultural conflicts experienced by the ex-military cadre during the post-retirement period.

Further, the exploratory analysis conducted by this research includes the logical collection of relevant data, reviews, and synthesizes of available empirical data and literature. Accordingly, a considerable number of academic journals, published government

and non-government reports, scholarly books, newspaper articles, and online databases were utilised in gathering data to conduct the research study. Furthermore, peer-reviewed articles published by various countries were extensively utilised to identify the phenomena of post-retirement issues of veterans. Accordingly, searching for scholarly work was conducted in various academic databases, both government and non-government official websites, and public media to collect relevant documents.

Thereby, collected documents were thoroughly analysed to identify the relevance to the research problem and to identify the credibility of information where empirical data with significant and reliable data were used during the study. After that, key information and findings, analysis, and discussion of the empirical data were analysed to identify specific patterns, relative findings, derived conclusions, suggestions, and recommendations emphasised to aid veteran employment and financial constraints, and social conflicts. Finally, thematic analysis was used to analyse and discuss the research data during the analysis part of the existing knowledge which categorised the information into specific themes related to the research problem. Accordingly, employment challenges, financial constraints, and sociocultural effects were considered as the main topics of the analysis. Accordingly, this paper provides an eye-opener for the multi-disciplinary scholars and research and development units of the government and non-government organisation to cover the lacunas highlighted in the veterans' post-retirement issues.

ANALYSIS AND DISCUSSION

This analysis delves into the subject by conducting an in-depth analysis and discussion of the findings derived from the research paper. Accordingly, the primary focus is to recognise the multifaceted challenges faced by the ex-

military cadre during the post-retirement period in transitioning from military to civilian life. Therefore, the major concern was made to discuss veterans' employment instability and financial instability, social integration consequences, and victimisation to illegal or criminal activities. Thus, these are deeply interconnected challenges that create complexities in veterans' overall well-being during the post-retirement period and affect the reintegration process into society.

Pre-retirement Training Programmes of Tri-Forces

According to the SL Army guidelines and the training doctrine, pre-retirement training is offered to military personnel to successfully integrate into civil society during post-retirement. Simultaneously, the Sri Lanka Navy and Air Force also provide a pre-retirement training package for personnel who are leaving the service upon completion of their service period. Nonetheless, military personnel, either who have engaged in misconduct or are considered to be provided with unsatisfactory service are not being considered for the pre-retirement training. However, analysis of the training programmes available in the tri-forces during the present context creates uncertainties about the feasibility of pre-retirement training programmes that could transfer the skills of the infantry and ground soldiers to successfully enter into the employment of society. The Sri Lankan Navy's attempt to provide sea qualification certification is a greater step taken to match the certification of qualification issue of the employment market.

The effectiveness of the pre-retirement training programmes is to be reincarnation after a thorough research study to match the future requirements of the job market. Further, the non-availability of psychological management is also highlighted during the training programme analysis. Besides,

effective integration of the retirement cadres into society necessitates effective management of psychological well-being, employment, and profound transition programmes tactics (McNally et al., 2003). However, pre-retirement training programmes necessitate incorporating necessary recognised grading and certification. Further, affiliations of the training programmes with government organisations, universities, technical colleges, and private institutions are necessary to acquire grading and certification. Accordingly, initiatives must be taken to reincarnation of physical and mental well-being of the retiring military cadres who have a competitive advantage in skilled training and certification in diversified trades and occupations, preserving that retired personnel could compete in the general job market in both local and international areas (Gibert, 1999).

Veterans' Employment Instability and Financial Instability

It was revealed through the exploratory analysis of the literature, that the lack of transferable skills posed by the military cadre hindered them from entering civilian jobs which required specific qualifications and skills matched to the domestic environment. The same matter was emphasised by the literature per descriptive analysis conducted by scholars that this mismatch results in prolonged underemployment and unemployment that could generate a stressful situation (Bahtic et al., 2008; Clemens & Milsom, 2008). For instance, a combat paratrooper would have an immense number of combat and parachute jumping experience but has a very little effectiveness in matching his skills to find a job in the domestic life other than the very limited adventure sports field in a highly competitive environment.

However, the transferability of skills is rather easier with the technical staff of the military rather than the infantry where the private sector is more willing to recruit

personnel with more disciplined environments such as militaries but the non-availability of the required transferable skills and qualifications affect the working performance of the employee (Bahtic et al., 2008). Therefore, private companies are highly vigilant on previous working experience in the specific field of expertise during the interviewing process, but a considerable number of personnel hesitate to achieve the desired goals during the initial stage of enlistment (Stone & Stone, 2015). Nonetheless, private sector specialists have emphasised that the senior officers and very junior officers are performing at a better level rather than the middle-level officers during post-retirement employment (Stone & Stone, 2015). Hence, the performance of the other ranks during the post-retirement is average in nature, where there are only a few who are performing at the exemplary level, but equally have the failed rate of employees too (Clemens & Milsom, 2008; Stone & Stone, 2015). However, security businesses have highlighted that the retired other ranks are successfully conducting duties in the initial stage, but some are struggling to manage their temper with the civilian society and the administration staff which resulted in losing their jobs (Mugera, 2019).

Further, emphasis is placed on the hiring of ex-senior military officers for they are highly committed to their job and possess significant managerial skills in line with their qualifications while having a greater potential for maturity in decision-making (Clemens & Milsom, 2008; Stone & Stone, 2015). Accordingly, it was understood that the higher level of managerial and decision-making skills posed by the senior ex-military officers poses a significant advantage in finding jobs in both government and non-government sectors. Simultaneously, younger officers are highly motivated, enthusiastic, and highly flexible to adjust to the company culture which makes the organization benefit in recruiting (Stone & Stone, 2015). It is understood that the young officers who left

the service for numerous reasons could adapt to the organisation culture and further develop their skills in the field of their employment. Therefore, younger officers who have been nurtured in a disciplined environment would have better opportunities to get jobs compared to middle-level officers due to their adaptability and flexibility.

Accordingly, it was identified, that the vacuum of knowledge and experience in the middle-level officers who are deployed in various duty roles that do not have a direct bearing on their paper qualifications. Moreover, as emphasised by Hachey et al., (2016), middle-level officers do not always possess the required skills, that may be directly transformed into civilian job requirements like senior officers, who have extensive management and leadership skills, or younger officers, who could be easily more adaptable and trainable. Further, this effect would result in both unemployment or underemployment making the officers suffer from underpaying, lack of status and reputation or dignity affection. Militaries have conical or pyramid-type structures of command and control which require a considerable number of officers to leave the service without making the structure jammed due to the stagnation of the bulk of officers for limited senior opportunities. However, non-availability of sufficient qualifications or skills to match the job vacancies in the domestic job market would result in unnecessary stagnation for promotions, facilities, and appointments of the officer cadre which ultimately affects the organic behaviour of the organisation. As a result, middle-level officers who are both qualified and skilled would leave the service due to the inorganic effect of the organisation where they are being provided with opportunities in the private sector. Moreover, middle-level officers could be categorised as overqualified for certain entry-level positions that are typically offered to younger level generations, but their previous rank and experience might have an effect of

demanding higher salary expectations and a job role with greater responsibility that do not coincide with the demand of the job market (Brynin, 2002).

Nevertheless, infantry or ground-based soldiers of tri-forces generally possess qualifications and skills that are required in military contexts, such as experience in field operations, skills in combat tactics, and weapon handling which are not directly transferable to civilian job requirements except the private security sector (Clemens & Milsom, 2008). Further, as highlighted by the Griffith (2011) majority of infantry soldiers lack formal qualifications and skilled certifications that are recognised by civilian employers where the absence of formal educational credentials creates a significant barrier for hiring. Accordingly, the lack of job opportunities available in the civilian sector forced other ranks to move towards the job opportunities available in the private or limited government security job sector. Even though skills and experiences acquired in military service by the infantryman could be directly transferred as assets in security roles, the reality is that veterans find themselves allocated with ordinary duties that do not match their capabilities or provide sufficient payroll. Therefore, despite the skills posed by the veterans, the private security sector offers low wages to their employees along with the other civilian employees in the same payroll, which eventually creates a vast disparity between their skills and compensation, leading to cause dissatisfaction and financial strain.

Supposedly, the non-availability of recognition for military credentials in the civilian job market is also a noteworthy barrier, where even though veterans possess significant expertise and experience in fields such as logistics, different fields of engineering, and other technical or medical fields, civilian employers generally anticipate to absorb employees with formal certifications or degrees

which veterans may not possess (Asch et al., 2009). However, tri-forces are attempting to mitigate this issue by cooperating their qualifications with various technical training institutions of particular fields. Hence, the non-availability of diplomas & degree graduations in comparison to the specific fields coupled with the deficiency of ideal job expertise would cause underemployment of the technical cadre during the initial employment.

As emphasised through the literature, both unemployment and underemployment are causes of financial instability and financial constraints of veterans which augment dissatisfaction and psychological stress. Further, the mass retiring of tri-force members would worsen the existing unemployment rate as shown in figure 1 and figure 2. Furthermore, the available employment opportunities would also dilute among the veterans where the underemployment would rise significantly creating financial constraints among the veterans causing a significant social issue for the country. Inevitably, this underemployment and unemployment would mostly affect the middle-level officers and the other ranks who are from the ground component or the infantry units who were recruited to cater to the combat requirements of militaries. Therefore, the growth of employment opportunities with less skill transference must be paramount in the future.

Social Integration Consequences

Social integration of a veteran is a crucial requirement of a nation, that is considered a complicated process involving the re-establishment of social connections, successfully integrating into new societies and communities, and transforming to adapt the societal norms and values believed by the civilian clusters. Nevertheless, the majority of veterans have undergone difficulties during the transition period, where a minority have failed utterly

during the reintegration process by creating numerous negative sociocultural effects against the community (Hachey et al., 2016). Therefore, this section emphasises the consequences the non-integration of veterans would cause significant issues in family dynamics, and community structure and analyses the broader societal impacts as a nation.

Family relationships are the closest and most immediate relationships that could be impacted during the social integration process of veterans. Nevertheless, those who are returning home with emotional and psychological scars would have an impact on their family relationship during the long stay with the family members during post-retirement (Sayers et al., 2009). Even though figure most recent studies in the US have shown that PTSD is quite high among veterans, the scars of the EELAM war have faded away in the Sri Lankan scenario due to the 15 years of non-violence, but remittance of special cases could be possible in the isolations. Besides, as emphasised by Karney & Crown (2007) during a research study conducted for the Research and Development Unit of the US military, marital relationships are highly vulnerable during the initial stage of social reintegration of veterans where understanding the behaviour of each other would find rather struggling as both partners were used to share and act individually during isolation. Moreover, the transition stress associated with financial instability, and further exacerbating marital tensions could result in separation or divorce, which has deep emotional and financial implications for both parties as well as affect the children in long-term.

Hence, a critical issue arises is parenting challenges or child assault during the transition period (Griffith, 2011). The combined stress faced during the transition period such as employment issues, reintegration difficulty, and social alienation could significantly influence

their parenting quality and sometimes lead to destructive activities such as child assault. Moreover, overcontrol of children may also lead to confrontations between children and the veteran, where opening up for dislike behaviours and patterns of children which they used to practice due to the absence of their parents. However, child assault and trauma on children would have a cycling effect and long-term implications. Besides, feelings of isolation and alienation are common during the transition period from military to civilian where the absence of camaraderie and inter-dependent teamwork of the military are replaced by a more individualized civilian environment for veterans. Therefore, feelings of loneliness make it difficult for the veterans to actively engage in community-based social activities and create new experiences due to the long-term absence of societal requirements (Karney & Crown, 2007). The understanding of civil society is also minimal in recognising the stressful situations that are faced by the veterans which are required to establish connections between the veterans and the society (Teachman, 2011). Further, general stigma and beliefs of violent behaviour of veterans are other causes to create barriers to establishing social relationships.

Literature has provided empirical evidence that social isolation and alienation could lead to alcohol, drug, and substance addiction in veterans. Moreover, the same addiction could worsen the financial instability by putting the family in danger. Hence, as discussed in the literature, substantial loss of salary due to the difference between active pay and pension, makes veterans to suffer from financial constraints and unemployment or underemployment that would worsen their stress. Accordingly, the possibility of addiction is quite possible for veterans which could affect the family structure.

Victimization and Attraction to Criminal and Illegal Activities

The financial constraints posed by veterans would affect post-retirement stability where it is a primary factor attracting ex-military personnel to search for new avenues of income generation. Therefore, the unavailability of proper financial insecurity and instability would create significant risk against these individuals being drawn towards illegal and criminal activities where their skills of weapons training assist them to become potential key members of criminal gangs. Additionally, the acceptance of calculated risks and the disciplined nature of adherence make veterans attractive recruits for criminal organizations and gangs that value potential skills in planning, execution, and loyalty (Stone & Stone, 2015).

Further, this economic strain could eventually push some veterans to accept jobs in substantially high-risk employment by exposing themselves to eminent danger. As a result, victimisation for extreme threat scenarios is also possible during this situation to support their family background. Accordingly, the potential of the soldier in combat would be harnessed by the smugglers through various means. For instance, smuggling Sri Lankan ex-military cadre into the Ukraine-Russia war could be identified as an example of such victimisation, where Sri Lankan veterans were smuggled to fight a war between two states as mercenaries/ paid soldiers or any other form.

According to the literature and the analysis, social isolation and alienation would cause addiction to alcohol, drugs, and other substances. Not only that substance addiction affects financial stability, but also it creates social isolation from family and society as emphasised by the literature. As a result of, the non-availability of adequate social support networks in the sphere of influence of veterans' lifestyle, veterans would experience feelings of

disenfranchisement and marginalisation from society. Accordingly, the loss of camaraderie and the familiar military lifestyle which always respected teamwork and cohesiveness, would generate a psychological state to search for belongingness by the veterans. According to Castro & Kintzle (2014) the 'search for belongingness' is a highly exploited factor of criminal gangs to recruit new members to conduct illegal activities and to expand their network.

Veterans who struggle with unsuccessful societal integration would lead to frustration and a sense of exclusion from society. Accordingly, this psychological status creates an appealing stage to ascertain control and gain economic benefits from conducting illegal activities. Further, the cheap recognition and the socially frightened adherence gained by popular criminals would be favoured by the people with social isolation to gain inorganic control over society (Elbogen et al., 2014). Therefore, the tendency to be attracted towards criminal activities, in the form of front liners, target shooters, and planning experts, is rising among the veterans in the current scenario.

Requirement of a National Strategy

The majority of military personnel have been successfully integrated into the society whereas only a few personnel have faced consequences of non-integration into civilian life in the Sri Lankan context. Therefore, the impact of the few was not highlighted in comparison to various other major factors to be considered in the Sri Lankan context. However, in future situations, with mass retiring of military personnel, the majority, would face the non-expansion of the employment opportunities, rising crime rate, and deteriorated economic status. Therefore, being a developing country, the non-existence of a successful integration mechanism would cause serious socioeconomic complications in the society. Further, existing

recession and higher inflation would augment the financial constraints of veterans that would directly have an impact on the social well-being of the community.

Thereby, a national strategy is to be implemented by the Government of Sri Lanka, incorporating both public and private partnerships to develop employment opportunities that are easy to transfer skills of ex-military cadres. Accordingly, the inclusion of veterans in the economy would successfully enhance the economy in both micro and macro levels. For instance, as per the thesis published by Lin (2021) 'Avant Garde Security Services' business initiatives to create new employment strategies during a business crisis of sea pirates could be taken as an example, which has created many opportunities for military veterans to be employed in less skill-transferable jobs. In both ways, the business has provided significant financial income to the veterans, as well as gained substantial foreign income as a nation.

Nevertheless, various innovative models and different programmes have been adapted globally for pre-retirement training mechanisms through affiliation of civil-military partnership, but it is highly required to identify a tailor-made model for the particular military and the type of force specialty (Blackburn, 2016). Further, developing sustainable employment opportunities is crucial to mitigate these risks and ensure the successful transition and integration of veterans (Shepherd et al., 2021). Accordingly, Sri Lankan authorities must conduct an in-depth analysis and develop a model of reintegrating mass post-retirement cadres into the national economy to harness the potential and mitigate the negative sociocultural effects.

CONCLUSION

The forthcoming wave of military retirements from the Sri Lankan tri-forces necessitates urgent development of strategies to integrate ex-military cadres into civilian employment. The termination of dedicated military service symbolises a reincarnation for soldiers where it creates a remarkable effort in transitioning from a standard structured and extremely stressed environment to a general civilian. Sri Lanka is a nation that has experienced considerable history of prolonged conflicts. Therefore, it especially requires a successful ex-military reintegration process to ensure that war veterans are smoothly reintegrating into the general community due to social betterment and the preservation of national security. Further, effective reintegration of ex-military cadre is vital for leveraging the extremely violent weapon skills of ex-service members to prevent possible social unrest and to mitigate potential security risks against the community. However, the issue of deserters, cashiered and AWOL personnel is to be administrated and researched separately by scholars to find solutions to mitigate sociocultural issues.

Besides, veterans' social integration is a multifaceted process that has to deal with difficulties such as the management of psychological health issues, socioeconomic shocks, and the mitigation of involvement in criminal or illegal activities. Holistically, the individual effects of veterans would invariably create broader societal impacts, including family dynamics to community cohesion and societal stability. Additionally, financial instability created through unemployment and underemployment would result in augmenting the socioeconomic pressures contributing to the risk of involving in criminal activities. Noteworthy, to identify the skills acquired during military service have potential validity in combat, but the same could be misappropriated

for criminal activities. Thus, the sense of social isolation and deficiency of relative camaraderie can drive veterans towards exploiting attempts of harmful peer groups that would result in adverse effects of joining criminal gangs.

Therefore, multi-disciplinary scholars and the military have to research the forthcoming crisis of mass retirement of the Sri Lankan military cadre as a matter of importance to develop successful strategies to reduce and mitigate the sociocultural effect. Accordingly, necessary strategic-level strategies, policies, support mechanisms, and legislative frameworks have to be implemented to reduce the sociocultural shock. Finally, the emphasis on future strategies must consist of mechanisms to harness the skill potential of veterans to be involved in the national economy and generate considerable income to retain financial stability that would preserve the dignity of the veteran in the face of family and society.

RECOMMENDATIONS

Specific Recommendation

Increase the number of job opportunities in collaboration with the private sector to create more investments in the areas where veterans' skills and qualifications are easily matched. Providing subsidies and tax breaks could encourage the private sector to create new businesses in the field.

General Recommendations

It is required to develop a mechanism to encourage multi-disciplinary scholars to research the feasibility of integrating mass retirement of military personnel and their social integration in due course. Accordingly, necessary steps are to be taken to mitigate the sociocultural implications in future.

It is necessary to establish employment assistance programmes among tri-forces to support the retiring personnel in finding employment opportunities. Further, it is necessary to develop and promote skills and qualifications during the pre-retirement training to match the job market available outside by conducting sufficient research and development.

Commencement of providing psychological health screening, support, and treatment is necessary for tri-force personnel during the final year of retirement to identify and manage the psychological shock of the retirement change. Further, psychological treatment support is to be extended through military or government hospitals until successful social integration.

It is necessary to develop a planned media strategy to create social integration among veterans and society. Utilisation of cinema, drama, teledrama, and public media is necessary to develop the psychological mentorship of society to build the relationship between returning veterans with their families and societies.

Providing an appointment to the closest installation of the house of the military person during the final years of service. This would allow him to mingle with society and the family more often which would assist him in the mitigation of retirement psychological shock.

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THE INFLUENZA PANDEMIC OF 1918-1919: THE OUTBREAK IN CEYLON (SRI LANKA) AND ITS IMPACTS

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ABSTRACT

Historical evidences reveal that natural disasters have impacted to the human activities from the beginning of their civilisations. According to archaeological evidences the oldest disaster in the form of a disease was reported in China. The Black Death of Europe during 1346-1356 was a devastative pandemic that greatly impacted the lives of Europeans. Apart from these two outbreaks, the Spanish Flu in 1918 and 1919 was considered to be pandemics which spread throughout the world. The influenza appeared first in United States of America in March 1918 and spread to various parts of Europe in October. It has appeared in June 1918 in Colombo and spread to Kaluthara and Matara districts of Ceylon in November and in October to other areas in 1919. This research discusses the outbreak and spread of epidemics in Ceylon and the measures taken by the government. The main objective of this research is to reveal the impacts on human activities because of the pandemic. Primary sources considered were administration reports,

census reports, Legislative Council reports, and other secondary sources have been mainly used to collect data. Bad health practices, the customs of the people and the climate caused the situation worsen and in the early period of the pandemic were more challenging. The historical analysis of outbreak of pandemic of 1918-1919 in Ceylon is rare; this research will contribute to fill the gap.

KEYWORDS: *Ceylon, Challenges, Impacts, Influenza Pandemic, Outbreak, Pandemics.*

INTRODUCTION

Historical evidences reveal that natural disasters were impacted to the human activities from the beginning of their civilisations. Unusual diseases such as epidemics have cost many lives due to unavailability of treatment and medicine. Pandemics have spread in various places in the world; while some spread in a small area some impacted the world as a whole. According to archaeological evidences, the oldest incident reported a disaster in the form of a disease in

the world is reported from China. The Black Death of Europe during 1346-1356 was a devastating pandemic that greatly impacted the lives of Europeans (Benedictow, 2021). Apart from these two outbreaks, the Spanish Flu outbreaks in 1918 and 1919 were considered to be pandemics which spread throughout the world (Chandra and Sarathchandra, 2014). The influenza appeared first in United State of America in March 1918 and spread to various parts of Europe in October. In India, it reached at its peak in Bombay in October and November in Bengal. It has appeared in June 1918 in Colombo and spread to Kaluthara and Matara districts of Ceylon in November and October and in fact, to other areas in 1919 (Ceylon Administration Reports, 1919). This article discusses the outbreak and spread of epidemics in Ceylon, the challenges faced, the measures carried out by the government and the impacts on human activities. The challenges faced by the government and the people during the outbreak of pandemic is the main problem. Administration reports, census reports, Legislative Council reports, and other secondary sources have been mainly used to collect data. Bad health practices, the customs of the people and the climate caused the situation worsen and in the early period of the pandemic was more challenging for the national health security.

LITERATURE REVIEW

There are considerable academic writings on the influenza pandemic that occurred in 1918-1919 in globally in historical perspective focusing impacts of world and specific geographical spaces. Although the academic writings of the British colonial period in Ceylon focus on the establishment of British power, the expansion of their administrative apparatus, policy formulation, social and economic changes, constitutional evolution and health measures, less attention is paid regarding the pandemic which spread during

1918-1919 its impact on Ceylon. Two main academic works identified available that are directly relevant to the study are as follows;

“The Influenza Pandemic of 1918-1919 in Sri Lanka: Its Demographic Cost, Timing and Propagation” by Siddharth Chandra and Dilshani Srathchandra mainly measures the mortality at the district level during 1918-1919 due to the influenza pandemic in Sri Lanka (Chandra and Sarathchandra, 2014). C. Longford and P. Story discuss the course and impact of the outbreak in Sri Lanka in “Influenza in Sri Lanka, 1918-1919: Impact of a new Disease in a Pre-modern Third World Setting.” They especially explain how influenza entered the island and spread throughout the country (Langford and Storey, 1992). Although these two articles directly focus on the situation of Ceylon during the influenza pandemic of 1918-1919, they do not discuss how involved the British colonial government to solving the problem and, measuring the socioeconomic of Ceylon due to the pandemic, this article has focused.

METHODOLOGY

The research designed for this study utilises historical approach to investigate the historical condition and socio-economic impacts of Ceylon during the period that outbreak of the influenza pandemic of 1918-1919. To gather data, the researcher employed primary sources mainly; Administration Reports, Census Reports and Hansard issued by the British Government and the secondary sources which focused the respective area.

DISCUSSION AND RESULTS

Humans have faced many natural disasters from early stages of civilisation to the present. Unusual diseases in the form of epidemics have caused death and devastation.

According to archaeological evidences, the oldest incident was reported from China. 97 human bodies have been found stuffed into a small, 5000 year-old house in a prehistoric village in North-Eastern China (Jarus, 2015). The bodies of young adults and middle-aged adults were packed together in the house. It is the largest and the best-preserved prehistoric settlement site called 'Hamin Mangh'. An anthropological team at the Jilin University of China has tried to determine what happened to these people. They found that the group of people died as a result of a prehistoric disaster (Ibid). Also, they have found that half of the individuals were between 19 and 35 years of age; no older adults were found (Zhou and others, 2022). This possibly relates to outbreak of an acute infectious disease. If it was a disease, it killed off people quickly. But, scientist did not speculate as to what disease it may have been exactly. This is the oldest incident that reported a disaster related to a disease in the world.

A considerable number of cases has been revealed related to pandemics in the past, but the Black-Death (1346-1353) was the other most devastating epidemic that travelled from Asia to Europe. According to some estimates, it has wiped out over half of the population in Europe. Also, this plague impacted changes to the history of Europe as well. Black-Death decreased the labour force of Europe and it marked the end of the feudal system of the medieval period in Europe. Then they turned to engage in a new economic system based on commerce. Besides, the lack of cheap labour caused new technical experiments and innovations.

Spanish Flu or the influenza pandemic was the most devastating pandemic reported in the past. It occurred between 1918 and 1919. According to estimates, 50 million people were victims of the Spanish Flu (Chandra and Sarathchandra, 2014). The largest number of deaths reported in the United States of America

was 6, 75,000. Despite the name Spanish-Flu, certainly, the disease did not start in Spain. Spain was a neutral nation during the war and did not enforce strict censorship of its press, which could therefore freely publish early accounts of the illness. As a result, people falsely believed that the illness was specific to Spain, and the name Spanish Flu stuck.

Epidemiologists still dispute the exact origin of the virus, but there is some consensus mentioning that it was the result of a genetic mutation that perhaps took place in China. The plague was first reported among the American soldiers. Scientists speculate that the pandemic was brought over by a bulk of Chinese labourers who came to Europe. Over-population and immigration contributed to the spread of the virus throughout the world in 1918. In the summer vacation in 1918, soldiers involved in the First World War went back to their home countries, and the virus spread in those towns and villages.

The influenza pandemic was seen in three waves. "The first wave was in the spring-summer of 1918 and was apparently fairly mild; the second was in autumn-winter of 1918 and very far from mild; showing a terrible propensity to lead on to pneumonic complications and death... the third wave, where there was one, tended to come in the early part of 1919, it involved the same serious form of the disease as the second wave but its overall damage was much less" (Langford and Storey, 1992).

The first wave of the influenza pandemic appeared in the United States in March of 1918 and spread during the next four month period throughout the world. According to Beveridge, the first wave of the pandemic may have begun in the United States or it may have begun in China (Ibid). According to Langford and Storey A.W. Crosby, that the first outbreaks of the above mentioned serious form of influenza occurred in the last week of August 1918 in France, in

Boston in the United States, and in Freetown in Sierra Leon (Ibid). The mortality rates of the second wave of the pandemic reached a peak in October 1918 in the United States, November reported the deaths in various parts of Europe and in November most of India, it reached a peak in Bombay in October and in November in Bengal. West Africa came to be the place that started the third wave of the influenza.

OUTBREAK IN CEYLON

Although Ceylon is an island, it could not avoid this outbreak because of global relations. According to evidence, the influenza pandemic entered the island from the main port of Colombo. The Principal Civil Medical Officer has mentioned this in his official report. The first case of influenza appeared in June of 1918 in Colombo, the capital city's main port, among harbor workers, and the disease spread from there (Ceylon Administration Reports, 1919). Langford and Storey point out that the influenza spread out in Sri Lanka from Colombo and some other points further north, possibly having arrived there from Colombo or possibly from elsewhere (Langford and Storey, 1992). Coastal districts in the north, north-east, and west and districts in the south-west near Colombo were affected by the disease and spread to districts in the south, finally it reached Batticaloa and spread throughout the island. According to the medical officer, the public health of Western Province was at an average level. However, in Colombo, the outbreak of influenza, however, was so sudden, and the disease spread so rapidly, that it occasioned much anxiety to the officers in charge of the district (Ceylon Administration Reports, 1918). The mortality rate of the Colombo district marked high in 1918 and 1919. The following figures show the mortality rate in the Colombo Municipality per mile due to fever and Influenza groups;

Year	Fever Group	Influenza Group
1911	2.6	5.2
1912	1.5	4.9
1913	1.2	4.5
1914	1.0	3.1
1915	1.0	2.9
1916	1.5	3.8
1917	1.1	3.1
1918	1.1	8.5
1919	1.5	7.3
1920	1.7	6.0

Figure 1: The Mortality Rate in the Colombo Municipality per mile due to Fever and Influenza Groups Source: Ceylon Administration Reports, 1920.

At first, the mortality rate from influenza group in Colombo Municipal reached its peak in 1918 due to prevailing influenza pandemic. The Commissioner of Census reporting on the public health in 1918 states that there was a sever epidemic of influenza throughout the district. The disease broke out quite suddenly and carried off a very large number of victims (Ceylon Administration Reports, 1918).

“The spread of the disease was rapid, and the gravity of the symptoms increased as the disease increased. By September and October, nearly every province and district in the island was affected. Notable features of the disease were the rapid onset of pneumonia in a large percentage of cases, most of the broncho-pneumonia type” (Ceylon Administration Reports, 1919).

Then the pandemic spread through Kalutara district between September and November 1918 and the mortality rate was high in places, especially among the Tamil labourers on some of the estates and in some of the coastal villages in the South of Kalutara, where there were many cases of the bronchial pneumonia type (Ceylon Administration Reports, 1918).

Turning to the Southern Province, in Matara district about half of the population contracted the influenza in October and November. There was a wide prevalence of influenza in Jaffna; the first occurred about the middle of August and appeared to be dying out towards the end of September. When in September it spread to every place in Jaffna. It came to be reported from Batticaloa, Trincomalee, Mannar, Mullattive, Kurunegala, Puttalam-Chilaw, Ratnapura, Kegalla, and Kandy in September 1918 (Ceylon Administration Reports, 1918) with a high number of patients.

Between September and November of 1918, a large number of persons was affected by the influenza pandemic in the Eastern province. Within two months, 1138 cases were reported in Batticaloa town. Trincomalee was also affected seriously by the influenza which lasted from the middle of September and 123 persons died at the end of 1918. Besides, Anuradhapura, Batticaloa, Chilaw, Kurunegala, Negombo, and Puttalam districts reached a peak number of mortality due to the pandemic in 1918. Only eight deaths were registered in Sri Lanka due to pneumonia and broncho-pneumonia in the early part of 1918 but, in September it reached 977 and it reached its peak by November 1918. The number of deaths registered was 8,253 to have caused by influenza and 6,082 deaths due to pneumonia or broncho-pneumonia (Ibid).

The first wave of the influenza pandemic continued during 1919 in Ceylon. In February, the number of cases reached its peak and which continued throughout the year. In the Western province, especially in Colombo, the pandemic spread during the early months of 1919. There was a fresh epidemic in the part of Raigam Korale in June and July. But it was a mild type and the mortality rate was low. The North-Central province was also heavily affected by the influenza in the early part of the year. The deaths for the first four

months were 4,028 as compared to 815 in the same period of 1918 (Ceylon Administration Reports, 1919). As mentioned above, there were a few cases reported in the other areas of the island excepting Anuradhapura, Kurunegala, Puttalam-Chilaw, Negambo, and Batticaloa. According to the statistical evidences, 161, 403, and 168, 323 were registered for births and deaths respectively in 1919. 84, 144 males and 84, 179 females have died (Ibid). According to the report of the Principal Civil Medical Officer and Inspector General of Hospitals the main reason for the high mortality was the influenza pandemic. Principally, the death rates in the districts of Kurunegala and Anuradhapura were 75.4 and 72.9 percent respectively. Batticaloa and Badulla also showed a high mortality rate during the year. Therefore, Anuradhapura, Kurunegala, Batticaloa, Puttalam, and Badulla were the main areas in 1919 of the influenza epidemic and the number of deaths registered due to influenza or pneumonia reached its peak in the first quarter of 1919. In 1919 remarkably, the reporting of the influenza cases decreased in the other districts than the previous year. Only a few cases were reported in the other areas compared with Kurunegala, Anuradhapura, Batticaloa, and Badulla districts.

Year	Births Rate per 1000	Crude Birth	Death	Crude Death Rate per 1000
1901	134252	37.5	98813	27.6
1902	141893	38.5	99680	27.5
1910	157554	39.0	110195	27.3
1911	156398	37.9	143380	34.8
1912	138303	33.2	134383	32.3
1913	162827	38.5	120008	28.4
1914	162177	37.9	136831	32.0
1915	160950	37.2	109818	25.4
1916	174930	39.9	120162	27.4
1917	183975	41.4	113389	25.5
1918	183384	41.0	149407	33.4
1919	161403	35.9	168323	37.5
1920	163719	36.5	132955	29.5

Figure 2: The Number of Birth and Death over the Period of 1910-1920 and Their Crude Rate
Source: Report on the Census of Ceylon, 1921.

The above table illustrates the number of births and deaths over the period of 1910-1920 and their crude rate per 1000. According to the report of the Commissioner of Census in 1918 and 1919 there was a severe epidemic of influenza in Sri Lanka which caused the death of large numbers of people. As the death rate in 1918 was high (33.4) and in 1919 the highest ever recorded in Ceylon (37.5), it was natural first to examine the rates for influenza which was known to have been ranging in those years. But, according to the Census report, it is difficult to trust the diagnoses of the causes of death, to know quite where to look for the effects of the pandemic. "An attempt has been made in the table to associate under the head of 'influenza group'¹ the census of death which are most likely to have been part of the pandemic but there is, in reality, little guarantee that much of the effects has been shown" (Report on the Census of Ceylon, 1921). The commissioner of the Census has reported that, "this index be multiplied by the mean population in 1918 and 1919, to find that the excess number of deaths

from the influenza group in 1918 and 1919 was approximately 57,000 in all say 32,300 in 1918 and 24,500 in 1919" (Ibid). In that report, there is a doubt about the figure of diagnoses. Malaria was also prevalent in some areas of Sri Lanka while the influenza occurred and the number of deaths from malaria and influenza may not have been identified clearly which might have affected the reported mortality rates as having changed unexpectedly.

Langford and Storey estimated that 50,000 patients have died approximately because of the influenza pandemic in Ceylon. In the Administrative Reports of 1919 and 1918, 22,814 and 19,102 deaths were reported respectively in the island because of influenza in the particular years. According to these figures, there are different views about the rate of mortality due to the influenza pandemic. But records reveal that the influenza pandemic negatively impacted society at large. There is a comparison of mortality figures as reported due to influenza pandemic in Australia, New Zealand and India with Sri Lanka in the Report of the Census of Ceylon, 1921. It states thus;

¹ Influenza group has divided into four main categories including influenza, acute bronchitis, broncho-pneumonia and pneumonia in the Report on the Census of Ceylon, 1921.

“the Year Books of Australia and New Zealand, for example, state that the total excess deaths from the influenza pandemic in 1918 and 1919 were, Australia (1918 and 1919) 14,528, or about 2.8 per mile of population; New Zealand (1918) 6000 or about 5.5 per mile” (Ibid). The figure of Ceylon was about 13 per mile, and be expected from the climatic conditions of Ceylon, the customs of the people, and their smaller powers of resistance to disease. But the figure of Ceylon might be better when compared with India. The influenza rate for 1918 and 1919 was 29.9 per mile for all India; for Bengal 8.5 for Burma 13.9, for Madras 16.7 and for other provinces varying figures up to 66.4 (Ibid).

The patients were reported as being affected by influenza in 1920 and 1921 also. Although the pandemic situation was continuing during the next couple of years, the numbers showed a substantial decrease as compared with the previous two years. 3,643 and 2,986 deaths were reported in 1920 and 1921 respectively in the island (Ceylon Administration Reports, 1921). The rate of mortality in 1921 was equivalent to 663 million persons and ranged from 1302 in Anuradhapura district to 117 in Chilaw. Only Galle and Jaffna districts recorded rates over 1000 viz 1054 and 1037 respectively (Ibid).

CHALLENGES, MEASURES TAKEN AND IMPACTS

According to medical reports of the Chief Medical Officer, the pandemic period was very challenging. Especially, the behaviour of the people increased the spread of the disease. Poor education, bad health habits and traditional rituals seriously impacted the spread of the disease and lead to create a bad environment in the country. Then, poor Sanitary facilities as well as overcrowding, poor ventilation and insufficient foods also caused the spread.

This was the first experience in Ceylon as a British colony, of facing a disease in which the world was affected. Therefore at the beginning, people did not, care about the situation seriously and their bad behaviours caused to spread the disease. “The disease being a new one, the villages did not for some time recognize how very infectious it was, crowding into infected houses to visit sick friends and relations. The disease thus spread like wildfire” (Ceylon Administration Reports, 1918). This incident was reported among the Tamil labourers in some of the estates and in some of the coastal villages in Kalutara South. Also, some people did not follow the advice given by Medical Officers. The prevalent idea too encouraged by most of the vedaralas, was that patients should be shut up and all fresh air exclude.” (Ibid). To avoid these situations the Medical Officers had to educate the people but the effort was wasted. “The dangers of the infection and the need for fresh air were sedulously preached by the District Medical officers and Sanitary Inspectors and through the headmen, but the disease had run its course through the village before many benefits could be derived from this education” (Ceylon Administration Reports, 1919).

The other challenge faced was that at the beginning of the pandemic the people did not trust Western Medicine. They went to Vedaralas to get treatment (Ceylon Administration Reports, 1918). These kinds of behaviour badly affected the spread of the pandemic among others and increased the mortality rate in the first wave of the pandemic situation in Ceylon. But, in the middle stage of the pandemic situation of the first wave, people trusted western treatments and a large number of patients got medicines from the government hospitals and dispensaries. Medical treatment was available for all who would have it as well, but according to the doctor's statement in Trincomalee, “owing to the combined effects of superstition, ignorance and bad example, a large

number of patients had hardly any treatment. About three-fourths of the numbers of patients who died had as their treatment starvation and imbibition of coriander water only” (Ceylon Administration Reports, 1918).

A dry cough, sneezing and pneumonia were the main features of the influenza pandemic. People may have believed that it is a normal fever condition. Therefore, they took traditional treatments from the Vedaralas. It was not only the fault of the people but also the government. The Colonial Government did not implement educational programs sufficiently throughout the island. The lack of staff members of the health sector also made the situation serious. Public health and sanitary facilities were not developed considerably even in the early period of the Twentieth Century, under the British Colonial period as well. Although the British facilitated the health and sanitary improvements especially among the estate people, they did not improve the public until the Donoughmore Constitutional reforms in 1931. Although hospitals established some places in the country, patients had to walk far to get treatments. Sometimes they went back without medicine because medical officers or medicine unavailable.

With the increase of death rates in the years 1918 and 1919, improvement in sanitary facilities should have been expedited by the government especially in the most seriously affected places in Ceylon. As a traditional custom, most people buried their relatives' bodies on their private land. But, during the pandemic period this tradition was seriously impacted the health and sanitary condition of the people. Therefore, in 1918, land for public cemeteries was selected in twenty-nine large villages in the Matara district. “The greatest opposition was encountered because people prefer to bury their dead in their land, however, near it be to dwellings and wells, and however much the grains be neglected, unfenced, soiled

and trampled on” (Ibid). Even in such serious conditions the people did not readily change their traditional practices but the government went ahead despite the peoples' opposition and established public cemeteries. According to these records the traditional practices of the people were the main challenges to controlling the disease.

1918 and 1919 were the years the pandemic reached ITS peak in Ceylon but THE next few years also were bad. Compared with other countries its impact was less, but death rates were higher than the other years. “As the death-rate in 1918 was high (33.4), and in 1919 the highest ever recorded in Ceylon (37.5), it is natural to examine the rates for influenza which is known to have been raging in these years” (Report on the Census of Ceylon, 1921). Considering the climate of Ceylon, the customs of the people, and their smaller powers of resistance to disease the excess rate was much greater in Ceylon comparing with Australia, New Zealand (Ibid). “A comparison of Ceylon with India is perhaps a better test, but it may be vitiated by the variety of conditions in the latter” (Ibid). Apart from the total count of death, infantile mortality of those aged less than 1 year was high during the pandemic situation. The highest infant mortality was recorded in 1919 which was 223² (to 1000 births). But according to the Census Report of 1921, the pandemic was not the main cause of the increase of the average figure.

According to the Medical officer of Health, Dr. Marshall Philip, there was a marked birth drop during the third quarter of 1919. As mentioned by him, the cause was the severe outbreak of influenza during the last quarter of 1918 without doubt (Ibid). The shortage of rice in 1919 affected a drop in number of births. With the pandemic situation the paddy cultivation was affected and the physical fitness of both

² First quarter showed the highest quarterly figure ever recorded, the effects of the influenza pandemic have probably to be regarded as furnishing part of the explanation

sexes came to be affected. Rice shortage was a hindrance to domestic life and resulted in the introduction of the Food Control Bill during 1919, which had at that time a beneficial rather a detrimental effect upon the health of the general population. The rice depots were responsible for the increase in the birth-rate during the following year. Impact of the pandemic, as well as the First World War changed the economic condition; which was settled in 1919 and raised the birth-rate during the 1920. There were three chief factors mentioned for the rise in the birth-rate during 1920; the decrease of influenza, the improvement in economic conditions and the indiscriminate mixing up of people of both sexes at the rice depots (Ibid).

CONCLUSION

The Influenza pandemic was a crucial disease which had a global impact for the first time according to historical evidences. Although Ceylon is an island, it could not avoid the experience of the pandemic because of global human relations. The pandemic appeared in the March of 1918 in the United States and June of 1918 in Ceylon. Accordingly, it did not take much time to breakout in Ceylon. Colombo, Kaluthara, Martara, Jaffna, Batticaloa, Trincomalee, Mannar, Mullaitivu, Kurunegala, Puttalam, Chilaw, Ratnapura, Kegalle, Kandy, Negombo and Anuradhapura were the most affected areas of the first wave of the pandemic. The mortality rate was high in 1919 in Kurunegala, Anuradhapura, Batticaloa, Badulla and Puttalam when compared to other areas. Raigam Korale shows mid type of spread and the mortality rate was less compared with other areas. Bad health practices, the customs of the people and the climate worsened the situation and in the early period of the pandemic were more challenging. But later measures introduced by the colonial government helped to overcome those challenges. With these measures, the health situation was controlled and the conditions improved and the spread

of the decreased gradually lessened in the later part of 1919. The British government showed little concern regarding the health of the general public and had no fixed social policy until 1931, which caused it to spread. Due to these issues, the domestic lives of the people were affected; the cultivation of paddy collapsed especially in Anuradhapura, Kurunegala, Puttalam Batticaloa and other major areas. The rice shortage impacted a decrease in the birth rate in 1919 and it impacted to disease the national birth rate as well. The influenza pandemic was not the main reason for the drop in the economic condition because the First World War affected economy and social life on a global level.

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TOWARDS EFFECTIVE LAW ENFORCEMENT: JOINT EXERCISES FOR SRI LANKA ARMY AND POLICE IN LAW ENFORCEMENT OPERATIONS

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ABSTRACT

This paper examines the critical need for a joint exercise between the Sri Lanka Army (SLA) and the Sri Lanka Police (SLP) to enhance operational synergy, communication, and efficiency in law enforcement operations. Through descriptive analysis of survey responses from 111 army officers, examination of four key case studies of past joint operations, review of relevant legal frameworks, and an analysis of successful international joint exercises, the study highlights the current challenges, including operational inefficiencies and legal ambiguities, resulting from the lack of coordination and joint training between the two forces. By analysing case studies, the paper underscores the need for improved legal awareness and collaboration to avoid the operational pitfalls experienced in past joint law enforcement efforts. Drawing on successful joint exercises from other countries, the paper proposes a comprehensive framework for Sri Lanka, including the establishment of a permanent Joint Training Committee,

the development of Standard Operating Procedures (SOPs), and the introduction of scenario-based training. Additionally, the paper emphasises the importance of community engagement and After-Action Reviews (AARs) to ensure transparency, build public trust, and continuously improve joint operations. The proposed joint exercise framework aims to strengthen the professionalism and efficiency of the SLA and SLP, ensuring a cohesive and lawful approach to maintaining public order and security. By fostering a unified front, the framework seeks to address contemporary security challenges, ultimately contributing to the safety and stability of Sri Lanka.

KEYWORDS: *Joint Exercises, Law Enforcement Operations, Sri Lanka Army, Sri Lanka Police.*

INTRODUCTION

In the evolving landscape of law enforcement, the Sri Lankan Army (SLA) plays a substantial role in maintaining law and order in

emergencies. However, the lack of coordination, and joint training with the SLP have resulted in operational inefficiencies, and communication gaps. These issues highlight the urgent need for a joint exercise to foster synergy between the two forces. The joint exercise would improve the operational synergy, communication, and provide confidence to the public of the SLA and SLP. A unified approach to law enforcement operations would ensure public security and public safety.

The police enforces law within the borders of the State, whereas the military protects the society against external threats (Yilmaz, 2020). 'Law enforcement' can be defined as a means of members of the regularly employed police forces for the prevention and detection of crime, and enforcement of the existing law of the State (Rotenberg, 2006). Members of the armed forces and the police in terms of provisions vested in them by the legislations of Sri Lanka have been empowered to enforce law and order of the country (Media, 2022). However, the involvement of the SLA in law enforcement has legal scrutiny, with past deployment raising concerns and challenges. This highlights the need for a clear understanding of legal framework and improved collaboration between the SLA and the SLP. With the appropriate role of the military in law enforcement being re-evaluated, this study encourages both the SLA and SLP decision-makers to work out joint exercises by simulating realistic scenarios to train its forces. This collaborative approach of joint exercises addresses a long-felt need for the military to navigate its proper support to law enforcement operations.

This paper aims to examine the legal aspects and challenges of the SLA in joint law enforcement operations together with SLP that proposes a structured joint exercise to enhance operational synergy, communication, and efficiency between the two forces, thereby

ensuring effective maintenance of law and order.

RESEARCH METHODOLOGY

This study employed a qualitative research design with supporting survey data to examine the need for and potential structure of joint exercises between the SLA and SLP. The research methodology consisted of four main components:

Survey Design and Implementation

A structured questionnaire was administered to 111 officers from the SLA who were actively involved in law enforcement operations at unit and subunit levels. The survey instrument contained both closed and open-ended questions covering: a) basic demographic information (rank and years of service), b) duty awareness and operational understanding, c) training adequacy and preparedness, d) legal knowledge and constraints, e) incident handling procedures, f) operational challenges, and g) recommendations for improvement

Case Study Analysis

Four significant incidents involving joint operations between the SLA and SLP were selected for detailed case study analysis: a) the Millennium City Scandal (2002), b) the Weliveriya Incident (2013), c) the Fuel Station Confrontation (2022), and d) the Parliament Protest Incident (2022).

These cases were analysed using documentary analysis of official reports, media coverage, and legal proceedings to identify: a) operational gaps and inefficiencies, b) communication breakdowns, c) legal ambiguities, d) coordination challenges, and e) lessons learned.

Comparative Analysis of International Joint Exercises

A comparative analysis was conducted for the successful joint military-police exercises in other jurisdictions, specifically: a) Exercise Suraksha Kavach 2 (India), b) Toowoomba Exercise (Australia), and c) Joint Response in Serbia 2023

The analysis focused on: a) exercise structure and components, b) training methodologies, c) coordination mechanisms, d) best practices, and e) lessons applicable to the Sri Lankan context

Legal Framework Review

A comprehensive review was conducted for the relevant legal framework governing military involvement in law enforcement operations, including: a) the Army Act No. 17 of 1949, b) Code of Criminal Procedure Act No. 15 of 1979, c) Public Security Ordinance No. 25 of 1947, d) related Constitutional provisions and, e) applicable international laws and conventions.

DATA ANALYSIS

Quantitative data from the survey was analysed using descriptive statistics, with results presented through graphs and charts to illustrate key findings. Qualitative data from open-ended survey responses and case studies was analysed thematically to identify recurring patterns, challenges, and recommendations.

RESEARCH LIMITATIONS

The study faced several limitations:

1. The survey was limited to army officers and did not include police perspectives.

2. Time constraints restricted the depth of case study analysis.

3. Access to certain operational documents was limited due to security classifications.

4. The comparative analysis of international exercises relied on publicly available information.

These limitations were considered when formulating conclusions and recommendations.

OPERATIONAL GAPS AND LEGAL AMBIGUITIES AS THE IMPERATIVE FOR JOINT EXERCISES

According to the existing law, members of the armed forces can be called to assist or to support the SLP to safeguard law and order. This has been the practice since independence. It is how the republic's sovereignty, the people's right to free speech, and their freedom of movement are protected. This has been demonstrated recently during the public protests in 2022 (Media, 2022).

However, operational inefficiencies with unfamiliar procedures were observed in the joint law enforcement operations. Furthermore, lack of awareness and understanding about the operational frameworks of the military duties could be noticed. This can be understood under certain case studies related to legal issues, and accessing the level of awareness about the law that governs the duties of the military that is discussed in the following chapters:

CASE STUDIES ILLUSTRATING THE LAW AND ISSUES IN SRI LANKA'S SECURITY FORCES

Lack of joint training and exercises would lead to operational inefficiencies with unfamiliar procedures and conflicts between forces at last

(Koerner & S. Staller, 2021). Accordingly, this study has referred to the four selected case studies to exhibit the operational gaps and legal ambiguities while performing duties under the existing law of the state (See Annex 'A'). These selected case studies highlight a troubling lack of awareness of the law and duty, as well as significant miscommunications between the Army and Police. First, the Millennium City Scandal exposed severe breaches in operational security, endangering lives and compromising military effectiveness (Sunday Times, 2004). Second, the incident where army personnel opened fire at villagers in Weliveriya, killing three people and injuring several others as they protested against a factory that polluted their drinking water sources, underscores a failure to uphold civilian protection and human rights (Rajasingham, 2014). Third, an Army officer who kicked a civilian at a fuel station highlights individual misconduct and the need for stricter adherence to legal and ethical standards (Ada Derana, 2022a). Finally, the investigation into the confrontation between police and army riders during a protest near the Parliament premises illustrates the persistent issues in coordination and cooperation between these forces (Ada Derana, 2022b).

It is evident that the SLP possess average understanding about the military duties on National Security of the country. Further, it is evident that there is no proper coordinated procedure when utilising military force in law enforcement operations including the disposal of unlawful assembly. It is also evident that no proper SOP exist when the military is called to perform police duties together with SLP. Finally, the military tends to exceed their powers and act in ultra-virus. These examples collectively point to the urgent need for improved legal awareness, clearer communication, and a reinforced commitment to the lawful and ethical execution of duties within Sri Lanka's security apparatus.

ASSESSING AWARENESS LEVELS: JOINT ARMY-POLICE TRAINING AND LAW ENFORCEMENT OPERATIONS

The implementation of legal norms in an operational setting became an indispensable aspect of military legitimacy and also the backbone of military professionalism (Newton, 2007). It includes the military law, civil law and the international laws such as International Humanitarian Law and Human Rights. The regular Forces shall at all times be liable to be employed on active service (Sec.18 of the Army Act) while Volunteer Forces are employed for active service by proclamation or by order called out on active service (Sec.19 of the Army Act). Further, the military may call out to perform non-military duties for the maintenance of supplies and services essential to the life of the community (Sec.23 of the Army Act). Moreover, military forces can be used to disperse assemblies (Sec.95(3) of the Code of Criminal Procedure Act) and commissioned military officers has the power to disperse unlawful assembly (Sec.96 of the Code of Criminal Procedure Code Act). In a situation which endangers the public security in any area or imminent of such incident, and if the President is of the opinion that the police are inadequate to deal with the situation, he may, by order published in the Gazette, call out armed forces for the maintenance of public order in that area. Furthermore, the military may be called out under emergency regulations under the Public Security Ordinance (Sec.2 and 5 of the Public Security Ordinance). Moreover, the military must be aware of the procedure of 'search and arrest of civilians' under the provisions of the Code of Criminal Procedure Act (Sec.23 of the Code of Criminal Procedure Act).

A survey was conducted with the participation of 111 x officers who actively take part in law enforcement operations at unit and subunit levels (Figures 1 and 2 of Annex 'B').

The survey exhibits that they had fair knowledge about the duties that they had to perform (Figures 3 and 4 of Annex 'B'). However, the legal awareness about the operations that they carried out was far below average (Figure 5 of Annex 'B'). Further, it is clear that fair and adequate training on joint operations was done, but they had less than sufficient time for preparation of the tasks they were assigned. (Figures 6 and 7 of Annex 'B').

It is evident that 76.4% of respondents 'strongly agreed' and 20% of respondents 'agreed' to the fact that joint training and development on law enforcement operations are required (Figure 9 of Annex 'B'). The results of the survey further exhibit that officers had used their common sense and conducted themselves diplomatically when handling situations with civilians (Responses to Q9 at Annex 'B'), and with their prior experience as they were not given formal training or knowledge about the legal parameters when dealing with civilians in which the SLP are experts. Therefore, the demand for joint training is evident (Figure 8 and 10 of Annex 'B'). Furthermore, it is evident that there was a lack of coordination between SLP, the Special Task Force and the military: no clear communication with Police counterparts, unwanted interference through SLP, and most importantly, the lack of awareness of the law that applies in such operations. Therefore, it is evident that officers need to be trained on these subjects through a joint forces exercise as discussed.

BUILDING SYNERGY THROUGH LEARNING FROM SUCCESSFUL JOINT EXERCISES

The Police-related tasks can basically be executed by the 'Stabilising Forces' of the Army (Lioe, 2011). It is a realistic proposal to acknowledge the importance of interface between police and military forces across the range of the homeland security system (Hills,

2000). Although the civil and military spheres are often considered as distinct and separate, they often overlap or merge in law enforcement operations. By examining countries where militaries and police forces participate in combined training, role-specific drills, simulated operations, and best practices that contribute to improved synergy between forces can be learned (Friesendorf, 2009).

INSIGHTS FROM FOREIGN JOINT TRAINING EXERCISES

Recurrent combined military and police exercises are held in other jurisdictions to improve inter-agency synergy and operational readiness. The joint exercises are designed to meet particular operational needs in the particular area of focus. The following are some selected Joint Military – Police exercises that give insights in formulating such joint exercises in Sri Lanka.

Exercise Suraksha Kavach 2.

It is a significant joint anti-terrorist exercise conducted by the Indian Army's Agnibaaz Division in collaboration with the Maharashtra Police on 22 March 2022, in Pune. The primary objective was to synchronise the drills and procedures of the Army and Police to effectively counter potential terrorist threats in the city (India, 2022). The exercise involved the participation of the Counter Terrorism Task Force (CTTF) of the Indian Army, the Anti-Terrorism Squad of the Maharashtra Police, Quick Reaction Teams (QRTs), Dog Squads, and Bomb Disposal Teams from both organizations. A simulated scenario of terrorists in a populated area required coordinated efforts for traffic control, establishing security cordons, neutralising threats, and conducting evacuation and bomb disposal operations. This exercise showcased the importance of inter-agency cooperation and aimed to enhance the coordination and effectiveness of joint

operations between the Indian Army and Maharashtra Police.

Toowoomba Exercise (Exercise Arras Sprint-2022).

It is a comprehensive joint training operation designed to test and improve the collaborative response capabilities of the Australian Army and the Queensland Police Service (QPS). Conducted by the 11th Brigade and QPS, the exercise features a series of activities aimed at enhancing the coordination and effectiveness of both forces in various scenarios. Key events included vehicle checkpoints, hotel quarantine support, community engagement, and visitors' day (Australian Government Defence, 2022). The exercise involves realistic training scenarios with soldiers and police officers working together in tasks such as managing vehicle checkpoints, performing search and rescue operations, and responding to simulated emergencies. These activities ensure that both the Army and Police personnel can effectively operate together, addressing potential real-world challenges with a coordinated approach, while also engaging with the local community to build trust and understanding.

Joint Response in Serbia 2023.

It is a large-scale tactical operation involving collaboration between the Serbian Armed Forces and the Ministry of Internal Affairs. Taking place over two weeks at multiple locations, this exercise aims to enhance joint capabilities in executing offensive operations. Participants include various units such as the General Staff, the Army, Air Force and Air Defence Training Command, 72nd Special Operations Brigade, 63rd Parachute Brigade, Special Anti-Terrorist Unit, Gendarmerie, and helicopter units. The exercise focuses on improving tactical and fire missions during the preparation and execution of combat

operations (The Serbian Armed Forces, 2023). A significant preparatory component included a computer-assisted command and staff exercise, "Response 2023," which tested command competence in planning and executing operations. The final segment, observed by the public and state leadership at the Pešter temporary range, showcased the training and operational capabilities of both the military and police forces, demonstrating their readiness and coordination.

Accordingly, the above joint exercises give several common features that act as strategic guidance for the designing of such exercise for Sri Lanka. Initially, it gives the legal and procedural awareness about the assignment that they undertake. Then, it emphasises the inter-agency coordination which ensure collaboration and coordination between military and police forces to effectively respond to security threats and emergencies. Further, it focuses on simulated scenarios that involve realistic training scenarios to prepare participants for actual incidents. Finally, it ensures the training, development and evaluation through regular training sessions, simulations, and post-exercise evaluations which are conducted to improve operational readiness and identify areas for improvement.

BUILDING A COLLABORATIVE FRAMEWORK FOR SRI LANKA THROUGH JOINT LAW ENFORCEMENT TRAINING

Establishing a collaborative framework with a joint command structure, clear communication protocols, and ensuring legal compliance through consultations give a comprehensive approach for the joint law enforcement training (Stephens, 2010). Building a collaborative framework for joint law enforcement training in Sri Lanka necessitates a multifaceted approach that emphasises legal, operational, and community aspects.

Firstly, it is imperative to establish a legal and procedural foundation that delineates the roles and responsibilities of the SLA and SLP. This framework must include comprehensive training modules on legal regime which includes national and international laws, military regulations and police procedures to ensure all personnel are thorough with the legal boundaries of their duties, and take an intra virus approach.

Incorporating regular joint training exercises that simulate real-life scenarios, such as counterterrorism operations, crowd control, protecting key and vital persons and points, arrest and search, and disaster response will enhance the interoperability of two forces. These exercises should focus on improving communications, coordination and command structures, fostering a unified approach to law enforcement.

Integrating community engagement into these training programmes is crucial. By involving local communities and stakeholders, these exercises can build public trust and ensure that law enforcement operations are transparent, and respectful of domestic law and human rights. Moreover, establishing a joint training command or task force dedicated to planning and executing these exercises can streamline the process and ensure consistency. Post-exercise evaluation and debriefings are essential for assessing performance, identifying areas for improvement, and updating training protocols accordingly. Learning from successful international training models such as Suraksha Kavach, Toowoomba exercises and Joint Response Serbia 2023 can provide valuable insight into the best practices and innovative strategies. By adopting a holistic and inclusive approach, Sri Lanka can develop a robust collaborative framework that not only enhances the operational efficiency of its law enforcement agencies, but also strengthen the overall homeland security and safety of the

nation. This framework will ensure that both the Army and Police are prepared to address contemporary security challenges effectively, maintaining public confidence and upholding the rule of law.

CONCLUSION

In conclusion, the proposed joint exercise framework for the SLA and Police represent a critical step towards enhancing operations with synergy, legal awareness and public trust. By addressing the current gaps in coordinating the training, this initiative aims at a cohesive approach to law enforcement that respect the existing legal framework and human rights, ensuring the military acts in accordance with the law without leaving room to be challenged before Courts of Law. The joint exercises will prepare both Forces to effectively engage with contemporary security challenges with sound understanding of the legal parameters of the duties they should perform. This collaboration is essential for ensuring the safety and security of the public and also to strengthen the professionalism and efficiency of the SLA in law enforcement assignments. Through continuous training, evaluation and community engagement, the SLA and Police can build a unified and resilient law enforcement front, capable of maintaining public order to protect sovereignty in an increasingly complex hostile environment that was created in Sri Lanka in the recent past.

RECOMMENDATIONS

This study has analysed the law enforcement operations in Sri Lanka and identified the issues at the ground level, and reviewed the best practices from other jurisdictions. In line with proposing a joint exercise for the SLA and Police in law enforcement operations towards the effective law enforcement, the following recommendations could be made:

Establishment of a Permanent Joint Training Committee

The SLA can propose to the Ministry of Defence (MOD) of Sri Lanka to establish a permanent Army-Police Joint Training Committee (JTC) responsible for overseeing the planning, execution, and evaluation of regular joint exercises. The committee may set the annual goals and objectives for joint training programmes and ensure continuity, addressing emerging challenges, and refining the training based on past experiences.

Sri Lanka Army to Establish a Joint Exercise Cell

Under the direction of Permanent JTC, the SLA can establish a Joint Training Cell that is responsible for the designing and developing of training modules on relevant laws, procedures and drills, and to facilitate the communication and collaboration between both forces. The Training Cell would be responsible for coordinating with the SLP on joint exercise planning and execution with special emphasis on the development and implementation of Army-specific training modules for joint operations.

Standard Operating Procedures (SOPs)

Based on the outcome of the joint training, it is recommended to develop a SOPs for joint law enforcement operations. Such SOPs consist of the roles and responsibilities, communication protocols and procedures, rules of engagement and procedures, and drills of such operations.

Introduction of Legal Awareness and Training Programme

It is recommended to conduct legal awareness training together with compulsory law modules on relevant areas of legislations

such as Sri Lankan Constitutional Law, Military Law, Criminal Procedure and the Penal Laws and the Laws of Evidence. It is also recommended to conduct legal workshops and lectures by experts in the field. Finally, it is recommended to distribute clear and concise legal reference material for the troops deployed in law enforcement contexts.

Scenario Based Training with Realistic Focus

It is recommended to conduct scenario-based training exercises that mirror potential real-world situations where the SLA might encounter together with the SLP such as riots, protests, hostage situations, protection of vital and key persons and points, etc. It is further recommended to consider *'Train as You Perform and Perform as You Train'* as the motto in developing Scenario Based Training. Further, it is recommended to define roles and responsibilities for army and police units in each scenario, to set clear communications, protocols, de-escalation tactics and integration tactics, techniques and procedures as relevant.

Invest in Community Engagement

It is recommended to develop a comprehensive community engagement strategy with the assistance of Police Training Divisions. Therefore, it is recommended to include programmes for public awareness campaigns to explain the purpose and benefits of joint exercises, emphasising improved public safety. Further, inviting community leaders and representatives to observe training exercises could lead to more transparency and foster trust in the community.

Investment in After-Action Reviews

It is recommended to conduct After-Action Reviews (AARs). The AARs are required to identify the areas for improvement in communications, coordination, and

execution of joint operations. It should reveal information and provide insight that would improve the current best practices and lessons, and finally - as a result - refine and upgrade training programs and procedures for future joint operations.

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APPENDIX - A

INCIDENTS THAT REPORTED POOR COORDINATION BETWEEN SRI LANKA ARMY AND SRI LANKA POLICE

Ser	Date	Incident	Issue
(a)	(b)	(c)	(d)
1	2 January 2002	The Millennium City Scandal	Military scandal that took place within the Millennium City housing scheme, Athurugiriya, Sri Lanka on 2 January 2002. Widespread media coverage and miscommunication between the Directorate of Military Intelligence and the Sri Lanka Police resulted in the exposure of military covert operations units known as the Long-Range Reconnaissance Patrols of the Sri Lanka Army.

2	01 August 2013	Army personnel opened fire at unarmed villagers at Weliweriya, killing three and injuring several others, as they protested against a factory which they said polluted their groundwater and demanded clean drinking water	<p>The recording of Summary of Evidence (S of E) regarding the Rathupaswala incident upon completion of the Court of Inquiry (C of I) continues. In the meantime, the Magisterial Inquiry regarding the same incident has been fixed for hearing on 6th November 2015 (No 13 / 1440). In consequence of the incident in the evening of 1 August 2013, an Army C of I was appointed to investigate the matter in accordance with military provisions. A Magisterial Inquiry and Police investigation had also been in progress at the time of appointing the said Army C of I.</p> <p>The four accused in the case over the shooting to death of three persons and injuring 45 others during a protest by villagers demanding clean drinking water at Rathupaswala in 2013, have been acquitted by the Gampaha High Court Trial-at-Bar.</p>
3	04 July 2022	Army launches probe over officer who kicked civilian at fuel station	Sri Lanka Army (SLA) says that a five-member Court of Inquiry (CoI) has been appointed to investigate and make recommendations on the incident where an army officer had assaulted a civilian at a filling station in Yakgahapitiya, Kurunegala. A video recorded using a mobile phone, showing an army officer kicking a person on the chest at a fuel station, had been widely circulated on social media recently.
4	04 April 2022	Investigation into Police, Army Riders confrontation during protest near Parliament	Commander of the Army has requested the IGP to immediately conduct an inquiry into the 'unethical and ill-mannered behaviour' of two Police officers (Assistant Superintendents of Police) and initiate disciplinary action against them when a four -member team of Army Riders on the directions of the Director Operations of the Army HQ arrived at the road entrance to the Parliament complex this evening.

APPENDIX - B

RESPONSES TO THE QUESTIONNAIRE ON 'TOWARDS THE EFFECTIVE LAW ENFORCEMENT: PROPOSING JOINT EXERCISE FOR THE SRI LANKA ARMY AND POLICE IN LAW AND ORDER OPERATION'

1. Basic Information - What is your Rank?

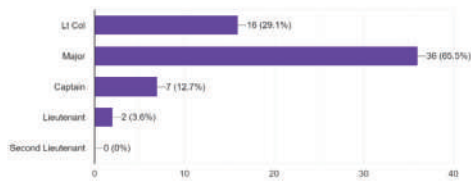


Figure 1: Basic Information - Rank

2. Basic Information – How long have you served in the Army?

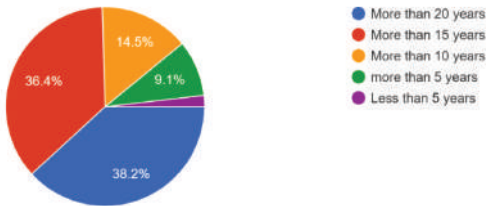


Figure 2: Basic Information – Years of Service

3. Duty Awareness – ‘I clearly understood my duties during the joint law enforcement operation.’

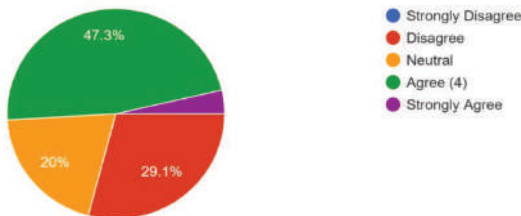


Figure 3: Duty Awareness – I understood what my duties are

4. Duty Awareness – ‘I was provided with a clear briefing about the operation’s objectives before deployment.’

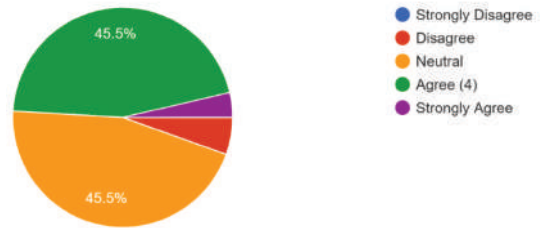


Figure 4: Duty Awareness – I was briefed about Operational Objectives

5. Duty Awareness – ‘I was informed about the legal constraints of the operation.’

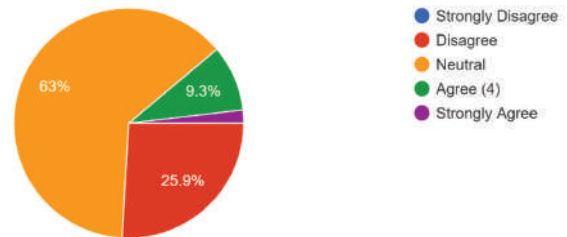


Figure 5: Duty Awareness – Knowledge on Legal Constrains

6. Training and Preparedness – ‘The training I received before the joint operation was adequate.’

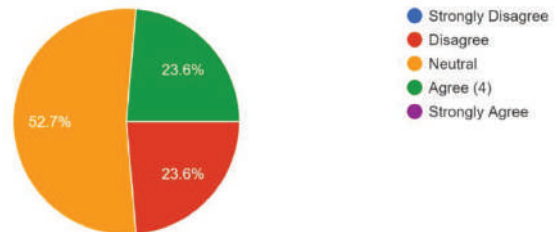


Figure 6: Training and Preparedness – Adequate Training before the Operation

7. Training and Preparedness – ‘I had sufficient time for the preparation of the tasks I was assigned’.

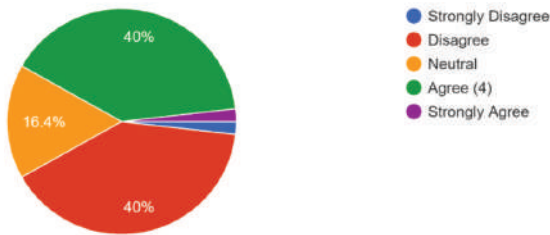


Figure 7: Training and Preparedness – Adequate Time for preparation before the Operation

8. Training and Preparedness – ‘There are areas of the training that need improvement’.

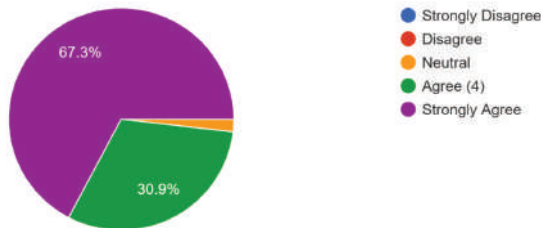


Figure 8: Training and Preparedness – Need Training Improvements

9. Incident Awareness and Handling – ‘How were you instructed to handle situations involving civilians during the operation?’

I used common sense by talking to the people nicely.

Conduct negotiations without negatively affecting to the image of SL army.

In accordance with law.

ROE was not clearly briefed to take action when in high intensity situation.

By common sense.

No any instruction were given.

We need to deal in a polite manner with the instructions of higher HQ.

Friendly way.

I used common sense by talking to the people nicely and at the same time, educated our troops regarding our responsibility of protecting civilians.

I was instructed to handle situations involving with civilliance as per the military law and civil laws at the country.

According to SOP.

First & foremost, I identified key the persons in the gathering and politely addressed them to neutralise the situation smoothly.

Handled the situation within the legal framework.

I used common sense by talking to people nicely and controlled the situation.

I used my experience.

Used common sense law & order to handle the people.

I used common sense by talking to the people nicely the and I adhered to law and order.

I used common sense by talking to the people nicely

Protecting their human rights.

10. Operational Challenges – ‘What were the main challenges you faced during the operation?’

Lack of coordination with police and STF.

Controlling subordinate in tense situations.

No common doctrine, absence of unity of effort.

When to using the minimum force against violent behaviour of the people.

No legal awareness.

Lack of coordination with police and other civil authorities.

Lack of coordination with police and STF and some govt officials.

Lack of coordination with police and STF and having minimum resources.

Lack of coordination with police and STF.

Requested to deploy troops for police tasks when they found it difficult to get down the required number of police personnels.

Lack of coordination with police and other authorities..

Soldiers were not aware about the law.

Lack of coordination with police and STF and most of the time operation information may go to unwanted people.

Lack of coordination with police and STF before going to operation and no clear instructions and clear detailed ROE to act and coordinate with them.

Lack of coordination with police and STF.

Lack of coordination with police and STF and immediately response.

Lack of coordination with police and STF and joint training before conduct the operation.

Delay of receiving clear instructions.

Legal constraints.

11. Do you believe there is a need for joint force exercises with the police to improve coordination and effectiveness in law enforcement operations? Please indicate your level of agreement.

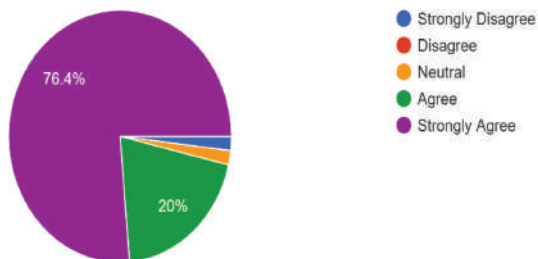


Figure 9: Training and Preparedness – Need for joint Force Exercises

12. Suggestions - What recommendations do you have for enhancing the training or briefings for future joint operations?



Figure 10: Training and Preparedness – Suggestions to Enhance Joint Operations with Sri Lanka Police

QUESTIONNAIRE ON ‘TOWARDS THE EFFECTIVE LAW ENFORCEMENT: PROPOSING JOINT EXERCISE FOR THE SRI LANKA ARMY AND POLICE IN LAW AND ORDER OPERATION’

1. Basic Information – What is your Rank?

Tick all that apply.

- ☐ Lt Col
- ☐ Major
- ☐ Captain
- ☐ Lieutenant
- ☐ Second Lieutenant

2. Basic Information – what is your years of Service?

Mark only one oval.

- ☐ More than 20 years
- ☐ More than 15 years
- ☐ More than 10 years
- ☐ more than 5 years
- ☐ Less than 5 years

3. Duty Awareness – ‘I clearly understood my duties during the joint law enforcement operation.’

(Please indicate your level of agreement with the following statements)

Mark only one oval.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree (4)
- ☐ Strongly Agree

4. Duty Awareness – ‘I was provided with a clear briefing about the operation’s objectives before deployment.’

(Please indicate your level of agreement with the following statements)

Mark only one oval.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree (4)
- ☐ Strongly Agree

5. Duty Awareness – ‘I was informed about the legal constraints of the operation.’

(Please indicate your level of agreement with the following statements)

Mark only one oval.

- ☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree (4)
☐ Strongly Agree

6. Training and Preparedness – ‘The training I received before the joint operation was adequate.’

(Please indicate your level of agreement with the following statements)

Mark only one oval.

- ☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree (4)
☐ Strongly Agree

7. Training and Preparedness – ‘I had sufficient time for the preparation of the tasks I was assigned.’

(Please indicate your level of agreement with the following statements)

Mark only one oval.

- ☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree (4)
☐ Strongly Agree

8. Training and Preparedness – ‘There are areas of the training that need improvement.’

(Please indicate your level of agreement with the following statements)

Mark only one oval.

- ☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree (4)
☐ Strongly Agree

9. Incident Awareness and Handling – ‘How were you instructed to handle situations involving civilians during the operation?’

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.....

10. Operational Challenges – ‘What were the main challenges you faced during the operation?’

.....
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.....

11. Do you believe there is a need for joint force exercises with the police to improve coordination and effectiveness in law enforcement operations? Please indicate your level of agreement.

Mark only one oval.

- ☐ Strongly Disagree
☐ Disagree
☐ Neutral
☐ Agree (4)
☐ Strongly Agree

12. Suggestions - What recommendations do you have for enhancing the training or briefings for future joint operations?

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.....
.....



Recommended Reference – Maheshika, V.A.A.P., Karunarathna, R.M.D.M., Ranathissa, N.D.M., and Rajapaksha, C.S. (2024). Monitoring Shoreline Changes of Sri Lanka Using Remote Sensing and Geographic Information System Techniques. *Sri Lanka Military Academy Journal*, 6. 85-95.

MONITORING SHORELINE CHANGES OF SRI LANKA USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM TECHNIQUES

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ABSTRACT

Shorelines are altering at an accelerating rate due to both human activities and physical phenomena as they represent the interface between the land and water. The primary objective of the study, Monitoring Shoreline Changes on the Coastline Security of Sri Lanka using Remote Sensing and Geographic Information System (GIS) Techniques, is to analyse shoreline changes from 2004 to 2021 using geospatial techniques. Shorelines for years of 2004, 2015 and 2021 were delineated using Landsat 7 and Landsat 8 images. By applying, the Normalized Difference Water Index (NDWI) landmasses were distinguished from water bodies, and shorelines were extracted. The Digital Shoreline Analysis System (DSAS) was used to quantify the rate of long-term shoreline changes over 17 years and assess shoreline changes, including Shoreline Change Envelope (SCE), Net Shoreline Movement (NSM) and, End Point Rate (EPR). The DSAS results reveal that the Kalutara region has experienced the greatest natural erosion, while the eastern coastline (Kayankerni area) has undergone the greatest natural accretion (except port city

and other harbors). The highest SCE values, reaching 843 m, were calculated within the eastern coastline. The highest NSM ranges indicative of accretion were recorded as 819 m in the eastern coastline, while the highest ranges indicative of erosion were recorded as -305 m in the western coastline. The calculated EPR of the area was -17.9 m/year. These findings can serve as valuable input data for maintaining the security of coastal zone management and mitigating further anthropogenic and natural threats to coastal habitats in Sri Lanka.

KEYWORDS: *Digital Shoreline Analysis System, End Point Rate, Net Shoreline Movement, Shoreline Change Envelope, Shoreline Changes.*

INTRODUCTION

A shoreline can be defined as the location of the land-water interface in a specific time. Moreover, it is a very dynamic feature that provides an indicator of coastal erosion and accretion (Mohammed E et al., 2018). The effects of various land uses, geological and hydrological dynamic phenomena have made

changes in coastal areas. Among them sediment erosion, transport and deposition have been identified as crucial factors. These changes can be detected in both short and long periods. In general, the processes of marine phenomenon cause a direct impact on the design of the security of the country especially in harbors, marine structures, and coastal management (E Tamassoki et al. 2014).

Security can simply be defined as actions taken to protect individuals, communities and their assets from threats and risks. Additionally, it can be identified as a highly nuanced process that encompasses various aspects including physical security, economic stability, bio diversity and ecosystems, environmental protection and national security, ensuring resilience against natural disasters, crimes, economic disruptions and other potential threats. Therefore, concerns about the consequences of coastal erosion onto security cannot be neglected and the protection of the coastline plays a prominent role in ensuring the safeguard of the nation. Whether its results are short-term or long-term, coastal changes have had a direct impact. Studying coastal changes is very important, especially in matters related to the safety of natural harbors, public safety, and the security of the interior of the country. With the sudden changes experienced over time, due to the factors such as climatic changes, most of the countries became vulnerable, facing enormous security risks to both human and nature.

Sri Lanka's low-lying coastal areas tend to undergo constant changes, with erosion and deposition continuously altering change the shoreline (Narayana, 2016). These changes include both seasonal and permanent shifts (Joseph, 2007). Sri Lanka's coastal regions are densely populated when compared to the inland areas. (Weerakkody, 1996; Berg et al., 1998; Gopalakrishnan et al., 2020) and among them, the southwestern coastal zone can be identified as the most populous (Elizabeth et al, 2005).

Coastal change analysis in Sri Lanka can be regarded as a critical piece of research that addresses the dynamic and complex interactions between natural coastal processes and human activities with regards to the security of the country. According to the Statistical Abstract of 2022, in the Department of Census and Statistics, the island, Republic of Sri Lanka is located in the Indian Ocean between the northern latitude of 5°55' and 9°51' and the eastern longitude of 79°41' to 81°53' and covers an area of 65,610 km². It mainly consists of an elongated pearl-shaped tropical island with a maximum length of 432 km from Dewandara Point in the south to Pedurutuduwa in the north and a maximum width of 224 km from Colombo on the west coast to Kalmunai on the east coast. Several small islands are also scattered along its coast. The coastline stretches approximately 1,790 km and coastline features may include bays, anchorages and natural harbours (Bandara, 1989). Coastal accretion, erosion and sea-level rise are identified as the significant threats to the coastal regions of Sri Lanka. Prominently, these issues often affect the social security, economic security (such as fisheries and tourism), infrastructure protection, urban planning and development, etc. Therefore, this research is very important in aligning future steps ensuring security of Sri Lanka's coastline.

This study investigates coastal changes in the main island of Sri Lanka, aiming to provide sound knowledge of the previous changes that have occurred across the entire coastal region on the main island with a perspective on safeguarding the security. These results can be used to analyse the reasons for erosion and accretion along the coastline and initiate measures for coastal management. When investigating these kinds of dynamics of the shorelines, remote sensing technology and geographic information systems (GIS) are useful tools. Shoreline changes can be investigated over time by comparing of satellite images (De Silva et al., 2021). Advanced remote sensing technologies and GIS are widely used in this research to provide accurate, up-to-date data

on coastal dynamics, enabling more effective policy-making and coastal management strategies.

Given the critical need for effective coastal management to protect infrastructure and communities in coastal areas, primary objective of this research is to monitor the shoreline changes using the multi-temporal medium resolution satellite images, acquired in Sri Lanka from 2004 and 2021 covering 17 years and to provide an analysis of their implications for protection. It comprises with advanced remote sensing technologies with geospatial analysis with Landsat data pre-processed and processed using Google Earth Engine (GEE). This research aims not only to contribute to academic understanding of coastal dynamics, but also to inform policymaking and strategic planning efforts aimed at improving coastal resilience and protection. The researchers seek to develop a robust outline for mitigating the impacts of coastal change in the future. The methodologies used in this study include satellite imagery analysis, processing outputs from Google Earth Engine into the Digital Shoreline Analysis System (DSAS 5.1) in ArcMap, calculate statistical values of coastal changes and GIS mapping of vulnerable coastal areas. The Digital Shoreline Analysis System (DSAS) is a freely available software application that works within the Esri Geographic Information System (ArcGIS) software. The DSAS extension generates the rate-of-change statistics for a time series of shorelines. Major statistical outcomes of the DSAS such as Net Shoreline Movement (NSM), Shoreline Change Envelope (SCE), Endpoint Rate (EPR) and Linear Regression Rate (LRR) are used for the interpretation and visualization of shoreline dynamics over time. Finally, this research seeks to provide actionable insights and practical recommendations for policy makers who are involved in coastal management and defence planning.

LITERATURE REVIEW

Shorelines are the most dynamic environments on Earth, continuously changing through erosion, deposition, and the action of waves and currents over time (Bird, 2000). The term 'coastline' is often used synonymously with 'shoreline'. Shorelines changes occur both in small ways throughout the day and in large ways over years or decades. A shoreline is defined as the physical boundary between land and water (Boak et al, 2005). Shoreline changes are influenced by various factors, including monsoon winds, wave actions, sediment transportation, sea level rise, tidal movements, and natural disasters such as tsunami, typhoon and human activities (Palamakumbure et al., 2020; Gunasinghe et al., 2021). Thus, shoreline changes the result from both natural and anthropogenic causes, manifesting as either erosion or accretion (Yu et al., 2011). Erosion is the wearing away of soil or rock while accretion is the opposite process.

Therefore, constant shoreline monitoring has become crucial to minimize impact on living and ecological resources, resulting in hazard-effective conservation mechanisms and maintaining the social, economic, and environmental security in the country (Al-Zubieri et al., 2020; Roy et al., 2018). Accurate calculation of shoreline change rates requires continuous and long-term monitoring of shoreline location data (Luijendijk et al., 2018). Combined ground and satellite observations and simulations of Indian Ocean sea level, have identified a clear spatial pattern of sea level rise since the 1960s. According to tide gauge data, the sea level along the coast of the northern Indian Ocean has risen by about 12.9 cm per century (Thasarathan, N.et al, 2023). Coastal communities and developments along Sri Lanka's coastline may be highly vulnerable to both permanent and short-term inundation and/or coastal erosion, making Sri Lanka a one of the hot spots to study in future sea-level change and risk assessments (Palamakumbure, L., 2020)

Understanding coastal dynamics allows for more resilient infrastructure design, protection against erosion and flooding (Wijeratne et al. 2018). To ensure national economic stability and daily operations, it is mandatory to protect infrastructure such as ports and commercial ports, power plants, other business institutions, important national security facilities, agricultural lands, and roads located in both inland and coastal areas. Coastal zones are strategic areas for national security due to their proximity to maritime borders and trade routes. Maintaining the integrity of these coastal zones is critical for preventing illegal activities and ensuring safe maritime operations, promoting nations to implement protocols for their security (Samarakoon, 2016). Sri Lanka, positioned along major sea routes between the West and East, which has strategic importance in the Indian Ocean, making coastal surveillance vital to maintain maritime sovereignty (Bandara, 1989; Samarakoon, 2016). However, during Sri Lanka's internal civil war, significant knowledge gaps emerged due to limited scientific research in the region over the past three-decades (Thasarathan, N. et al, 2023).

In recent years, numerous studies have been conducted to assess the extent and impact of coastal erosion along the eastern, southern, western coastal zones separately. The east coast is home to many critical features, including ports such as Olivil, Trincomalee as well as urbanized areas and tourist destinations such as Nilaveli, Pasikuda and Arugambe, and important conservation areas like Yala and Kumana National Parks. Additionally, high quality mineral deposits are found in locations such as Pulmodei, Verugal and Kokilai (Zoyso et al., 2023). After the end of the civil war in 2009, Sri Lanka underwent rapid urbanization and underwent various large-scale development projects such as Colombo Port City Project, Hambantota Port, and Olivil Port, Coastal Road and Infrastructure Projects implemented in various coastal areas.

As many changes have been caused to the coastline with the mega development projects, variations have been observed with respect to coastal changes within the study area. Despite the significant changes to the coastline from these development projects, a notable gap exists in research on the overall coastal changes across the country. According to the author's knowledge, no recent study has comprehensively analysed the entire coastline of Sri Lanka. Making informed decisions related to national security requires addressing threats to any sector promptly, focusing on the whole country. Therefore, this research aim to fulfil the existing knowledge gap and secure the country from future coastal threats.

METHODOLOGY

The study area selected for the research is the island of Sri Lanka located in the northern part of the Indian Ocean between the northern latitude of 5°55' and 9°51' and the eastern longitude of 79° 41' to 81° 53'. The total land area of the island is approximately 65,610 km² with a coastline about 1,620 km. While Sri Lanka comprises many small islands, this study focuses solely on the mainland.

The methodology of coastal change monitoring in Sri Lanka using remote sensing and GIS techniques consist of four main stages namely data acquisition, preprocessing, processing and calculation of coastal change rate (see figure 1). Coastal changes in the study area were analysed using Landsat satellite images from the years of 2004, 2015 and 2021. These satellite images consist of multispectral images captured by Landsat satellites. The first step in the research was to retrieve data from Landsat 8 and Landsat 7 images from the relevant image collections in Google Earth Engine.

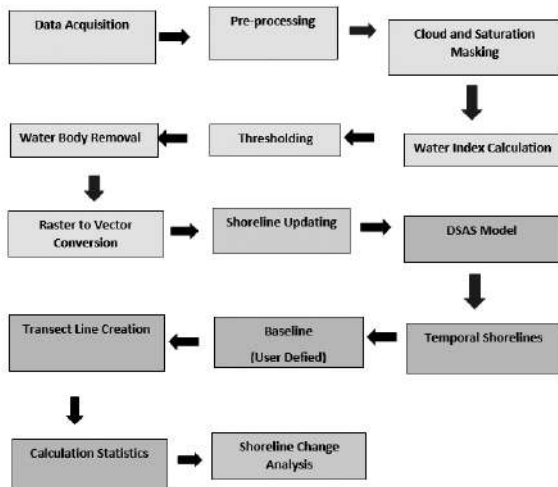


Figure 1: Methodology for Coastal Change Monitoring Using Remote Sensing and GIS Techniques

These images were processed and analysed using Google Earth Engine and Geographic Information System (ArcGIS software) to identify and delineate the shoreline accurately. Then, the Normalized Difference Water Index (NDWI) was applied to enhance the contrast between land and water, facilitating precise shoreline extraction. Following the extraction, a buffer was created to digitize the baseline, forming the initial step for the fourth stage. In a personal geodatabase, all selected coastlines and the digitised baseline were combined into a single feature class.

This research utilised the Digital Shoreline Analysis System (DSAS) integrated ArcGIS 10.8 to assess and monitor shoreline changes in the study area. DSAS computes rate-of-shoreline change statistics for a time series of shoreline vector data. Once shorelines were prepared, DSAS was used to create a baseline, from which transects were cast perpendicular to the shoreline at regular intervals. It is a must to include all vector data into a personal geo-database by giving correct parameters. The transect spacing and length were adjusted based on the specific geomorphological characteristics of the study area and by considering the

pattern and direction of shorelines to optimize the analysis. The shorelines gathered from 2004, 2015, and 2021 exported into shape file (.shp) and after merging all three shorelines, saved in a personal geo-database called 'Shoreline'. The created baseline (onshore) also added to a personal geo-database called 'Baseline'. Using the shoreline and baseline data available in the personal geo database, a transect layer was created using DSAS tool at 100 meter intervals by considering the lengths of shorelines with a smoothing distance of 1,000 meters. All the data layers were projected in Universal Transverse Mercator (WGS 1984 / UTM zone 44N) projection. Positive accretion and negative erosion were observed in the rates of shoreline variability. Major statistical outcomes of DSAS such as net Shoreline Movement (NSM), Shoreline Change Envelope (SCE), Endpoint Rate (EPR) are used by the researcher for the interpretation.

The Net Shoreline Movement Equation is used for each transect or hypothetical line that crosses a shoreline perpendicularly, NSM summarises the actual distance between the oldest and youngest shoreline (Thasarathan, N. et al, 2023).

$$NSM = (d_{2004} - d_{2021}) \text{ m}$$

Equation 1: Net Shoreline Movement Calculation

The End Point Rate (EPR) calculated by dividing the distance of shoreline movement by the time elapsed between the oldest and the most recent shoreline.

$$EPR = \frac{d_{2021} - d_{2004}}{t_{2021} - t_{2004}} \text{ m/year.}$$

Equation 2: End Point Rate Calculation

The shoreline change envelope (SCE) reports a distance (in meters), not a rate. The SCE value represents the largest distance between all coastlines intersecting a given transect. The value for SCE is always positive,

since there is no absolute distance sign between two coastlines (USGS, 2018)

RESULTS AND DISCUSSION

Long-term shoreline changes in the study area calculated by extracting shoreline proxy positions from seventeen years between 2004 and 2021 using automated methods, after which the DSAS was used to calculate and visualize the amounts and rates of change between the different shoreline positions.

The net shoreline movement (NSM), which represents the total horizontal shoreline change between 2004 and 2021 is shown in figure 2. This illustrates the changes in the form of a chart where varying amounts of total erosions or accretions occurred, along with a graph showing the exact amount of NSM at each 150m transect. The results in Figure 02 show that much of the study area has experienced both negative and positive NSM over the studied period.

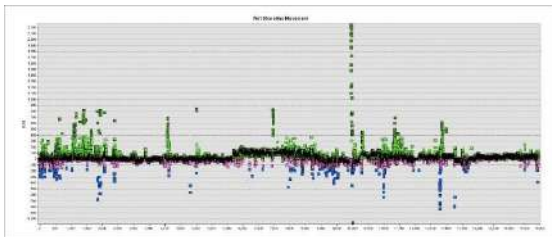


Figure 2: NSM over 17 years

Overall, 45.6% of the study area has experienced positive NSM with an average movement of 41.5m. The greatest NSM was 2,314.38m and occurred in the Colombo district coastal area in the western coast due to the Port City project, while the greatest advanced (landward) movement was -305m. Around, 27.2% of the study area has experienced negative NSM with an average movement of -29.8m. This erosion occurred mainly in some parts of the eastern coastline, western coastal area as well as in the south-western coastal area. Moreover, within the total transects, 27.2% of transects showed no detectable change (Table 1).

Table 1: Summary of Erosion and Accretion Statistics

Net Erosion (%)	Maximum Erosion	Net Accretion (%)	Maximum Accretion
27.2%	305.96m	45.5%	2314.38m

In addition to the NSM, the Shoreline Change Envelope (SCE), which is the greatest distance between shorelines regardless of time and direction, was computed. Even though, the SCE shows more variability and dynamics of shoreline movement. Most of the shoreline transects has happened due to significant man made changes and not due to natural causes over the studied period. Table 2 summarises the SCE statistics that correspond to the maximum and minimum NSM of 2314.38m and -305.96m respectively.

Table 2: Summary of Shoreline Change Envelope (SCE) Statistics

Average	Maximum	Minimum
39.77	2314.38	305.96

DSAS calculates three different statistics to represent the rate of horizontal shoreline change over time (m/yr). These are the End Point Rate (EPR), the Linear Regression Rate (LRR) and the Weighted Linear Regression Rate (WLR); where the EPR is simply the NSM divided by the total period (17 years). Hence, the maximum EPR was the NSM value of 2,314.38m divided by 17 years, which equates to 135.7m/yr. Similar to the NSM results, 27.2% of the study site transects have negative rates (erosion), while 45.5% have positive rates (accretion). The maximum EPR was the NSM value of -185.98m divided by 17 years, which equates to -10.94m/yr. These statistics are summarised in Table 3 and Table 04, respectively.

Table 3: Summary of Accretion Rates

Average Accretion Rate	Percent of Positive Rates (Statistically Significant) (%)	Maximum Rate of Accretion
2.6 ±5.8	45.5%	135.7 ±11.6

Table 4: Summary of Erosion Rates

Average Erosion Rate	Percent of Negative Rates (Statistically Significant) (%)	Maximum Rate of Erosion
-1 ±2	27.2%	-30.8 ±5.5

The results of the coastal change analysis using Digital Shoreline Analysis System (DSAS) over the study period of 17 years of long-term, the coastal change measurement and the rate, highlight significant patterns of coastal dynamics that have critical implications for coastal management and planning. According to the results, 27.2% of the transition zones show an average erosion of -29.8m per year. This rate is substantial for a small island like Sri Lanka. Maximum erosions are observed especially in the northern, eastern, western and southern parts of Sri Lanka and the same was confirmed by the previous studies. These areas are highly vulnerable to wave action, natural disasters, human activities and sea level rise.

According to the study, erosions are lesser in north eastern and north western coast. Iranawila beach is also mostly threatened due to beach erosion in Puttalam district. In 2010 at Oluvil Harbour area, severe impact of coastal erosion extended to Saindamarudu, covering 16 km north of Oluvil Harbour, in which the country lost more than 100m of coastal strip in the study period. Furthermore, due to flood control measures in 'Kalu Ganga' in estuary by

expanding 2017, the barrier beach of Kalutara (Kalido beach) has been destroyed. These flood control efforts resulted in severe erosion that spread over 3km, passing the Tangerine Beach Hotel and Royal Palm Beach Hotel. Moreover, a sand bar is developing in a different orientation at the 'Kalu Ganga' river estuary and due to this situation, direct waves and river flow affected the island, and about 100 m of land washed away along the coast of the island. Further, Galle in the southern coast is one of the most vulnerable areas of erosion. Hikkaduwa and Habaraduwa are the most vulnerable of the erosion identified on the South coast. In addition, Trincomalee and Batticaloa have minor erosion conditions due to regional seasonal changes. Moreover, as shown in Figure 03, it can be observed that the country is losing a strip of land along the Oluvil beach.

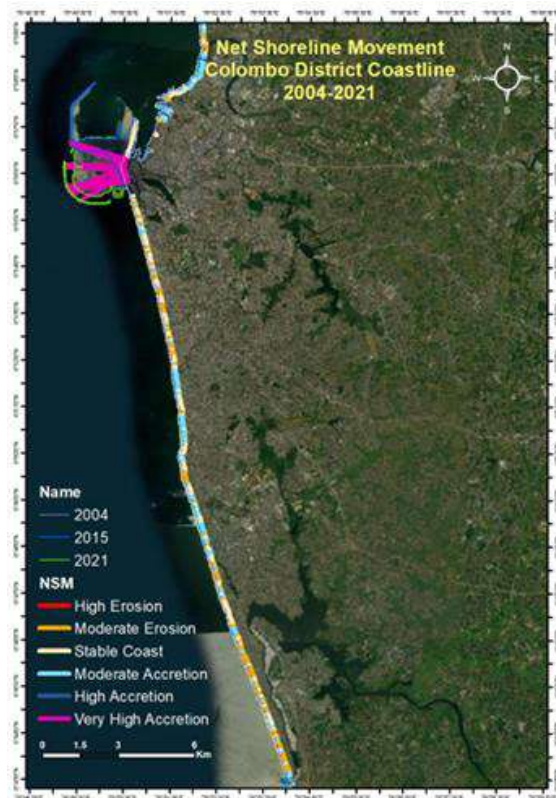


Figure 3: Coastal Erosion in the Oluvil Coastline

Coastal accretions are important due to formation of new lands; enhance coastal protection by buffering against storm surges and erosion, and support habitats for diverse marine and terrestrial life. According to the study, most of the southern and western parts of Sri Lanka taking averaging accretion as a result from reduced wave energy due to sediment deposition from upstream systems and the presence of natural breakwaters. The main changes of shoreline accretion can be identified in the Colombo Port City Project, Hambantota Port and other anthropogenic structures. According to the results of this study, 45% transects records beach accretion

including, the Port City project. Along with the analysis data, 45% has been recorded in terms of beach accretion. Although the amounts have been recorded as 45%, natural beach accretions are mainly identified in south of Oluvil harbour and around Kalpitiya and minor accretions notably taken place in the north eastern coast. This suggests that these areas can act as sediment sources for eroded zones if sustainable sediment management practices are instituted. Additionally, these available lands can be utilised for the development, recreational purposes by enhancing the security of local economies and communities.

The results of this study support the hypothesis and stress the necessity of constant observation and evaluation of shoreline changes to develop effective strategies for coastal security. Thus, erosion and accretion analysis help stakeholders to decide which areas require the most attention and funds and which regions should be focused on to safeguard infrastructure and community from potential natural disasters such as flooding, storm surges to improve the safety of inhabitants of coastal areas. The future studies should encompass long-term changes and incorporate socio-economic aspects in order to analyse the effects of shoreline shift on habitats and their security while providing safe and sustainable coastal environment.



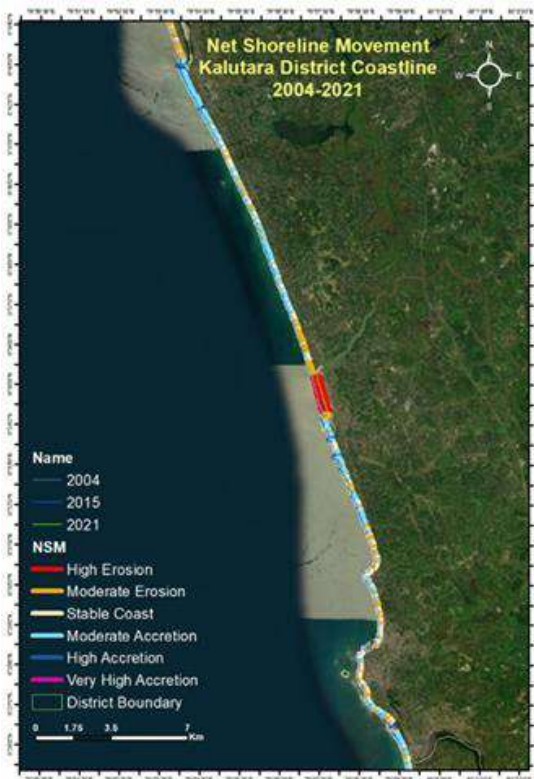


Figure 4: Net Shoreline Movements around the main island of Sri Lanka and few districts

CONCLUSION

This paper compared shoreline changes of the coastline of the Sri Lanka in the period of 2004 - 2021 and demonstrated net shoreline changes during the studied period. According to a coastal erosion trend analysis carried out by Abeykoon L.C.K et al., 2021 covering the 2005-2019 period, focused on the Western and North-western provinces revealing average coastal erosion rates of -1.21 ± 0.04 m yr⁻¹ in Kalutara, -0.54 ± 0.63 m yr⁻¹ in Colombo, and -0.7 ± 0.58 m yr⁻¹ in Gampaha district respectively. Puttalam district showed a 0.26 ± 0.07 m yr⁻¹ average accretion rate, while the highest accretion rate (0.95 ± 0.58 m yr⁻¹) was evident in the coastal region of Wilpattu National Park, an area that has few anthropogenic interventions.

The study results found that the application of hard structures to mitigate the effect of coastal erosion has increased within the past 17 years. According to the Coastal Zone and Coastal Resource Management Plan 2024 – 2029 of Coastal Conservation Department, by the end of 2019, the country mainly used revetments up to 23,554 m in length (occupying 9.05% of the total study area), consisting of 18,960 m in the Western province (7.29%) and 4,594 m in the Northwestern province (1.76%). The Western province has applied more hard structures at a higher rate than the Northwestern province due to mega-development projects.

Using multi-temporal satellite images acquired over a 17-year period (between 2004 and 2021), shoreline dynamics along the coastline stretch of Sri Lanka (main island) was extensively investigated. The analysis revealed that some of the evaluated areas were experiencing significant erosions as well as accretions. The areas around the Puttalam, Galle, Matara, Gampaha (Pamunugama), Hambantota, Ampara, Batticaloa, Trincomalee (the canyon in the Trincomalee Bay traps most of the sediment supplied by the Mahaweli river), and Jaffna (Vankalai and Kondachikudah) are high erosion risk zones. According to the research findings and the literature of the previous studies in the specific areas, natural reasons such as loss of sand due to breaching and wash-over of a sand berm, offshore sand loss during extreme wave and storm surge conditions, loss of sand due to presence of canyons, deposition of sand at sand spits and dunes, loss of coastal vegetation, tsunami, cyclones and other episodic events, and Sea level rise accelerate the erosion.

In contrast, high threatening anthropogenic factors to the coastline that have identified in the study are beach sand mining, river sand mining, construction of buildings and other structures too close to the beach and on sand dunes, breaching sandbars at river and lagoon outlets and construction of unplanned or poorly planned rigid coastal structures, etc. It can be seen that accretion processes are taking

place due to the natural flows of the major rivers in the study area and due to the activities of illegal sand mining in the respective rivers. Accordingly, the conclusions derived from this study can be applied to improve the future stability of the identified area and the construction of appropriate coastal structures in the entire coastal region of Sri Lanka. In view of this, they do enrich the knowledge on coastal security challenges emanating from coast erosion and sedimentation, hence safeguarding critical infrastructure, human dwellings and sensitive ecosystems that embrace the coastal regions. It is no doubt, the experiences derived from this study shall assist future Coastal Zone Management in the formulation of policies and measures to protect regions vulnerable to erosion and sedimentation, thereby achieving long term security and coastal resilience for the people of Sri Lanka.

Therefore, there is a need to emphasise the limitations and future research directions of this coastal study. Using 30 m resolution Landsat images, which are available free data, some constraints are encountered in the research and those constraints have affected the accuracy. Especially in cases related to location, a source (Google Earth Pro) or its authenticity should be confirmed. Integrating other data sources such as drone imagery, aerial photography or light detection and ranging (LiDAR) data can be explored to improve the accuracy of coastal mapping and expand detection. In addition, advances in satellite technology may provide higher resolution images enabling more detailed, accurate analyses in the future, and such studies will be more likely to collect data using present information. Furthermore, the researcher hopes that this research will serve as a basis for future research in the field, for policymaking and security confirmations in related sectors, to have a basic understanding of coastal dynamics, and to find valuable discoveries by minimizing the limitations to be faced. It will guide future researchers in designing and conducting studies that are more informative and focused on enhancing coastal security.

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THE COMPETENCY OF TAMIL AS A SECOND LANGUAGE FOR THE RECONCILIATION INITIATIVE: A CASE STUDY BASED ON THE ARMY PERSONNEL IN MULLAITIVU DISTRICT

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ABSTRACT

This study is an exploration of the Second Language Competence, i.e., Tamil, among the Army personnel in the Mullaitivu district and its impacts on their contemporary role of eradicating misperceptions and building a healthy relationship between the Tamil community and the Army personnel. The provision of humanitarian assistance and organising Community Service Programmes for the people by troops demand much-needed essentiality for verbal communication in Tamil. It has become an impediment and a challenge for the Army personnel, who have a Sinhala-speaking background, in their contemporary role since their knowledge of Tamil is far below. The study explored how best competency in Tamil can be employed, winning the hearts and minds of the people to determine sustainable peace. This phenomenon was gauged by distributing three separate questionnaires among 150 individuals, i.e., the public, school children, and the Army personnel in the Mullaitivu district. The speaking ability has

earned comparatively the most important tool of communication to interact with both parties during the data analysis. The major finding revealed that the ability to communicate with the negotiating party in their own language facilitates the eradication of misperceptions and misunderstandings while building mutual understanding, and healthy relationships. The study concluded by emphasising the gravity and the sensitivity of learning Tamil by the Army personnel as a sense of humanity rather than an obligatory fact to achieve an inter-ethnic healthy relationship, an initiative for ethno-linguistic reconciliation towards enduring peace.

KEYWORDS: *Healthy Relationship, Misperception, Mutual Understanding, Reconciliation, Second Language Competence.*

INTRODUCTION

The geographical and historical factors contributing to Sri Lanka's ethnic and cultural diversity, coupled with the impact of language

dynamics during and after the conflict, underscore the critical importance of fostering mutual understanding through language proficiency, particularly in post-conflict regions like Mullaitivu, where the military's engagement with Tamil-speaking communities remains essential for reconciliation and rebuilding trust.

The geographical location of Sri Lanka in the center of the Indian Ocean and its proximity to India has been a point of convergence of the routes of international sea-borne trade and it decisively influenced Sri Lankan history, her ethnic, and cultural diversity (The Ministry of National Coexistence, 2017). According to Bush (1999), the island had shared with Hindu Tamils, Tamil-speaking Muslims, and Tamil/Sinhala-speaking Christians even though the Sinhalese Buddhists existed as the majority in the country. Sri Lanka had experienced a multi-ethnic society, periods of harmony, as well as conflicts, in the centuries prior to the colonial period. Sri Lanka, a country with a majority of Sinhalese, became home to various groups of people that speak several languages, i.e., Sinhala, Tamil, English, Malay, Creole, and Vedda Language, in her boundaries.

According to Coperehewa (2011), there had been a debate between British

administrators and missionaries, during the early nineteenth century, deciding on what kind of language policy should be introduced for education and it was the first impact on questioning the language policy in the country. Perera (2015) views that dynamics in language due to the politicization of language had paved the way for the most potent manifestation of the Sinhala-Tamil conflict and managed to occupy the centre-stage of Sri Lankan politics during this period. The situation was further developed, especially unto a complexity over the use of language blended with a sense of discrimination, during the post-independence scenario, leading many controversies to have an unpleasant experience of communal riots, violence and a three-decade conflict in the North and East in the country. During the post-conflict "Sri Lanka embarked on an essential and long-term two-fold post-conflict strategy: (i) rehabilitation and reintegration of former Liberation Tigers of Tamil Elam (LTTE) combatants, and (ii) the rebuilding of the conflict-affected Tamil communities of the Northern and Eastern provinces" (Dharmawardhane, 2013, p. 27). Mullaitivu district is located in the North-eastern part of Sri Lanka and belongs to the Northern Province. The district is administratively entailed in 6 Divisional Secretariats.

Table 1: Ethnic Wise Population

Divisional Secretariat	Sri Lankan Tamils	Sinhalese	Sri Lankan Moors	Burghers	Total
Maritimepattu	34916	877	6786	2	42581
Puthukkudiyiruppu	41336	-	72	-	41408
Oddusudan	19435	33	93	-	19561
Thunukkai	12790	-	-	-	12790
Manthai East	9825	17	16	-	9858
Welioya	29	11589	9	-	11627
Total	118331	12516	6976	2	137825

Source: Statistical Hand Book, 2021
(Mullaitivu District)

The Mullaitivu District is a Tamil-speaking majority who resettled after the conflict and no significant Sinhala-speaking presence except the Divisional Secretariat Welioya. In July 1996, the LTTE consolidated the area, having overrun the Mullaitivu Army Camp, the only military base in the area (Ministry of Defence, 2011; Times, 1996). This was the leading cause for distancing the Tamil people in the district from the governing regimes, people in the south, and Sinhala-speaking military presence.

In the protracted conflict between Tamil separatists and the Government of Sri Lanka, the district of Mullaitivu, along with its demographic features, was a strategically important ground. According to the sources of the District Secretariat, Mullaitivu (2021), it covers the forest by 65.33% of its total land, making a favourable battlefield where the Army in July 1996 and Tamil separatists in May 2009 met their Waterloo consecutively, (Ministry of Defence, 2011; Times, 1996). Moreover, the people in the district had an experience of the most extensive hostage rescue operation in the world, during the final phase of the conflict, conducted by the Security Forces of Sri Lanka (Sri Lanka Army, 2009)

The ability to defeat an insurgence in a military campaign is limited, especially in a multilingual country like Sri Lanka, and the rest will be of the gesture of solidarity to rebuild the friendly relationship - social, cultural, political, and linguistic spectrum - between the affected communities, i.e., Sinhala, Tamil, Muslim, and other minorities. People in the Mullaitivu have painful, bitter life of experiences and psychological trauma in their lives for years due to the imprints of internal conflict. Accordingly, the interaction of the Security Forces with the affected community, during the post-war situation, has been an unprecedented challenge as the wounds and painful reflections of the conflict remain ineradicable in their minds. The

troops of the Army as the representatives of the government, the majority who speaks Sinhalese, have to associate closely with the Tamil community in the Northern Province to uplift the livelihood of the people. Increasingly, it has been a conceivable opportunity for the military to root out the misunderstanding, misperception, and mistrust in the minds of the people.

The organizing of psycho-social events and Community Service Programme (CSP) or Civil Affairs programme beneficial to uplift the livelihood of these resettled people has become one of the primary roles of the Army, especially in Mullaitivu, aligning the aim to win their hearts, minds and minimize the friction between the civilian population and the military as well (Security Forces Headquarters (Mullaitivu), 2010). In this plausible scenario, the ability to maintain verbal communication in Tamil, i.e., Second Language, is a much-needed essentiality of the Army personnel in the area and its incompetence has been a challenge, a restriction for mutual understanding, and an issue which remain unsolved and unidentified by the responsible authorities where the language affinity has come to the fore and a direct predominant bearing to the reconciliation initiative of the government.

LITERATURE REVIEW

The initiatives on determining a language of administration in Sri Lanka by the rulers during the colonial period and the post-independence era were central on negative impacts on the social integration, reconciliation, and also a root cause for the division of major communities dragging for a conflict. The ethnic and socio-political controversies during these periods witnessed the lucid exposition of inefficiency of the regimes on determining the National Language Policy in the country.

LANGUAGE: A TOOL FOR RECONCILIATION

It is obviously evident that former enemies or victims must live together following a conflict, especially, if it happened within the same territory. According to Brounéus (2007), in recent years there has been increasing discourse concerning reconciliation as a post-conflict measure for the prevention of further conflict. Jayathilake et al. (2022), defines that language allows, being a common tool of communication, people to share their own set of feelings, ideas, attitudes within groups and societies while conceptualizing as a worthy tool for reconciliation. It further states that the two-edged concepts, “language” and “reconciliation” can be consistent in a multiethnic society where the language is deemed a tool enabling human interactions and relationships within ethnic groups. Wakkumbura (2016) explains, the importance of language for social reconciliation: Sri Lanka’s ethno-cultural setting and governance structures too have led to complexities over the existing language policy. It further asserts that, after the conflict, the existing political movements in the country had however focused on ‘Sinhala’ and ‘Tamil’ as the official languages and ‘English’ as the link language for social reconciliation.

POLITICIZATION OF LANGUAGE AFTER INDEPENDENCE

Yusoff et al.(2015), states that “like many pluralistic states, Sri Lanka has witnessed the phenomenon of minority language rights becoming one of the major contested issues in post-independence governance. Both the initiatives of democratic governance and development administration have failed to accommodate the due rights, concerns, and grievances of ethnic minorities” (p.31).

Jayathilake (2017) says that “when the independence to Sri Lanka was granted in 1948, Sinhalese political leaders attempted to recoup political and economic influence and extended their power to marginalize Tamils through linguistic means” (p.190). This is justified by Yusoff et al.(2015) saying that “the introduction of Sinhala as the only official language on political grounds shifted the status of the Sinhala language to a superior level and placed the Tamil language in an inferior position, thereby relegating Tamil to a limbo of official nonexistence”(p.35). According to Sarjoon (2009, as cited in Yusoff et al.,2015), the politics of language - recognizing the language of the majority (Sinhala) as the state language and the denial of identifying the language spoken by the minorities (Tamil) — is the primary root cause that transformed the clash between the majority and minorities into violent ethnic conflict in Sri Lanka (p34). In the findings of the language policy in Sri Lanka’s critical junctures and resistance factors preventing successful implementation, Wyss (2020) states that “the adoption of this postcolonial language policy marked not only a turning point in ethnic relations in Sri Lanka, but also the triumph of linguistic nationalism that led to the domination and the marginalization of the Tamils, drove the Sinhalese and Tamil communities asunder and caused the division and the mobilization of ethnic differences around language”(p5).

TRIGGERING THE DIVISIONS OF MAJOR COMMUNITIES

Jayathilake (2017) sees that “the British administration’s policies favoured the Tamil minority and subsequently had a negative impact on the unity between Tamil and Sinhalese populations” (p.190). Christopher (1988) elaborates that British, during their rule, adopted the “Divide-and-Rule” policy promoting the territorial separation through segregation and partition the communities for a long lasting geographical consequences and

it caused the division of major communities bringing them into conflict, an imperial heritage, as the number of current problems and crisis testify with colonial origins. De Votta (2007) says that “the marginalization of Buddhism during colonialism; Britain's divide-and-rule policies that favoured the Tamil minority; the subsequent Tamil overrepresentation in the civil service, armed forces, universities, and professional bodies; and the political maturity and patron-client expectations generated from voting had contributed to the clamour by Sinhalese Buddhist forces for a Sinhala-Only policy” (p. 17). Perera (2015) also views that “the passing of the Bill made language a permanent and thus irreconcilable and contested domain in the Sri Lankan inter-ethnic conflict. Moreover, the nonviolent protests organized by Tamil leaders to question the provisions of the ‘Sinhala-Only Bill’ ushered in the first wide-scale anti-Tamil violence in the century” (p.57). This is asserted by Wyss (2020), “the frustrations of the Tamils and the ethnic tensions ultimately culminated in a bloody civil war between the Sri Lankan government and the LTTE that lasted almost three decades and claimed the lives of many Tamils and Sinhalese” (p.57). Peiries, & De Silva (2003) state that in response to the grievances of the Tamil community, the argumentative language policy of the government of Sri Lanka reached its destination, earning the official status with due prominence of Tamil language in the country.

ROLE OF ARMY PERSONNEL IN MULLAITIVU DISTRICT: A NON-TRADITIONAL ROLE

SFHQ (MLT) (2010) describes that the Army- the ground troops- in Mullaitivu District has been entrusted with the involvement to strengthen the livelihood of people in the area and it had become a primary non-traditional military task of them soon after the armed conflict.

According to District Secretariat, Mullaitivu (2021), all the people in the area were resettled after the conflict; it can be illustrated below:

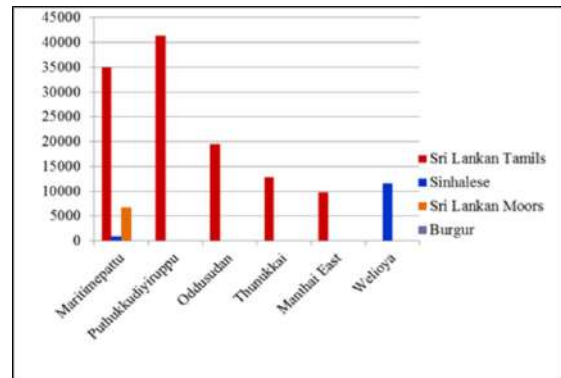


Figure 1: Resettled population in Mullaitivu District

Source: Statistical Hand Book, 2021 (Mullaitivu District)

The article in the Office for the Coordination of Humanitarian Affairs (OCHA), Reliefweb (2014) witnesses the role of the Army in constructing houses for the resettled people in Mullaitivu. The Ministry of Resettlement had provided the financial allocations for the construction of houses and the labour and the civil engineering expertise were provided by the troops serving under the Security Forces Headquarters Mullaitivu. Sri Lanka Army (2016) further witnesses its unwavering effort in constructing the houses for the resettled families in the area. In the post-conflict context, the role of the Army in Mullaitivu was to establish a healthy relationship between this community, understanding their plights and concerns. The provision of humanitarian assistance to uplift their livelihood by the Army in the area however earned a greater sense of meaning.

TAMIL AS A SECOND LANGUAGE: AN ESSENTIALITY FOR THE ARMY PERSONNEL

Article 22 of the Constitution of Sri Lanka¹ provides the right to receive service from the language of administration for the people - Sinhalese in Sinhalese-speaking provinces and Tamil in Tamil-speaking provinces. The constitution of Sri Lanka further states: "In a particular area where a substantial proportion of minority language speakers are available, people in the said area to receive administration from both languages". This is a clear guideline and indication for the administrators to use language in a particular area. In line with this policy, the Army personnel in close contact with the people, especially in Northern Province, are no exception to having the Second Language (L2) competence. Organizing psycho- social events and Community Service Programmes (CSP) beneficial to the resettled people in this area are a much-needed requirement to uplift their livelihood, which subsequently became a primary role of the Army. The article OCHA, Reliefweb (2014) quotes the statement of then the Secretary of Defence, Mr. Gotabaya Rajapaksa in which he identified the importance of learning Tamil: "Terrorism would be reorganized and reactivated if ignored. The mutual relationship and understanding between the military and civil society should be strengthened by diminishing the language barrier. Tamil language speaking proficiency of the armed service personnel would be enhanced targeting a good service to the Tamil community". In line with the above, Lekamge (2015), in his findings, says that the inability to communicate with Tamil people had created a growing distance between military forces and civilians in Tamil predominant areas. Lekamge (2015) further elaborates that the military, on the contrary as opposed to the contribution of other members of the community from

¹ See the Constitution of the Democratic Socialist Republic of Sri Lanka <https://www.parliament.lk/files/pdf/constitution.pdf>

the South and bureaucracy, has greater responsibilities towards reconciliation as they are the only element that associates the affected population at all-time whilst representing the Government and Sinhala community at the most.

METHODOLOGY

This research, which is exploratory but applied, reveals the practical phenomena. The study attempts to find how the competence of L2 is effective and useful for Army personnel in the Mullaitivu district to build mutual understanding between both parties while eradicating the misperceptions of each other. It makes recommendations to enhance the effectiveness of Second Language Competence (SLC). This study was designed to reveal insight driving research objectives and questions. The technique of in-depth study on various secondary sources on the subject, the personal experiences of the researcher, and primary sources such as interviews took the features of mixed method- qualitative and quantitative-approach. In order to derive sound recommendations, the researcher applied to collect primary data from 6 Divisional Secretariats of Mullaitivu district i.e., Maritimé pattu, Puthukkudiyiruppu, Oddusuddan, Thunukkai, Manthai East, and Welioya considering its demographic distribution, and Army personnel serving under 3 Infantry Divisions in Mullaitivu i.e., 59 Infantry Division, 64 Infantry Division and 68 Infantry Division. The sample size for the study was limited to 150 personnel - School children from grade 10 to grade 12, adults from the public, and Army personnel in the field - covering the entire district accordingly. Interviews were carried out to gain information such as individuals from government officials, entrepreneurs, school teachers, community leaders, school children, senior Army officers, and soldiers in the area. The personal experiences of the researcher - service in the

Mullaitive District for more than a period of one and a half years after the conflict and the total service of 13 years in the Northern and Eastern Theater of War — were used for the exploration of the problem. The secondary data in the study were the scrutiny of journal articles, articles in periodicals, books, official publications of the government, official websites of Security Forces, and the experiences of other researchers cum authors of other World Wide Website papers as well. In order to identify the issues in the area of the study and make viable recommendations for them, descriptive and correlation analysis along with inferential analysis was used to analyse the data.

CONCEPTUAL FRAMEWORK

This study explores the role of SLC - Tamil - by Army personnel in promoting healthy relationships while eradicating misperceptions among most minorities to achieve the anticipated reconciliation for enduring peace. The relationship between SLC (independent variable) and reconciliation (dependent variable) conceptualized to explore the study's logical structure and the variables' relativity. The following model (Figure 2) was developed to make the discussion more accurate based on mind mapping. It attempts to cover the areas discussed under the study's research questions.

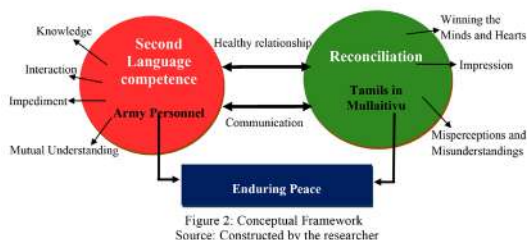


Figure 2: Conceptual Framework
Source: Constructed by the researcher

CONCEPTUALIZATION ANALYSIS

The findings below correlate the objectives of the study and the research problem: verbal communication between Tamil community has become a great challenge for the Army personnel due to the incompetence in their L2 and a sensitive issue making a barrier in winning the hearts and minds of the people.

The study reveals the impacts and direct bearing of the constructs, as introduced under the independent and dependent variables, to communicate with the people in their language of Tamil, leading to the ultimate achievement: enduring peace in the country.

INTERACTION

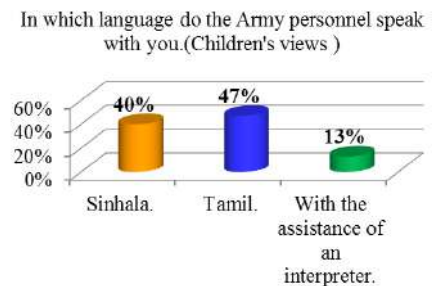


Figure 3: The language in use by the Army personnel

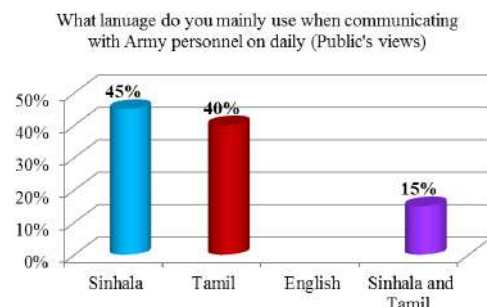


Figure 4: The language in use by the public

It can be identified that communication is the basement of worthy interaction, which helps to develop healthy relationships. the Researcher has found that it has become a common practice to employ a soldier who is good at Tamil to communicate with people when they are on duty. The results in Figure 3, therefore, might be the reason for earning 47% but it is a showcase of possible and practical approaches for school children to have healthy interaction. In another way, Sinhala has come in second of the order in the chart with a substantial percentage. It proves the Army personnel's incompetence in Tamil as they are fully aware that the children in Mullaitivu don't have the ability to use their L2, i.e. Sinhala.

The statistics in Figure 4 indicate that the public primarily, in their routine work, communicates with the Army personnel in Sinhala and it determines the incompetence in L2 of the Army personnel. The situation of this nature indicates a future development of a Sinhala-dominant context in the area, depriving them of their right to receive the service in their own language of Tamil as stipulated in the constitution.

In another way, on many occasions, as experienced by the researcher, getting the assistance of an interpreter from the Tamil community in the area has been very common, especially in addressing the people by senior Army officers, when interacting with school children and people in CSPs in the area. It is however observed that the message to be conveyed to the audience doesn't reach, as the speaker expected, since the interpreter, a Tamil individual, found in the same area, replaces the words depending on his knowledge of Sinhala. The charts above further elucidate that the Army personnel in the area, being the representatives of the government and the official force of the country, are unaware of the value, sensitivity, legal obligation, and worthiness of communicating with the school children and people in their language of Tamil.

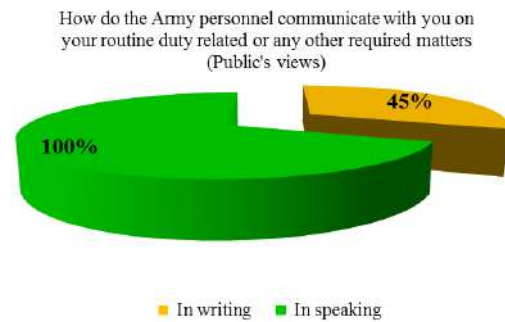


Figure 5: The mostly used language skill

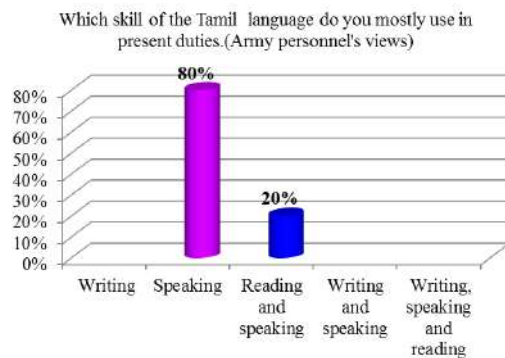


Figure 6: The mostly used language skill

The troops on field duties are the first to contact the public and they communicate with them on various matters related to their job of work. Figure 5 and Figure 6 indicate which language skill is being mostly used and what language skill of the Army personnel to be improved to maintain the relationship. The effectiveness of speaking ability bears the degree of interaction needed to earn a place for the Army personnel in their hearts and minds. It is a question that remains unaddressed whether the responsible authorities have understood the sensitivity and the prominence to improve the ability of Army personnel to speak in L2. As per the result in Figure 5 and the experiences of the researcher, writing literacy finds the least value except for very special reasons, i.e., handbills, notices, posters etc, for public awareness programmes. As explored by Somasundaram (2008), the conquest of the Kandian kingdom of Sri Lanka by the British is a fine lesson in how the initiatives and motives in John D'Oyly's

letters to the Kandyan Kingdom facilitated him in winning the hearts and minds of Kandyan nobles and the employability of his competence in Sinhala, in the process of psychological infiltration, to subjugate the militarily impenetrable Kandyan kingdom. It explores how best a negotiating party's language can be employed to get control of an entire country.

KNOWLEDGE

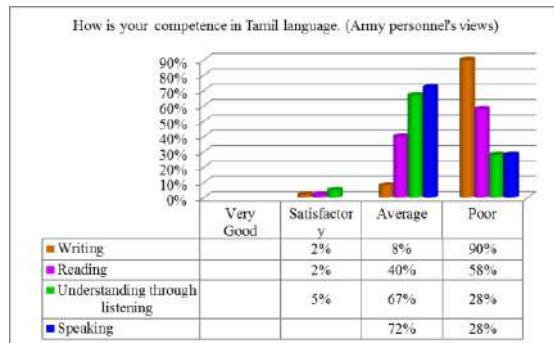


Figure 7: The competence in Tamil

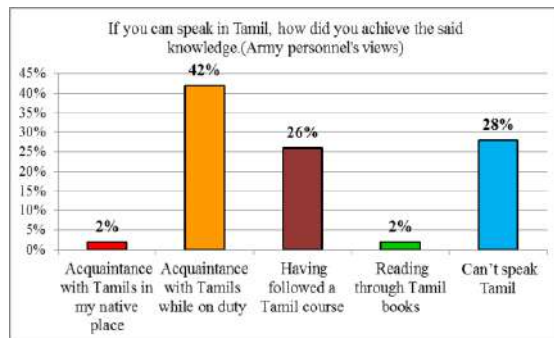


Figure 8: The competence in Tamil

The percentage for speaking ability of L2 in Figure 7 and Figure 8 reveals that they commonly agree their ability to speak in L2 is average, and it might be of their acquaintance over the people in the area. It further finds at chart above that the Army personnel have accepted 28% of them are 'poor at speaking' or 'can't speak Tamil'. This is an issue that hinders their present role of duties to close with people and such a result is inadmissible as the Army personnel in the sample group was had completed a period of service over 3 year

acquaintance over the Tamil community. The statistics in Figure 8 and the interviews with the community leaders, entrepreneurs and government officials in the area derive that both parties have acquired their L2, after the conflict, having acquainted with each other when dealing with their routine work. It fosters language compatibility and language harmony, which establishes the foundation for a strong relationship. Usually, a Tamil course at Army training encompasses important information i.e., culture, beliefs, customs, traditions, and norms, rather than teaching language skills for which 74% of the group have missed the said opportunity.

IMPEDIMENT

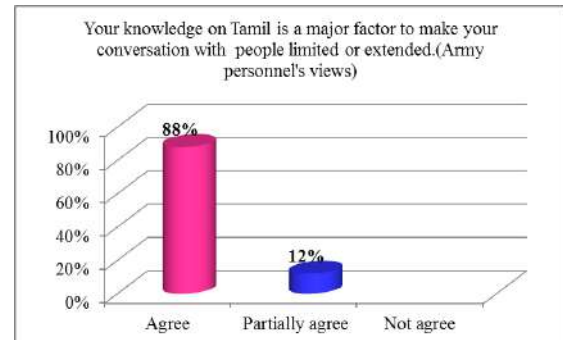


Figure 9: The major factor for conversation

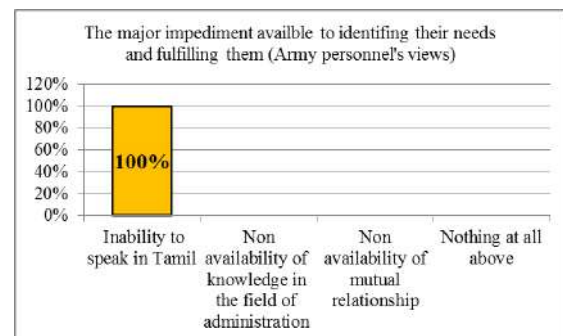


Figure 10: The major factor for conversation

The outputs of Figure 9 above reveal that most of the Army personnel usually limit their interaction with the Tamil community due to the language barrier, missing their good opportunity to interact and build healthy relationship. This is another issue of distancing people from missing an opportunity to eradicate the misunderstanding and misperceptions. It was found at the interviews and Figure 10 that the incompetence in Tamil influences the Army personnel to approach a selected group of people, who are good at Sinhala, in the area to identify the needful of the people, not the government officials. The approach and interaction with such a group of people make good relationships and bridge both parties. The terms of this nature, especially interaction with the senior Army officers, however, give these people prominence in the community while becoming community leaders. In the interviews with the public and government officials, it was revealed that such an exposure to the Army personnel by these people, has led to negative repercussions and developed bad impressions on Army personnel as some of them have abused their interactions with Army personnel for their gains. Further, such situations impede the identification of the needs of the people. The researcher however, finds no measures have been taken to improve the competence in L2 of the Army personnel by the responsible authorities but conduct a number of CSPs to build mutual understandings and healthy relations which are incapable to produce favorable outcomes for the future bearings.

MUTUAL UNDERSTANDING

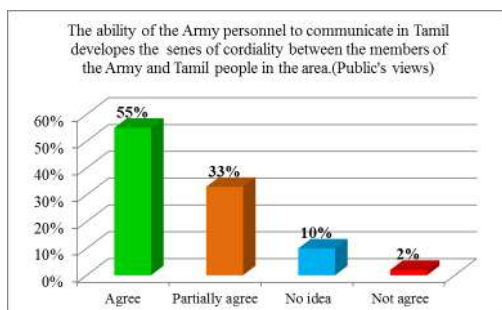


Figure 11: The significance of the language

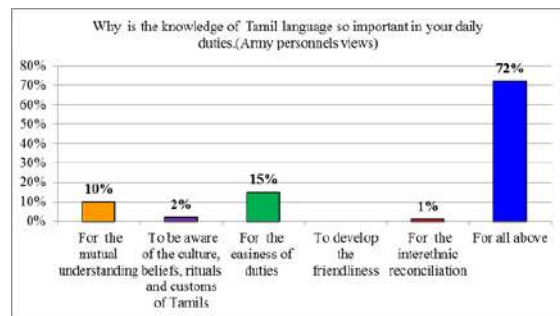


Figure 12: The significance of the language

The results 'agree and partially agree', in Figure 11 describe that speaking to them in their language is the key to building a sense of cordiality, earning mutual understandings, and eradicating misperceptions between Army personnel — the Sinhala-speaking body representing the South of the country— and Tamil people in the area. It further opens the eyes of the Army personnel to understand the significance of speaking to them in their language of Tamil, which justifies the saying of Nelson Mandela, the first black president of South Africa, as mentioned by Weber (2011), "If you talk to a man in a language he understands, that goes to his head. If you talk to him in his own language it goes to his heart". The response of 72% in Figure 12 suggests that they have understood the gravity, national value, and the sensitivity of knowing Tamil. The competency in Tamil, therefore, is not merely a duty centered purpose but rather a deeper meaning that demands a sense of humanity to achieve an inter-ethnic healthy relationship.

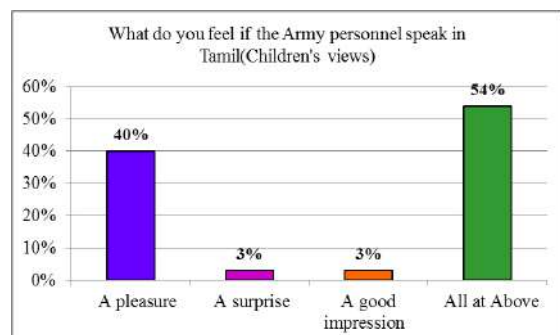


Figure 13: Impression of Army personnel

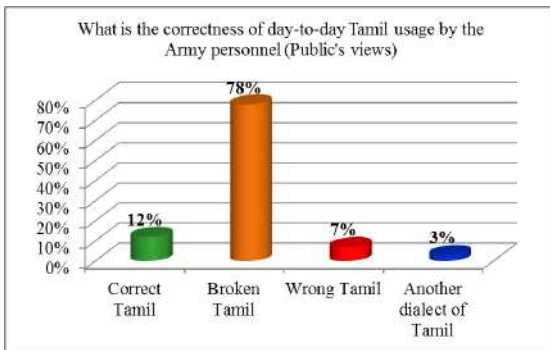


Figure 14: Correctness of Tamil

IMPRESSION

The results in Figure 13 above illustrate that the school children feel pleasure, get surprised and have a good impression on Army personnel if they speak to them in Tamil. This is a good impression in the hearts of children that can earn healthy relationships. It further stresses that such an impression has the bearing on eradicating misunderstanding and misperception on Army personnel and it leads to a healthy relationship ultimately.

The statistics in Figure 14 above have found that the majority of the Army personnel, in contact with the public, very often use substandard and imprecise Tamil. The results, however, determine the lack of clarity and due respect to the language is unavailable in the flow of a message to the receiver. It further explains how it damages the language identity, purity, and language affinity as well. When considering the total percentage for 'Broken Tamil' and 'Wrong Tamil', the use of L2 by Army personnel bears a question on the language clarity and purity and a situation of this nature cannot be accepted from an official force.

MISPERCEPTIONS AND MISUNDERSTANDINGS

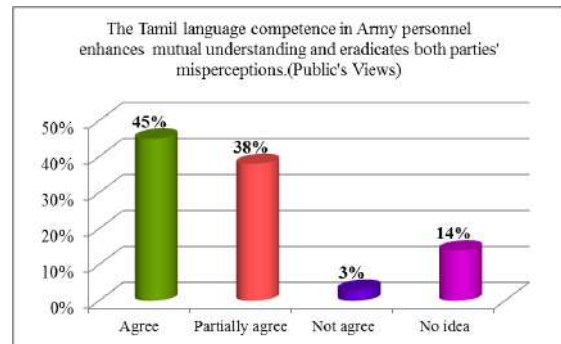


Figure 15: Misperceptions and misunderstandings

After overrunning the only military base in Mullativu town by Tamil separatists in year 1996 July (Ministry of Defence, (2011), people in the district distanced themselves from the governing regimes and also from the Sinhala-speaking military personnel. At the interviews with the community leaders in the area, it was revealed that the hearts and minds of these isolated people were empowered with the sense of discrimination of the South and misperceptions. It is a widely recognized fact that both parties experienced misunderstandings due to various reasons, especially the consequences based on the incidents during the conflict. Maintaining verbal communication can suggest that more facility to understand them will pave the way for a healthy relationship. The statistics in Figure 15 above explain that the public in the area agrees that speaking to them in their language eradicates the misperceptions and misunderstandings of each other. The statistics in Figure 15, in another way, speak that the general public is of the opinion that the language barrier develops misperceptions and misunderstandings and distances the mutual understanding.

WINNING THE HEARTS AND MINDS

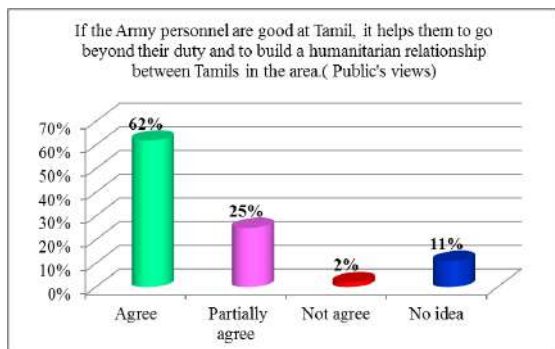


Figure 16: Humanitarian relationship

The findings in Figure 16 realize that the public is of the view that social possibilities are available for the Army personnel to go beyond their limits positively in building humanitarian relationships if they are good at Tamil. It justifies that learning Tamil is merely not only a duty-centered obligation but also a moral and ethical need to live in harmony. The statistics in Figure 17 find that the Army personnel have identified the most important group of people to win the hearts is 'Children at the age 7-20' and the second most important group is 'Adults at the age 30-60'.

Indisputably, both adults and youths retain bitter experiences of the conflict in their hearts and minds. The perceptions on Army personnel, as engraved in their hearts, due to the conflict cannot be eradicated easily, and it needs a considerable time. Since the schoolchildren in the area have grown up with the association of these two generations, they might share their experiences in the conflict developing the misperceptions in their minds. The social environment, motives, intentions, and perceptions of these three generations are different and communicating with them demands a careful but a methodical approach. In possession of an appropriate set of words, tone of speech, politeness of speech and power of expression have a direct bearing on approaching these groups separately. Therefore,

the researcher is in doubt whether the troops on the ground and the responsible authorities have understood the impact of these language circumstances.

However, the researcher stresses that school children are the most sensitive group to win the hearts and minds who can be motivated for any kind of adversary situation as they have grown up with many positive and negative insights backed by the contemporary young and old generation.

The discussion further explores, the possession of Army personnel's knowledge on Tamil is a portrayal of unity between the two nations. It bears the sentimental value of a good relationship to live in harmony that promotes always reconciliation and long-lasting peace in the country.

DISCUSSION

Communicating with the people in their language bears significant value, sensitivity, and worthiness and it facilitates eradicating misperception, misunderstandings and building mutual understanding and healthy relationships as well.

The researcher finds, based on the opportunities to interaction with each other, that the verbal communication has become the only medium of communication and the most effective means of communication to bridge both parties i.e., people and the Army personnel.

The study revealed that acquaintance with each other has facilitated the acquisition of knowledge of their second languages and fostered language compatibility, but the number of Army personnel who have received systematic language training in Tamil is considerably less.

The study finds that the public, in their routine work, is compelled to communicate with the Army personnel in Sinhala due to the Army personnel's incompetence in L2. A situation of this nature indicates a future development of a Sinhala-dominant context in the area depriving of their right to receive the service in their language of Tamil as stipulated in the constitution. Approaching a group of selected people, who are good at Sinhala, by the Army personnel is another finding that has led to make negative repercussions and developed a wrong impression on Army personnel as these people misuse the terms with Army personnel for their personal gains. The assistance of an interpreter, found in the area, is a common practice when conducting the Community Service Programmes, but the desired meaning of the message doesn't reach to the target audience as he or she replaces the words depending on his or her knowledge of Sinhala.

The use of substandard Tamil and imprecise Tamil by Army personnel to communicate with the public bears a negative impact on the sense of language purity, its identity, and language clarity and a situation of such a nature is inadmissible from a professional and an official force of the country.

As stipulated in the constitution on language policy, especially in Northern Province where Tamils are the majority, there is no exception to having a second language competence by the Army personnel when in interacting with the people. The study further explores that learning Tamil by Army personnel is not merely a duty-centered obligation but also a moral and ethical need to live in harmony as they can reach the people positively, beyond their limit of duties, to build humanitarian relationships. Notwithstanding, improving the Army personnel's knowledge of Tamil to communicate with the people in their language towards the enduring peace

in the country has not been identified by the authorities responsible and it therefore remains an unaddressed linguistic issue as yet.

RECOMMENDATIONS

The verbal communication between the troops on the ground and Tamil community in their language has become a great challenge, a language barrier, and a sensitive issue in their role to provide humanitarian assistance, and uplift the livelihood of people. Hence, it needs viable but practical and achievable remedies for this issue.

The researcher recommends that the Tamil language learning course be commenced locally at the Security Forces headquarters level, as conducted soon after the conflict, if the Army Language Training School itself cannot afford vacancies in large. Systematic educational workshops for the troops on the ground can be arranged to overcome the negative effects on language purity and clarity as found in the practical application of language usage. Being the official force of the country, Army personnel to understand, when on duty in an area where the Tamil-speaking people are the majority, their obligation to communicate with the people in their own language. Hence, the practical and achievable measures as identified by the researcher - an awareness programme on language rights and its legal obligation, a compulsory Tamil language paper for the promotion tests, a considerable number of periods on teaching Tamil in every military course syllabus, including basic recruit training, conducting of yearly tests to make a qualification pay- are recommended as remedies. The emergence of Sinhala dominant language environment in the area, as explained above, can be safely identified as a portrayal of incompetence of L2 of the troops. It has future implications for distancing people while developing misunderstandings between the two communities. Hence, minimizing the

communication in Sinhala and avoiding the approach to the people good at Sinhala in the community are recommended for strict adherence. In addition, both male and female youths from the North and East provinces are to be enlisted and employed along with other Army personnel, making room for building ethnic harmony. Researcher further recommends that the ground troops, being the first to contact, to be convinced of the gravity and the sensitivity of speaking to people, especially to school children, in their own language of Tamil is not merely an obligation for duty-centered purpose. It is a bridge to develop good relationships to live in harmony that promotes always reconciliation and long-lasting peace in the country.

CONCLUSION

The ability to defeat an insurgence in a military campaign is limited, especially in a multilingual country like Sri Lanka, and the rest will be a gesture of solidarity to rebuild the friendly relationship -social, cultural, political, and linguistic spectrum- between the affected communities i.e., Sinhala, Tamil, Muslim and other minorities.

The deployment of the Army in Mullaitivu District, after the conflict, comparatively has a greater sense of meaning where the largest humanitarian rescue mission in the world had taken place during the final phase of the conflict. The constant interaction, providing humanitarian assistance, and uplifting of the livelihood of people in this area have subsequently become a non-traditional role of the Army and it has demanded a much-needed essentiality of maintaining verbal communication. The incompetence in the second language of Army personnel, as found in the study, to interact with the people remains an unaddressed challenge, impediment and also a sensitive issue that needs official recognition and remedial measures by the

authorities responsible. The study was focused on exploring how the competency in Tamil as the second language, speaking to them in their own language, by the Army personnel in Mullaitivu bears the importance of winning the hearts and minds of the Tamil community: a reconciliation initiative in determining the sustainable peace.

It further provides guidelines for conducting additional future studies in this field and serves as a helpful eye - opener for the authorities responsible for promulgating policies at the national level on the use of L2.

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A BIBLIOMETRIC ANALYSIS ON EVOLUTION OF MILITARY HISTORIOGRAPHY

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ABSTRACT

The study of military history and the evolution of warfare spans over two millennia, yet significant gaps persist in comprehensively understanding its scholarly landscape. This study addresses these gaps by employing bibliometric analysis to systematically examine 538 journal articles published across 348 journals in the Scopus database between 2000 and 2022. Utilizing performance analysis and science mapping techniques, with tools such as VOSviewer, the study evaluates the contributions of 840 authors, key publication sources, and influential nations in this domain. The findings reveal trends and research clusters, highlighting areas of dynamic scholarly growth and identifying under-researched topics, including post-war impacts, imperialism, and military technology. These insights underline the need for deeper investigations into critical themes such as human experimentation, military sexual trauma, and simulation. By advancing bibliometric methodologies, this study provides a structured framework for

future research in military history, fostering interdisciplinary exploration and practical applications.

KEYWORDS: *Bibliometric Analysis, Military History, Performance Analysis, Science Mapping.*

INTRODUCTION

Bibliometric analysis has shown its applications across several disciplines such as political science, sociology, and environmental studies, with identifying research trends and gaps. For instance, Bibliometric studies in political science have highlighted several changes in theoretical paradigms and emphasised under-researched topics such as diffusion of policies mostly in emerging economies in developing countries (Jones et al., 2020). In sociology, the incorporation of computational techniques for multidisciplinary research has indicated a grown significance in the context of bibliometric techniques (Brown et al., 2019). The mentioned studies illustrate the effectiveness of bibliometric

techniques in offering a comprehensive in-depth examination on military related complex research landscapes. Nonetheless, regardless of its effective utility, the field of military history has remained underutilised the bibliometric techniques (Bailey et al., 2022a).

Military history is still in an intriguing position today as it has been for years (Winter & Prost, 2020). The development of tactics and tactical thought, as well as the study of battle, all depend on military history (Collins, 2022). For the development of general theory as well as the learning and improvement of tactics, historical experiences are of the utmost importance (Winter & Prost, 2020). Military culture and the military profession both value history highly. Military tactical thinking is biased toward the offensive due to this engrained interest and military history's propensity to highlight effective offensive actions. The ideational discourse of military history is dominated by institutions and great leaders who are known for their offensive techniques, whereas leaders who are known for their defensive strategies are accorded far less attention (Weissmann & Ahlström, 2019).

Military history encompasses a diverse array of practitioners and audiences (Stahl, 2009). Contemporary academic military history adheres to rigorous scientific and pedagogical standards, yet it has encountered criticism within academic circles due to its perceived connections with applied and popular military history (Stahl, 2009). Applied military history literature, for example, is grounded in the premise that insights from historical conflicts may inform strategic decision-making for future military planning and operations. Academic military history, however, has developed distinct research pathways, particularly in two main directions (Herrick, 2020). Traditional approaches focus on 'material and operational' studies, which examine the characteristics of weaponry and military operations within their broader political, economic, and technological

contexts (Bousquet, 2022). Such research remains relevant within the field. Additionally, a shift within military history reflects broader historiographical trends, as scholars increasingly adopt approaches aligned with the 'cultural' or 'linguistic turn,' thereby expanding the discipline's methodological and thematic scope (Bousquet, 2022; Hersman et al., 2022). But, many military historians believe that focus on reality's subjectivity and the hedging of agency caused by cultural norms connected with that turn run counter to judgments made on the battlefield that had all too real repercussions (Lee, 2007).

A particular research study looks at the representations of war and war making in modern war museums (Cercel et al., 2019). It examines and contrasts the concepts underlying the permanent exhibitions of two museums, the Military History Museum (MHM) in Dresden, Germany, and the Historical of the Great War in Perrone, France, using examples from the exhibitions to support its claims. It also talks about the horizontal and vertical arrangements of these museums' architecture. The Historial serves as an example of how society as a whole and conflict are intertwined. A 1992 move that was extremely innovative included artifacts indicative of the domestic and military fronts equally throughout the permanent exhibition in Perrone. The Historial challenges the idea that the fronts are separate and work to reestablish their link through the partition of space between military and civic life. The complicated patterns of communication between residents at home and civilian troops in the trenches are retraced as visitors move between the two domains. Additionally, by focusing on "private, commercial propaganda," the exhibit emphasises how total war permeated every element of day-to-day life (Cercel et al., 2019).

At several points in its development, the Red Army, the Soviet Union's army, had a radically different composition. Before

widespread mobilizations significantly altered the appearance of the new army, internationalists were particularly prevalent and conspicuous in 1918 (Ganin, 2022). It is not a coincidence that the early stages of the Civil War in various parts of the country mostly involved foreigners, especially the interethnic war in Eastern Russia between the White Czechs and Red Hungarians (Ganin, 2022).

The state of Qin conducted a number of lengthy military excursions into China beginning in the late fourth century B.C.E. The term "men of farming and war" indicates that the troops that made up the Qin army were conscripted farmers who served as soldiers (Miyake, 2018). Numerous studies on this institution of conscripting farmer-soldiers have come to the conclusion that Qin's soldiers were typically required to serve for a certain amount of time each year, if not longer in some cases, and that unfulfilled service was transferred to the following year in the event that no service was necessary in a particular year. The conscripts were not released from their obligation until they had completed a full year of accumulated service (Miyake, 2018).

Military history is very well-liked by the American public as a whole but is largely ignored by professional academic circles. It has a particularly imposing media presence, whether it is on television in the shape of the History Channel or on the big screen in a regular diet of war-themed films. Its public profile is continuing to rise at a rapid rate. But while military history rules the airwaves, its academic presence is dwindling, and several of our top colleges no longer offer courses in it (Citino, 2007). In American military history, the "war and society" concept has been used by several academic military historians since the 1960s. The more humane aspects of battle have been emphasised in recent military history. Who served and what happened to them while they were there? Due to the

overwhelming success in addressing those fundamental inquiries regarding the make-up of military organizations and the experiences of their members, additional and more complex inquiries regarding expectations, values, and motivations have started to surface. The shift away from social history and toward the so-called cultural or linguistic turn has thus been followed by military historians (Lee, 2007).

Military history has been covered in boundless detail in a high number of research studies across the globe and in their research publications from various eras as aforementioned (McClellan & Dorn, 2015; Moore, 2018). Considering the enormous amount of literature on military history, the main concentration was on narrative analyses, recalling of history, and thematic studies (Dahlberg & Dalgaard-Nielsen, 2020; Hines et al., 2015; Hoppen et al., 2021; Hoppen & Morina, 2019). Few studies have applied bibliometric techniques on military history (Bailey et al., 2022b; Currie & Chipps, 2015; D'Alessio et al., 2024; Stadler et al., 2022). However, the domain shows a deficient in a systematic exploration of its scholarly works. To the best of our knowledge, the previous works have not comprehensively analysed the data with bibliometric techniques, and the current research study intends to address this knowledge deficit, with an updated database from Scopus up to the year 2022. The study assesses the present status of the field with global literature, and the bibliometric approach guides interested scholars on the publications published between 2000 and 2022. In comparison with the other similar findings, our study covered a larger period of time. As a result, the sample size has been upgraded, providing another contribution to our findings. The extensive usage of bibliometric analysis provides unique insights on trends in research, under-explored research areas, and scholarly influence towards identified research gaps, thereby making data-driven analysis. The potential to recognize them via

traditional qualitative reviews over bibliometric techniques might generate a chance to disregard them unintentionally. Thus, this study aims to offer a structured framework prior to address limitations, by employing techniques such as keyword mapping, and performance analysis to build up a comprehensive understanding of military history.

This study is significant for its ability to reconcile the gap between the rich narrative tradition and the analytical rigor of bibliometric techniques in the context of military history. The extracted 538 journal articles from the Scopus database comprehensively analyse the development of the research area, and shows the thematic areas which requires more scholarly attention in future. Moreover, the results will assist with the academic and practical applications pertained to military history by encouraging evidence-based comprehension of its scholarly works. Thus, the objectives of the research were to: (1) identify the countries, sources, and authors who made a significant impact on the field. (2) to find research areas that merit additional consideration for military history. The next sections of the paper delineate the methodology used for the current study, emphasising the adoption of performance analysis and science mapping techniques, followed by an in-depth discussion of the findings of the study.

METHODOLOGY

Bibliometric analysis is a scientific computer-aided review process that can find prominent authors or areas of research as well as their relationships by assessing almost all the publications relevant to a particular subject or field. Before identifying the research objectives, the study's scope should typically be sufficiently broad for this analysis, because it is designed to manage enormous volumes of bibliometric data (Ramos-Rodríguez & Ruíz-Navarro, 2004). *Science mapping*, which

focuses on the connections between research elements, and *performance analysis*, which takes into consideration the contributions of research constituents, were utilised as analysis techniques in the study.

The Scopus database was used to discover articles on military history that had been published between 2000 and 2022 for the study. This database was chosen since the majority of literature review research has comprehensively covered it. The massive amount of research articles on multidisciplinary academic literature especially in social sciences and humanities with compared to Web of Science, serving as an ideal resource for analysing establishing trends in military history. However, the study omits the non-English sources acknowledging as a weakness against Scopus indexing policies. The search term for the current study was "military history." The availability of "Final Journal Articles" authored in "English" within the time period was another selection criterion for the database. The database's versatile nature also allowed for the cleansing of the data. The removal of inaccurate and duplicate data entries from the corpus led to an excellent bibliometric data analysis. Figure 1 illustrates the selection of the research study's database as well as the inclusion and exclusion criteria.

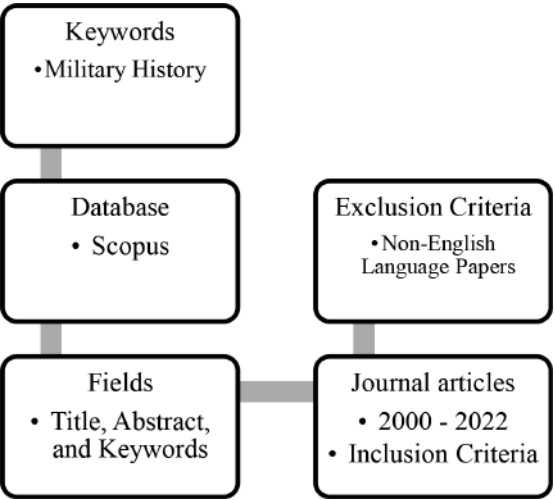


Figure 1: Database selection criteria

Choosing bibliometric analysis techniques, defining the objectives and scope of the bibliometric study, gathering the necessary data, performing the analysis, and reporting the findings are the four steps that make up the bibliometric analysis process (Donthu et al., 2021). The Bibliometric analysis in the research study was conducted using the software VOSviewer and Biblioshiny. VOSviewer was selected due to its robust network visualization features, which enables unambiguous depictions of keyword co-occurrence and citation networks. Meanwhile, Biblioshiny was used for its extensive data pre-processing capabilities and due to enhanced functionalities of generating descriptive analytics interactively. The authors decided the mentioned approaches fulfill the study’s objectives to pinpoint under-explored domains in military history.

Initially, the data was cleansed after downloading metadata from Scopus database in .csv format, and duplicates were detected and removed in order to guarantee the accuracy and consistency. The verification was made manually to ensure no required records were omitted due to data cleaning. Also, the time period from 2000 – 2022 was selected to capture contemporary research trends in addition to the foundational studies from the early 21st century. This time frame reconciles the scope in historical aspect with the recent advancements. Thereafter, the data was loaded and set the parameters prior to obtain the vizualizations. Biblioshiny integrates the bibliometrix package's capability with the web apps' user-friendliness while using the Shiny package environment. The Bibliometrix package includes a number of algorithms that can be used for bibliometric analysis. These routines can be used to create data matrices for co-citation, coupling, scientific collaboration analysis, and co-word analysis. Furthermore, new information frequently emerges in areas where structural and temporal evolution intersect, such as network analysis, factorial analysis, and thematic mapping. The results

section also presents the findings (Huang et al., 2021). The relationships between these words are shown by the VOSviewer in a "keyword co-occurrence network visualization" map (Dogra & Priyashantha, 2023; Priyashantha, 2023). The three primary objectives of the study are achieved by the analysis performed using the programme, which reveals the countries, sources, and authors who made a significant impact on the field, disclose connections between different countries and scholars relevant to the articles, finds research areas that merit additional consideration for military history.

RESULTS

The research study has considered 538 research articles published in 348 journals written by 840 authors in the period of 2000 to 2022. According to the statistics, the annual growth rate of the publications is 11.16 and the average number of citations per document is 9.331. The total number of references available in the corpus is 26110. The number of research articles only with a single author is 393 while 363 authors of single-authored documents are there. The number of co-authors per document is shown with a value of 1.71 and all the mentioned statistics are in below Table 1.

Table 1: Main information

Description	Results
MAIN INFORMATION	
ABOUT DATA	
Timespan	2000:2022
Sources (Journals)	348
Documents	538
Annual Growth Rate %	11.16
Average citations per doc	9.331
References	26110
DOCUMENT CONTENTS	
Author's Keywords	1643
AUTHORS	

<i>Authors</i>	840
<i>Authors of single-authored docs</i>	363
<i>AUTHORS COLLABORATION</i>	
<i>Single-authored docs</i>	393
<i>Co-Authors per Doc</i>	1.71
<i>DOCUMENT TYPES</i>	
<i>article</i>	538

This section consists of the excel data tables and the visualizations obtained from "Bibliometrix" R Studio package and the VOSviewer application. The annual scientific output for journal research publications on military history was found to have significantly increased, as seen in Figure 2. Despite occasional ups and downs, the number of units produced annually has gradually climbed over time. In between 2002 – 2012, the average research article production was around 20. But, the count has exceeded 40 in the year 2020. As a result, the image unmistakably shows that by 2022, academics' interest in military history will have significantly increased.

Table 2 lists the most relevant sources for the topic of military history. The sources considered in the research study are journals only. Thus, the top five most relevant journals according to the Scopus database are the *Journal of Military History*, *War in History*, *Small Wars and Insurgencies*, *Journal of Medieval History*, and *Journal of Strategic Studies*. Among the mentioned top journals, the *Journal of Military History* has published more than the double count of the second most relevant source *War in History*.

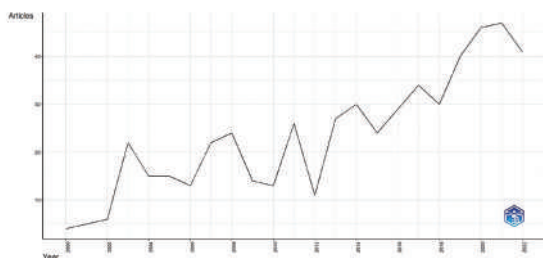


Figure 2: Annual scientific production

Table 2: Most relevant sources

Sources	Articles
<i>Journal of Military History</i>	57
<i>War in History</i>	22
<i>Small Wars and Insurgencies</i>	9
<i>Journal of Medieval History</i>	7
<i>Journal of Strategic Studies</i>	6
<i>International Journal of Military History and Historiography</i>	5
<i>War and Society</i>	5
<i>Armed Forces and Society</i>	4
<i>History Compass</i>	4
<i>Journal of American History</i>	4
<i>Military Medicine</i>	4
<i>RUSI Journal</i>	4
<i>Critical Military Studies</i>	3
<i>Defense Studies</i>	3
<i>Historical Journal</i>	3
<i>Journal of American-East Asian Relations</i>	3
<i>Journal of Chinese Military History</i>	3
<i>Journal of Contemporary History</i>	3
<i>Journal of Educational Media, Memory, And Society</i>	3
<i>Journal of Special Operations Medicine: A Peer Reviewed Journal for SoF Medical Professionals</i>	3

Figure 3 shows the production of the sources over time as follows. Accordingly, the *Journal of Military History* is uniquely progressing impressively throughout the years initiating from the year 2000 and maintaining a constant level without any further cumulative occurrences. The journals *War in History*, *Small Wars and Insurgencies*, *Journal of Medieval History*, and *Journal of Strategic Studies* are

very slightly progressing or in some years no progress can be seen. However, after the year 2018, the *Journal War in History* seems moderately progressing towards 2022.

Figure 4 illustrates the topic area's country-by-country distribution. The portrait shows the single country publications (SCP) in Green and the multi-country publications (MCP) in Red. Accordingly, the United States of America (USA), the United Kingdom, and Australia, the Netherlands and Israel are the five primary nations where the corresponding authors are located.

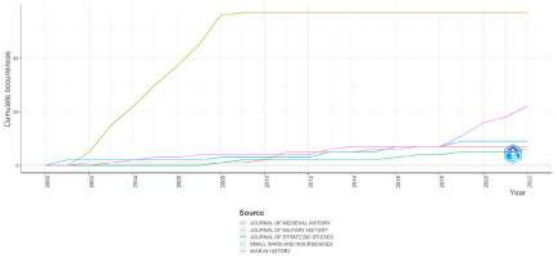


Figure 3: Source's production over time

Figure 5 illustrates country scientific production in world map shading the countries with different shades of blue to represent the highest and lowest journal article production on military history. A considerable number of countries lack any form of scientific production. But, the countries such as South Africa, Germany, Hungary, Sweden, France, Finland, Croatia, China, Spain, Poland, Nigeria, Italy, Hong Kong, etc., are showing significant contribution to the scientific production.

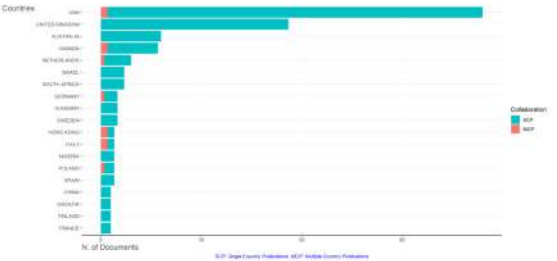


Figure 4: Corresponding author's countries

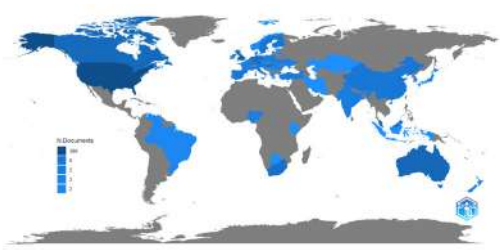


Figure 5: Country scientific production in world map

According to the Table 3, *Jamsari EA*, *Black J*, *Andrade T*, *Bachrach DS*, and *Calhoun PS* are the most relevant authors who have written and published research articles on military history during the period of 2000 – 2022. Finding these authors are important for the scholars and also for the development of the research thematic area. Their contribution towards the topic is highly valuable. The relationship and flow between authors, keywords, and sources in military history research were examined using a Sankey diagram. The three-field layout, which is depicted in Figure 6, is another term for it. In light of this, the movement between the aforementioned entities is depicted in this representation, and the width of the arrows and the boxes reflect the frequency of publications (Soundararajan et al., 2014). The words *historiography*, *veterans*, *first world war*, *second world war*, *violence*, *soldiers*, *Iraq*, etc., are the dominant keywords while they show high frequency.

Table 3: Most relevant authors

Authors	Articles
<i>Jamsari EA</i>	5
<i>Black J</i>	4
<i>Andrade T</i>	3
<i>Bachrach DS</i>	3
<i>Calhoun PS</i>	3
<i>Hughes M</i>	3
<i>Kudler H</i>	3
<i>Lee WE</i>	3
<i>Mordi EN</i>	3
<i>Phillips G</i>	3

A keyword co-occurrence analysis was performed using VOSviewer software as shown in the Figure 7. The software has divided the author keywords into different clusters based on the association algorithms (Corbet et al., 2019). Consequently, eight clusters are visible in the military history keyword co-occurrence network. The most prominent keyword is the *military history* as it was the searching term. In addition, the keywords such as *social history*, *great war*, *military nursing*, *human experiment*, *mental stress*, *depression*, *suicide*, *military sexual trauma*, *political history*, *mortality*, etc., and few country names are significant. The network's clusters also show the field's areas that should provide future concentration.

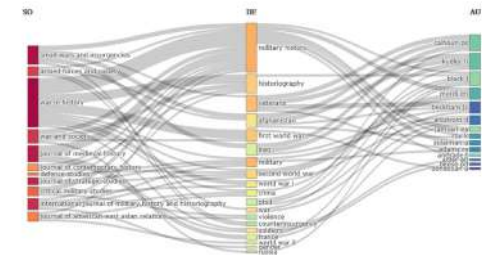


Figure 6: Sankey diagram of military history research (source-keyword-author linkages)

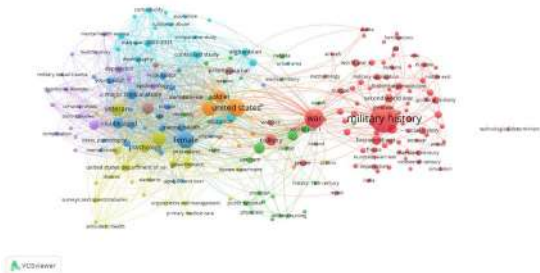


Figure 7: Keyword co-occurrence network in military history

The density visualization diagram shown in Figure 8 has areas with different colors. The image is divided into regions with varying color schemes, and the terms that fall inside the red zone indicate a body of established knowledge in the research field (van Eck & Waltman, 2014). Keywords found in the yellow area denote typical levels of research,

whilst those found in the green area denote scant amounts of investigation (Priyashantha et al., 2022). Thus, in future the scholars should be more focused on the topics such as *human experiment*, *post-war*, *imperialism*, *simulation*, *fortifications*, *mental stress*, *suicide*, *military sexual trauma*, *depression*, etc.

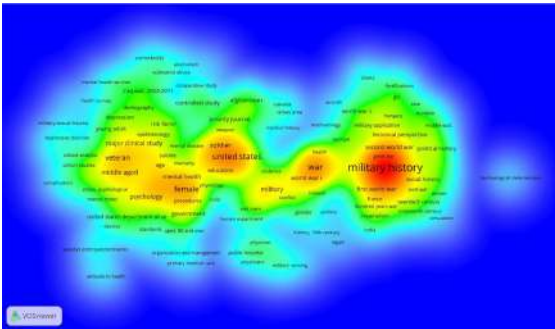


Figure 8: Keyword co-occurrence density visualization

DISCUSSION

Two primary objectives were achieved by the research investigation. The first objective was (1) to identify the countries, sources, and authors who made a significant impact on the field. Accordingly, the authors identified the *Journal of Military History*, *War in History*, *Small Wars and Insurgencies*, *Journal of Medieval History*, and *Journal of Strategic Studies* as the most impactful sources through the main analysis of the study. The United States of America (USA), the United Kingdom, Australia, the Netherlands and Israel are the five primary nations where the corresponding authors are located and *Jamsari EA*, *Black J*, *Andrade T*, *Bachrach DS*, and *Calhoun PS* are the most relevant authors in the military history research field. The second objective was (2) to find research areas that merit additional consideration for military history. It was achieved by applying the bibliometric techniques and the scholars need to more focus on areas such as human experiment, post-war, imperialism, simulation, fortifications, mental stress, suicide, military sexual trauma, depression, etc.

Future research may consider additional sources including conference papers, proceedings, and books as this study only used articles from peer-reviewed journals. Another issue of using only the Scopus database, which would have excluded significant military history studies, might be eliminated by using alternate databases, such as Web of Science. The research database can be broadened to include publications in languages other than English in order to increase the number of important papers.

CONCLUSION

The authors examined research in military history from 2000 to 2022 to trace its scholarly evolution. This study achieved two primary objectives: identifying the most influential countries, sources, and authors in the field, and uncovering research areas that warrant further exploration. Through performance analysis and science mapping, the study revealed significant contributions from specific regions, with prominent attentions of research output and collaboration among institutions that have shaped the current understanding of military history.

Key findings indicate that certain authors and sources have steadily led in citations and impact, reflecting both the depth and geographic concentration of military history. Furthermore, the study highlighted emerging themes and methodological approaches within military history, expanding beyond traditional narratives focused solely on military operations and strategies. The research contributes valuable insights into the intellectual structure of military history, identifying gaps that point to a need for more interdisciplinary studies. This study not only provides a comprehensive summary of scholarly activity but also emphasises areas that have been underexplored, thereby guiding future research efforts.

The results of the study also provide insights into the intellectual structure with the practical implications for military strategies, policy development, education and interdisciplinary research. The under-explored research areas especially such as post-war trauma, and mental health can be used to enhance military education and training programmes. The facts will equip the people for practical scenarios over conventional battlefield scenarios with psychological and social aspects. Policymakers may use the findings to build specialized mental support systems focusing on suicide prevention, and stigma reduction. Moreover, the funding bodies can get ideas on how to corporate and facilitate the studies after recognizing geographic and thematic research gaps. This will strengthen and encourage the collaborations between the interdisciplinary experts and military historians. Further, the results may guide military strategists by offering historical lessons derived from previous triumphs and failures to the success of modern operations. Additionally, the study has implications for public education emphasising neglected contributions and personal experiences in military history. Higher education institutes may use the generated insights to update military history curricula by introducing new courses on under-represented topics mentioned. In conclusion, this analysis generates new knowledge by mapping the evolving landscape of military history research and identifying pivotal contributors and trends.

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THE PSYCHOLOGICAL DIMENSIONS OF CONFLICTS IN PRE-COLONIAL AND COLONIAL SRI LANKA

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ABSTRACT

The military history of Sri Lanka advanced the sophisticated knowledge and strategic expertise its early warriors were equipped with. This paper examines military planning and execution by Sri Lankans, from King Dutugamunu's first war of unification to the battles against the Dutch and Portuguese between 1505 and 1796. The paper highlights the psychological aspects of warfare and reveals the top-notch strategies that played a key role in the success of these manoeuvrers. Drawing from diverse primary sources, historical accounts, and the writings of both local and foreign scholars, this study explores the psychological dimension of warfare seen in Sri Lankan warfare. It reveals how psychological tactics were as pivotal as physical confrontations on the battlefield. Notably, King Dutugamunu and King Vijayabahu I harnessed psychological factors in their battle strategies to demoralize enemies and bolster the morale of their own troops. Similarly, in the Kandyan resistance against Portuguese and Dutch forces, Indigenous combat techniques were fused with psychological strategies to exploit the vulnerabilities of colonial powers.

The analysis realizes that a significant portion of psychological warfare was employed in defending the Kingdom of Kandy, emphasising the ingenuity and adaptability of Sri Lankan military tactics.

KEYWORDS: *Military History, Psychological Warfare, Strategy.*

INTRODUCTION

Psychological and geographical tactics go hand in hand when it comes to properly choreographed battle strategies. Many renowned strategists, including Sun Tzu and Clausewitz, emphasise the importance of a psychological aspect to warfare. According to Clausewitz, psychological warfare is a means by which a certain objective is obtained in the long term, acting as an aid to the end game of the command strategy. Psychological warfare falls under strategic theory. 'Strategic Theory' is identified as the possible result of moral and psychological forces (Clausewitz, 1832). Under this statement, it becomes clear that psychological factors play a crucial role in every successful military campaign in history.

Clausewitz's definition of strategy gives us two important segments. One is the physical which he collates to the wooden hilt of a sword and the second is the psychological or moral one which is compared to the metal from which the sharp edge of the sword is formed. This analogy is important to understand just how much value these military strategists place on the use of psychological warfare.

Psychological warfare often heavily relies on the growth of a fear-based intuition in the enemy's psyche. This is also why the Vietnam War of the 1950s became immortalized. Their use of guerrilla tactics is discussed with a hint of admiration and criticism. The fear it instilled and the success it brought, for the most part, stemmed from that reputation. This phenomenon can be identified as a recurring theme in the Sri Lankan battles from Dutugamunu's war campaign to the series of wars in Kandy against foreign invaders.

This paper will discuss the strategies of the following Kings:

1. King Dutugamunu- 161-162 BC
2. King Vijayabahu I- 1055 AD

The Colonial battles fought with the Portuguese, Dutch and English will be discussed with a greater focus on the Portuguese and Dutch confrontations. This mainly focuses on the accounts available for prominent battles including Balana, Randeniwala, Gannoruwa, Mulleriyawa and many other conflicts that came in the form of rebellions and raids.

These battles have been identified as the principal events that exhibit a greater calibration of psychological warfare in Sri Lankan history.

Sri Lanka's psychological warfare landscape has not been given enough attention in a focused manner by the research community. Studying the use of psychological tactics in the

warfare of the ancient Sri Lankans, we aim to identify two things:

1. The complex nature of Sri Lanka's military history
2. The need to identify and present Sri Lankan history in a narrative that is wholly divergent from the Western dialogue of Sri Lankan history.

Understanding this vital perspective of warfare allows the reiteration of facts based on Strategy. Studying the psychological aspect of Sri Lankan battles becomes indispensable in substantiating the deeply machiavellian essence of Sri Lankan strategists.

For instance, while the tactical, logistical and statistical aspects of ancient Sri Lankan battles have been widely elaborated, the psychological aspect only appears timidly and barely addressed.

This paper attempts to map out and exhibit the psychological implications behind the conduct of battles and uprisings of the Sri Lankans of the past.

LITERATURE REVIEW

The Mahawamsa, the primary source for much of the information on the ancient wars in Sri Lanka, fails to provide adequate details on the nature and strategy of warfare in King Dutugamunu's campaign from 161-162 BC. While the Mahawansa gives a detailed account of this campaign's religious and nationalist motives, much of its strategic value has been lost.

This great battle of Anuradhapura has been emphatically written from the perspective of a 'holy war', and therefore fails to pay attention to the strategies and the political implications of the war, which would have been vital for the study of Sri Lankan military history. It must

be noted here that the primary sources carry only limited information about these great wars and hold only restricted knowledge about the strategic aspects of the wars discussed. It is only through modern texts of authors like W.I Siriweera that we can understand a level of strategic connection to these historic events. King Vijayabahu I's campaigns have been reciprocated in 'Warfare in Sri Lanka' by W.I Siriweera. The book separates King Vijayabahu's campaign in 1055 AD into two phases:

1. Phase one: Capturing Anuradhapura and blocking Mahathitta
2. Phase two: Surrounding Polonnaruwa.

The book explains the various strategies implemented by King Vijayabahu concerning the aforementioned phases of the war. Upon further investigation and annotation of the events, it can be concluded that most of Vijayabahu's tactics involved overwhelming and surprising the enemy forces, backed by a siege intended to starve and demoralize the enemies resulting in their surrender, ultimately enabling the Sinhala king to emerge victorious. 'Warfare in Sri Lanka: Military History of the Island from Earliest Times up to Independence' lays down the strategies of King Vijayabahu I. By studying the nature of his war campaign against the Cola, the implications of psychological warfare can be highlighted. His campaign, according to the text, was conducted in two phases, both displaying a mixture of elements of surprise and overwhelming forces of the enemy. Three texts confer with the setting of Kandy and the nature of warfare between the European forces and the locals. Gaston Perera's *Kandy Fights the Portuguese: A military history of Kandyan Resistance*, reproduces a tapestry illustrating with detail, the geophysical nature of the terrain which serves as a direct elucidation of the nature of the battlefield at the time. By studying these incidents that appear in the book in the form of accounts, diary entries and letters

by various Portuguese personnel, it becomes evident how on one hand geography bestowed a massive disadvantage to the Europeans and a tremendous advantage to the locals.

According to the book, Major R. Ravenhart's accounts describe the terrain to be a 'steep ascent' and the climb- 'extremely fatiguing'. This route which was one of several paths to enter Kandy was a tiring one, often leading the soldiers to carry their ammunition and supplies through the rugged landscape. These descriptions of the terrain and landscape of the path leading to Kandy are critical factors to consider when discussing the European psyche. It is quite clear that the ascent to Kandy was as brutal as the war itself, and the soldiers were fatigued even before the actual attack took place. This had a severe psychological impact that, knowingly or unknowingly the Kandyans used to their advantage.

When studying the patterns by which the Kandyans navigated the terrains, and their tactical ploys, it is clear that they used what is commonly called the 'Element of Surprise'. Queyroz describes the Kandyan's movement as 'wiry, light-footed.... Marching many leagues in a few hours (Gaston Perera,2007). These accounts by the general and other personnel on the front lines who directly came into combat with the Kandyans provide a valuable understanding of the nature of the Kandyan war-fighting tactics. Excerpts from accounts found in books like the aforementioned and 'The Kandyan Wars' by Geoffrey Powell provide the European perspective of the Kandyans and their tactics. These directly speak to the strategic value of the wars in Sri Lanka at the time.

Geoffrey Powell's work is centred largely around the accounts mentioned above. Upon close analysis, these reveal the nature of the Kandyans on the battlefield. How the descriptions are made abundantly speaks for the deep emotional lacerations that these

confrontations had created in these soldiers. Here, the Sinhalese were deemed 'barbaric' as stated in both Powell's and Perera's work. The looting, the carnage and how they 'put them to death in a most barbarous and shocking manner', (Geoffrey Powell, 1984) as described in these texts go a long way in establishing not only the destruction but also the psychological impact created through those actions. What Powell describes as 'blood lust' actually proved useful in instilling fear in the minds of the enemy. The graphic descriptions like, 'cursing and reviling them, and spitting in their faces; they mostly knocked out the soldiers' brains with clubs....' show how the Kandyan brutality created a fear stimulus in the enemy.

'Kandy at War' by Channa Wickremesekera points out a more formal outlook on the battles between the Kandyan resistance and European powers, with greater emphasis on the European experience in Sri Lanka.

METHODOLOGY

Primary sources of Ancient Sri Lanka like the Mahawamsa and Culawamsa were used for data collection on the pre-colonial battles. In the context of the first war of unification by Dutugamunu in 161 BC, the Mahawamsa is the primary text of reference. It provides an in-depth analysis of the motive of the war: reuniting Sri Lanka under one flag and taking over power from the South Indian invaders and thereby securing the future of Buddhism. However, there is no adequate documentation of the nature of the war and the strategies employed. The author of the Mahawamsa precludes the attention from strategy to patriotic outlooks. Because there are very limited examples of strategy presented in the original texts like Mahawamsa, the research findings concerning the pre-colonial battles have been limited. The psychological factors of warfare are left open for interpretation and are heavily dependent on the readers' perspective regarding the insinuations of the event.

The accounts of the various individuals on the front lines depict explicit details of their thoughts and feelings that directly attest to their psyche. These are essential in deciphering how the Kandyans fought. The annotation of these accounts is a vital aspect of the methodology since, if nothing else, the entire research depends on this analysis.

Secondary sources by prominent historians and authors provide insight into the nature of these battles. These sources provide an adequate interpretation of the strategies used, just enough to identify the psychological factors in them. The commentary provided by these secondary texts and the various other research articles aid in decoding the implications of psychological strategies in the wars under consideration. Although psychological warfare has been mentioned, it has not been given significant attention in these secondary texts either.

The primary and secondary sources have been analysed based on their content regarding psychological warfare. The texts referring to Kandy were much easier to annotate as they directly provided a psychological background to the experiences documented. These documents, being documentaries of the direct psyche of the people present, make it easier to understand how the Kandyans' actions affected them. The primary sources like the Mahawamsa and Culawamsa lacked strategic implications and their selection was based on the author's analysis of the events described.

All data is qualitative, having been interpreted and explained from a psychological perspective. Whether these were done intentionally according to a strategic plan or whether they were coincidental, there is no palpable means of knowing due to the aforementioned lack of strategic insight by the primary texts and the shortcomings of the secondary sources in establishing a psychological factor.

RESULTS AND DISCUSSIONS

In the 25th chapter of the Mahawamsa, the author writes 'overcame him by cunning' (Wilhelm Geiger, 1980) - referring to an 'allusion' of promising his mother's hand in marriage to his contestant in return for the governance of that provincial kingdom. This can be interpreted as a form of deception which indicates psychological thinking. Another instance of this battle displaying deception can be seen closer to the final confrontation of Dutugamunu and Elara. The Mahawamsa states how the Sinhala king ordered stockades to be placed with effigies (Wilhelm Geiger, 1980) to confuse the enemy. Although this strategy has not been given significance in the text, it is also an instance where King Dutugamunu utilised visual deception to obtain a battle advantage against the Cholas.

The two phases in which the battle of King Vijayabahu was conducted have solid psychological implications. One is a series of Sting attacks and tactical withdrawals (Siriweera & De Silva, 2017) which not only disoriented the enemy but also left them gravely disturbed. It cannot be assessed if these tactics were conducted to create psychological turmoil in the enemy, but these events contributed to the victory.

Phrase two was the attack followed by the surrounding of the city of Polonnaruwa and taunting the enemy until they finally had no choice but to surrender. Vijayabahu made use of overwhelming the enemy as one of his central strategies- this is a classic example of the understanding and use of battle psychology. The three-pronged strategy used in this battle is another example of this.

The battles between the Europeans in the 17th to 19th centuries hold a larger quantity of events that can be interpreted as psychological warfare. Although these conflicts were

rebellions in nature and lacked organizational structures, they still proved to be some of the most brutal confrontations in the history of Sri Lanka.

The majority of the confrontations that took place during this period were guerilla warfare and this exerted an insurmountable amount of pressure on the Europeans who were used to open confrontations. When it came to the Kandyan resistance, they were ruthless in their manner. Although this is deemed as 'barbaric' and bloodthirsty, this was a necessary tactic, which became the key component of their victories in defending Kandy. One such instance was the invasion of Pedro Lopez de Sousa in 1594 where King Wimaladarmasooriya used what is known as the '*fons et origo*' (Gaston Perera, 2007) meaning luring the enemy into a location which is favourable in condition for you to have a battle advantage. Here, the enemy will come in with confidence not knowing the fate that awaits them. This was a successful way of blindsiding them, putting the enemy in distress.

Another popular strategy was to wear them down and lie in wait until the enemy had exhausted his strength and rations. - '*...waited for starvation and insalubrious climate to take their toll on the trapped Europeans..*'. The Europeans had to trudge through foreign territory, unlike the battle environments they were used to face a multitude of challenges in the terrains.

The illnesses like Malaria and fevers which spread through the advancing ranks, were debilitating. Further, the journey itself was described by a Portuguese writer as 'the most laborious in the world' (Gaston Perera, 2007). DeSaa e Menezes states that the path was 'difficult and dangerous' and Bocarro as presented by Gaston Perera states that 'the soldiers had no place to rest'. It is clear how significant the magnitude of the toll the journey might have had on these soldiers. The illnesses,

lack of rations, the unfamiliar environment and the rough terrain topped with the constant anxiety of a surprise attack, left the soldiers in no shape to fight a war. This directly affected their performance when confronted with the Kandyans. This is the same reason why Queyroz writes- 'all skill consists of protecting oneself' meaning their concentration was diverted towards self-preservation. A soldier who is concerned about himself is a soldier who has strayed from the fight. In the face of self-preservation, a deliberately created setting, the Europeans were weakened in their will as well as their physical strength.

The European accounts of the Kandy resistance were often portrayed as 'laborious' and taxing on the soldiers who were unfamiliar with the topography and guerilla tactics of the Sri Lankans. This was not only a physical taunt but something that added to the mental disturbance as well, reducing morale. Many soldiers were said to be ready to kill themselves in case of capture by the rebels. The fear of capture which drives one to the point of being willing to commit suicide shows how deep the fear had been etched in the minds of the invaders.

One other strong argument revealed when studying these texts is the nature of the individuals who fought the wars. The circumstances of the fighters played a key role in the way the wars were faced. Statistics from old reports and books reveal that most, if not all, of the European forces were prisoners. Russel Wood as seen in 'Kandy fights the Portuguese', the troops mainly comprised of individuals 'forced into service as a result of periodic sweeps of streets and jails of port cities'. It is clear these people were unwilling to go to war. In contrast, the Kandy resistance was much more morally superior as they came forward willingly intending to redeem their homeland. This nationalistic nature of their participation in turn led to its partial success in maintaining

that so-called 'brutality' which derives from their determination to intimidate their enemy. This disparity in morale between the two ends of the conflict can be interpreted as a driving factor that drove the psychological aspect of the war. With one party more goal-driven than the other, the Kandyans partially succeeded in most of the attempts to intimidate the enemy.

CONCLUSION

Although ancient texts of Sri Lanka provide very little analysis of the warfare strategies, it is difficult to maintain an understanding regarding the attributes employed. The interpretation of these events from a psychological perspective will show indications of such attempts. However, it is still difficult to acknowledge the deliberation of these strategies given the lack of accounts and focus on the actuality of the war. Therefore, the implications of any kind of warfare are difficult to analyse wholly, it is merely the surface understanding that drives the definition of whether a certain event had psychological implications or not. King Vijayabahu I's series of sting operations overwhelmed the South Indians even before the troops marched into the capital. This ultimately led to a siege of the capital and taunts directed at them for a long time till they surrendered.

The Colonial period had a variety of sources to derive the nature of warfare. The interpretation of these exchanges and accounts helps portray most of these events from a psychological perspective. The personal experiences documented by the European generals, soldiers and other commanding figures provide ample evidence to study the nature of the wars fought by the Kandyans. The documents reveal the way the Europeans felt and how they viewed the Kandyans and their techniques during these confrontations.

The fear and the constant anxiety that the guerrilla warfare and the brutal confrontations by the Kandyan contributed to the weakening of the Europeans' morale even before there was any real battle. In many instances, the Europeans encountered surprise attacks leaving their logistics destroyed and ranks dismantled. This made them easy targets. The brutality the Kandyan used in their fighting spread fear within the ranks and left the soldiers hopeless—this was also important to mentally defeating them well before their bodies did. The success of the Kandyan's in defending their city was a result of the extreme distress, destruction of morale, and embedding fear into the Europeans along with the topography playing a contributory factor.

The 'barbaric' manner of warfare, as described by the Europeans, focused on creating anxiety and striking blows directly to their morale. This was successful as many accounts describe such outcomes. The pre-colonial and colonial battle landscapes of Sri Lanka have enough evidence to show that psychological warfare had taken place. Although the intentions remain inconclusive it is nevertheless a strong manifestation of the elite military planning by the Sri Lankan counterparts.

Sri Lanka has fought numerous wars since the Kandyan saga. The Sri Lankan war against the LTTE used numerous manoeuvres to weaken and gain the upper hand during the course of the entirety of the war which lasted for 30 years in Sri Lanka. This modern context also requires discussion as it was a resounding victory for Sri Lanka, and these psychological aspects of warfare should not go unnoticed. However, this research is limited to discussing the ancient and colonial tapestry of psychological warfare in Sri Lanka. The psychological warfare tapestry of Sri Lanka leans back from the ancient past to the modern battles fought, and to unveil them is a historical breakthrough in the history of battle strategy of Sri Lanka.

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