The effects of affective organizational commitment on voluntary resignation in the Brazilian Army

Los efectos del compromiso organizacional afectivo en las solicitudes de rescisión voluntaria en el Ejército brasileño

Abstract: Based on organizational commitment, this longitudinal study analyzes the contribution of affective commitment toward the Army to develop a predictive model to describe the voluntary resignation of career officers in the Brazilian Army. Longitudinal data for 22,695 commissioned Brazilian Army officers from 2009 to 2014 were analyzed using a mixed logistic model, presenting, on average, five measures for each performance variable, which were obtained from periodic commissioned officers' evaluations. Using these performance variables, we developed a statistical model to predict the probability of military personnel resigning early. This probability is influenced by the military's training school of origin and rank, together with the performance variables associated with the affective commitment toward the Army. The article concludes that higher levels of affective organizational commitment, in this study expressed by the concepts of military attitude, military posture, military discipline, and military leadership, lead to lower probability of voluntary early resignation.

Keywords: Military Schools, Affective Commitment Variables, Resignation; Longitudinal Analysis, Generalized Linear Mixed Regression Model.

Resumen: Con base en el compromiso organizacional, este estudio longitudinal analiza la contribución del compromiso afectivo hacia el Ejército para desarrollar un modelo predictivo que describa las solicitudes de rescisión voluntaria de los oficiales comisionados en el Ejército brasileño. Se analizaron los datos longitudinales de 22 695 oficiales comisionados del Ejército brasileño entre 2009 y 2014 utilizando un modelo logístico mixto, presentando, en promedio, cinco medidas para cada variable de desempeño, las cuales se obtuvieron de evaluaciones periódicas de oficiales comisionados. Utilizando estas variables de rendimiento, desarrollamos un modelo estadístico para predecir la probabilidad de que el personal militar renuncie prematuramente. EEsta probabilidad está influenciada por la escuela de formación de origen y el rango del militar, junto con las variables de rendimiento asociadas al compromiso afectivo hacia el Ejército. Este artículo concluye que mayores niveles de compromiso organizacional afectivo, expresados en este estudio por los conceptos de actitud militar, postura militar, disciplina y liderazgo militares conducen a una menor probabilidad de rescisión anticipada voluntaria.

Palabras clave: Escuelas Militares, Variables de Compromiso Afectivo, Rescisión; Análisis Longitudinal, Modelo de Regresión Lineal Mixto Generalizado.

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1 INTRODUCTION

Military leaders must be prepared to carry out a variety of missions under new and rapidly changing conditions. They must be able to quickly assess situations, make decisions, formulate plans, and adjust to unexpected outcomes (Morath et al., 2011). As a result, investment in training military leaders is always high, and when such an investment is made, the expectation is that those highly trained personnel will remain in active service for many years.

An effective military leader needs not only technical knowledge but also good interpersonal skills to encourage those under their command (Tremblay, 2010). Contemporary operational environments involve military performance requirements that are more rigorous and, thus, increasingly better evaluated (Morath et al., 2011). Some studies show that noncognitive variables might distinguish good leaders from others (House; Howell, 1992; Bartone et al., 2002; Bass, 2006).

According to Krause (1999), many organizations and nations thrive entirely on the vision and ability of their leaders, and the challenge of developing these leaders is not a new phenomenon; this is equally true for military leadership. In Brazil, the loss of intellectual capital in the armed forces, especially among career officers, has been accentuated for some time now, either due to early resignation, relocation in the labor market, or paid reserves (Ticom, 2011). Administrative analyses of the issue, when they occur, typically show no scientific basis, and consist merely of simple judgments of value, mainly concerning remuneration.

In fact, the specificity of the military profession distinguishes professionals in the Armed Forces from all other professionals in public administration, particularly when analyzing the required sacrifices and risks they may take, including life itself (Santos, 2012, p. 25).

We confirm that we considered the protection of associated intellectual property in this study and that there are no obstacles to publication, including timing, regarding intellectual property concerns. This affirms that we have followed our institutions' intellectual property regulations. The confidentiality of the data obtained in the databases was guaranteed at all stages of the study. The information was archived anonymously and used solely for scientific research purposes. The Brazilian Army Command authorized the use of the assessment data, even though it was restricted, as long as none of the participants were identified.

1.1 The Brazilian Army's Assessment System

The Army has conducted a formal evaluation system since 1973. To keep the system adequate to the Force's demands, successive improvements have been introduced over the years. In 2015, the assessment was aligned with the Army's transformation of the performance management system.

The new system holds two objectives: the first, focused on people, is to improve professional performance; and the second, centered on the organization, is to subsidize the Army's selection and promotion processes.

According to the Regulatory Instruction for the Army's Military Personnel Performance Management System, performance management will be based on the assessment of the service

personnel's competence. In this document, competence is defined as the set of knowledge, skills, attitudes, values, and experiences, evidenced by the soldier in the performance of a position or function. Competencies are divided into basic characteristics, common to all military personnel, regardless of rank, graduation, position, or function performed; and specific characteristics that concern their performance in the post, graduation, position, or function. The assessment of a given competency is made by comparing the performance and behavior of the serviceman during the evaluation period with the competency descriptors.

Among the various characteristics evaluated in the Army's military personnel performance management system, military spirit (i.e., attitude, posture, discipline, and military leadership) stands out, representing the affective commitment to the Brazilian Army institution.

1.2 The Concept of Organizational Commitment

The concept of organizational commitment refers to a binding force between the individual and the organization (Meyer; Herscovitch, 2001) and can be defined as "a psychological state that (a) characterizes the employee's relationship with the organization, and (b) has implications for the decision to continue or discontinue membership in the organization" (Meyer; Allen, 1991, p.67). Although there are different conceptions and models of organizational commitment, the model by Meyer and Allen (1991) has received the most support, being the most frequently used in the field of research (e.g. Gagné, et al., 2008; Meyer, 2014; Meyer; Maltin, 2010; Tremblay et al., 2009), specifically the military context (e.g. Fraga et al., 2018; Gade, 2003; Gade et al., 2003; Karrash, 2003; Tremble et al., 2003). According to this model (i.e. Meyer; Allen, 1991), there are three dimensions of commitment. The first refers to the affective dimension that reflects the emotional bond between the worker and the organization, which, in the case of the military context, can be understood as the emotional connection of a soldier with military service or the unit to which that individual belongs. The second refers to the normative dimension, which results from experiences that lead workers to have a sense of obligation (reciprocity) towards the organization, representing, in the case of the military, a sense of duty that makes the soldier consider their activity more as a moral obligation than a job. The third, on the other hand, refers to the dimension of continuity, which represents the awareness that the worker has in relation to the costs associated with a possible departure from the organization, referring, in the case of the military, to a functional bond that demonstrates the need for the serviceman to remain in the institution because of the difficulty of finding another job or because they have too many years invested in the service of the institution to give up certain achieved benefits (Gade, 2003; Meyer; Allen, 1991, 1997; Meyer et al., 1993). Of these three dimensions, the affective dimension, referring to a sentimental attachment, as well as a feeling of wanting to belong as a reflection of a voluntary desire (Meyer; Maltin, 2010), is the one that has shown the most positive effects in the well-being of the soldier and in the desire of such personnel in staying longer in the institution (e.g. Begley; Czajka, 1993; Cooper-Hakim; Viswesvaran, 2005; Meyer et al., 2002).

This study aims to develop a predictive model from the evaluations of the service personnel in the Army's military career performance management system, seeking to demonstrate that higher levels of affective organizational commitment, in this study expressed by high scores in the military

spirit variables (i.e., military attitude, military posture, military discipline and military leadership), leads to longer stays within the Brazilian Army institution. Therefore, soldiers with greater affective organizational commitment are less likely to voluntarily resign.
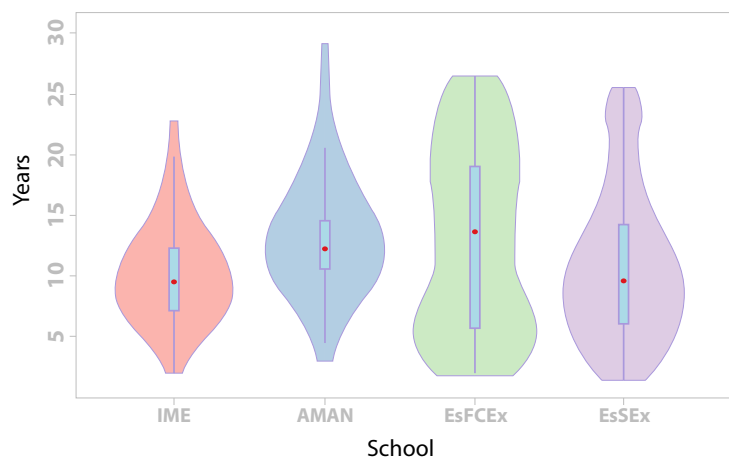
To the best of our knowledge, no previous study has identified the performance variables associated with increased dismissal in the Brazilian Army. This should be an invaluable tool to aid the leadership of military units in assisting military personnel with their challenges and in conserving the resources of the federal government.

1.3 Resignation in the Brazilian Army in Figures

The Brazilian Army has rules for the provision of voluntary military service. Those who wish to remain in the ranks of the Army must apply for one of the four Military Schools. After completing training that varies from one to five years, the army cadet is obliged to remain on active duty for at least five years. However, after investing in military training, the Army expects career officers to complete their active duty before transitioning to paid reserves. In Brazil, the training period was historically included in the 30 years of total official service time, and it continues to be included when the total service time was extended to 35 years in 2020.

The resignation rate of commissioned Brazilian Army officers has increased dramatically over the past ten years, resulting in a significant loss of personnel, which tends to impact operational and administrative management. Cases of early dismissal have been observed throughout the military, in all four Career Lines (combat line, Health, Military Engineer, and Complementary). Each school gives rise to different career lines: AMAN – combat line; EsSEx – Health; IME – Military Engineering; and EsFCEx – Complementary Formation (includes all university-level subjects not covered by the other schools, such as Administration and Statistics). As illustrated in Figure 1, the dismissal time (in years) differs when comparing the schools.
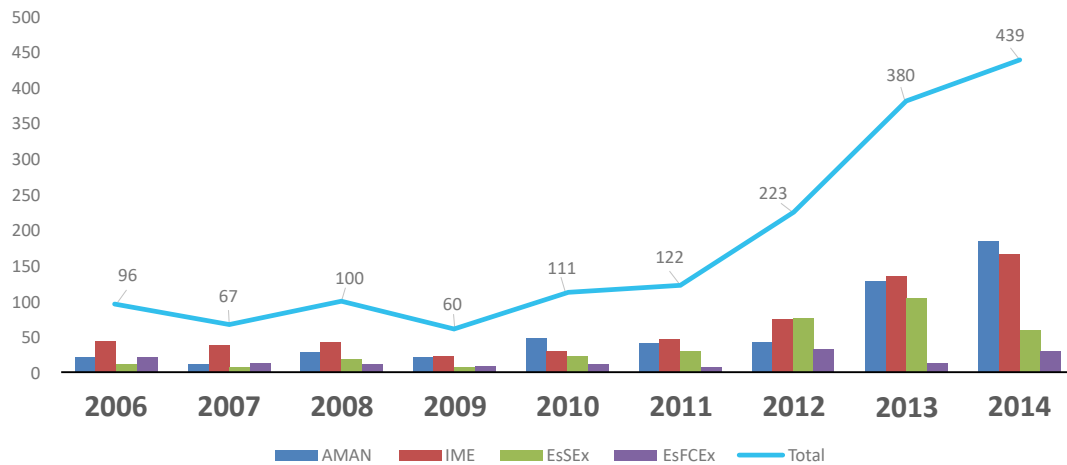
**Figure 1. Violin plot of the years in Service (2009 to 2014) by school of origin:
Army Engineering Institute (IME), Military Academy of Agulhas Negras (AMAN),
Army Health School (EsSEx), and the Army Complementary Training School (EsFCEx)**

Source: prepared by the authors.

From 2012 to 2014, 1,042 career officers submitted early resignations, reflecting a 256% increase compared to the period from 2009 to 2011 (Figure 2). As shown in Figure 3, 1,335 career officers requested early resignation from the Army General Department of Personnel's database from 2009 to 2014. Over this period (2009–2014), there was a 631.67% increase in resignations. During 2012 and 2013, 15% of first lieutenants and 3.8% of captains in military engineering, as well as 3.5% of first lieutenants and 1.4% of captains in the medical corps, resigned from the Brazilian Army (DAProm, 2014). Captains and lieutenants are the most common ranks to resign. The number of resigning official military engineers and career officers of health exceeds that of the operational cadres in the three-armed forces (Navy, Army, and Air Force). Resigning career officers are typically in the lowest career positions. They also have high in-demand skills in the current labor market, such as engineering, medicine, and logistics (Balbi, 2013).

Figure 2. Resignation from the Brazilian Army (2006 to 2014) by school of origin (bar charts) and total values (blue line)

Source: prepared by the authors.

2 MATERIAL AND METHODS

2.1 Study Participants: Military Database

This study aimed to analyze the resignation of career officers from the Brazilian Army. Thus, a large military database from 2009–2014 was analyzed. In addition, neither career officers who died nor those who left the Army involuntarily were considered. After excluding those officers, a total of 22,695 career officers (active or reserve servicemen) who served in the Brazilian Army from 2009 and 2014 were included.

2.2 Study Outcome and Predictors

The initial consideration of the study was information on whether the officer resigned from the Army. Thus, the response variable (called Resignation) took the form: one if the

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commissioned officer left before completing the regular service (deceased military personnel or those whose exits were not spontaneous; resignation due to reasons beyond one's control, such as health problems or court decisions, were not considered); or zero if the commissioned officer had served their regular service by the date of receipt of the databases.

Each officer occupies a specific position in the military unit, and what the Army expects from them is clearly defined in the Military Positions Plan. At the beginning of each evaluation period, three officers, who are their immediate superiors, meet with the officer under evaluation to ensure they know what skills are expected for their role and how they will be measured.

The Army Promotion Board periodically seeks to give lectures to aid recall the concepts that guide the evaluation. Career officers are then evaluated on each of the performance variables. This same board analyzes all the evaluations and then compares them with previous evaluations. The evaluation form is assessed if a deviation is found, whether positive or negative, and the evaluators must write a justification for the given grade. The officer being evaluated also takes note of these assessments and can request the Promotion Board to analyze the cases individually.

The predictor variables are based on the soldiers' evaluation as well as demographic variables:

1. **Military school of origin**. From the four Brazilian military schools;

2. **Military rank**. Within the same rank or undergraduate degree, military rank is established by seniority. Our study was based on officers, namely, lieutenants, captains, majors, lieutenant colonels, and colonels;

3. **Years of Service**;

4. **Performance Variables**. These are variables that demonstrate various factors related to professional performance.

Amongst the performance variables, some describe the military spirit, which is strictly related to the levels of affective organizational commitment. This study focuses on the variables of military spirit: attitude, posture, discipline, and leadership. Table 1 provides a brief description of these variables. On average, every commissioned officer had five measures for each variable under study.

Table 1. Description of the performance variables under study: Military Spirit

Military Spirit	Description
Military attitude	Military commitment to the duties, values, and principles of institutional ethics
Military posture	Attitude of permanent attention to one's image, uniformed, or not, aware that posture and personal presentation must be dignified as a member of the Brazilian Army
Military discipline	Ability to comply with laws, regulations, and standards
Military leadership	Ability to mobilize the will and to maintain the cohesion and morale of one's team or people

Source: prepared by the authors.

Each performance variable was measured using a 10-point Likert scale, then converted to a 5-point scale following the structure: A=9.5–10; B=8–9.49; C=6–7.99; D=4–5.99; and E=0–3.99. Each officer is evaluated annually by up to three career career officers who are trained evaluators. Thus, each commissioned officer can obtain up to three different grades, and the final evaluation corresponds to their average for each evaluation item.

2.3 Statistical Analysis

This study analyzed the association between the scores obtained in the periodic labor evaluations attributed to the Brazilian Army career officers and the probability of voluntary resignation of the military personnel.

The regression model used in this research had to accommodate the following features of the database: (1) the longitudinal nature of the data: on average, each officer had five observations for each performance variable collected from 2009 to 2014, which introduced a correlation structure among the observations that belonged to the same individual. It was necessary to model the correlation between repeated measures for the same individual, characterized by an unobserved level of response that persists over time (Belloco, 2001); (2) an intrinsic hierarchical structure existed in the observations, as officers were clustered by school of origin (five schools) and by rank (five ranks) within each school, forming a two-stage clustering; (3) imbalanced samples were noted across the clustering variables; (4) the schools of origin under consideration were a subset of all Army schools, suggesting that inferences could extend to a broader population of such schools. In summary, the data under study was characterized by hierarchical and longitudinal structures, as the officer is grouped into ranks, which in turn are nested within each school of origin; each career officer was evaluated longitudinally on the same performance variables over six years (2009–2014).

To deal with these data characteristics, GLM extensions were employed, namely the generalized linear mixed models (GLMMs), also called hierarchical linear models or multilevel models (Bickel, 2007; Diggle, Heagerty; Liang; Zeger, 2013; Marôco, 2014; West; Welch; Galecki, 2014). In this case, the mixed effects logistic regression model was employed, a particular case of the GLMMs, as the outcome (resignation or not) is a binary variable.

The covariance model employed in this work was the heterogeneous Toeplitz (TOEPH) (Liu, 2015). The specification of this covariance model is based on the hypothesis that the pairs of errors within the subject separated by a common time-difference have the same correlation but accommodate heterogeneous variances over time (Wolfinger, 1996).

All the variables under consideration presented a Variance Inflation Factor (VIF) lower than five, indicating the predictors are at acceptable levels of multicollinearity (graph not shown). A description of the statistical model under consideration is given in the Appendix.

The selection criteria employed in this work relied on mathematical information theory. The variable selection process used in the final model was based on the stepwise procedure using the Akaike Information Criterion (AIC). The conditional R^2 (Johnson, 2014) was used

to evaluate the proportion of the explained variance to describe resignation from the army by the predictors under consideration.

The R software version 3.4.4 was used for data processing and analysis (more information at www.r-project.org). A major R package used was the "glmmTMB" (Version 0.2.3).

3 RESULTS

The entire military database comprised 22,695 career officers, of which 1,298 had asked for voluntary resignation (5.7% of the total). We randomly selected 12,570 military personnel from this database to fit the GLMM while maintaining the original proportion of military personnel who requested voluntary resignation.

The ages of the career officers ranged from 21 to 55 years old, and the mean age was 39 (SD = 11). Only career officers (from lieutenant to colonel) were included in the sample, most of whom hold a college degree (91%; 9% hold a general equivalent diploma). The length of service ranged from 1 to 40 years, with an average of 25 years (SD = 12). The participants showed different skin colors: 46.7% White, 41.2% Brown/Mixed-race, 9.1% Black, and 3% Other. In total, two thirds of the participants (64%) reported a household income in the last 12 months ranging from 15,000 to 34,000 USD (converted from Brazilian reais).

To assess whether the performance variables included in the Brazilian Army Database were relevant to distinguish between the military personnel who requested early dismissal from the others, we performed a two-tailed Welch two-sample t-test. This step was performed to estimate whether the difference in the means of the two underlying populations was statistically significant. Table 2 shows the results.

Table 2. Results from the two-tailed Welch Test: mean (standard deviation, SD) of the military spirit's variables for the military personnel who resigned and those who did not
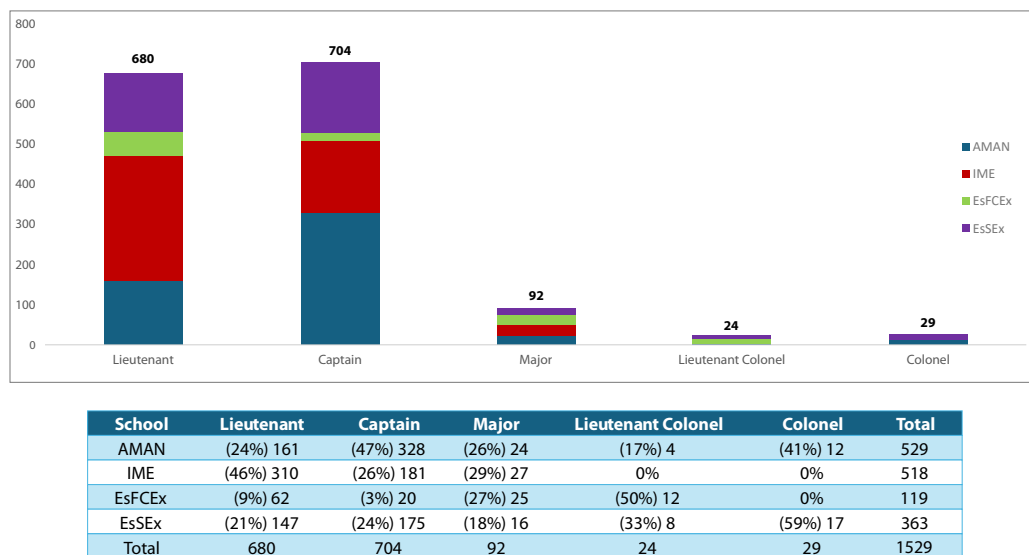
	Mean (SD)		
Military Spirit	No Resignation (n = 11 853)	Resignation (n = 717)	p-value
Military Attitude	8.86 (0.62)	9.03 (0.81)	< 0.001
Military Leadership	8.65 (0.72)	8.85 (0.88)	< 0.001
Military Discipline	9.03 (0.58)	9.19 (0.82)	< 0.001
Military Posture	9.03 (0.56)	9.31 (0.77)	< 0.001

Source: prepared by the authors.

Bearing in mind that p-values are equal to zero for all variables under study, we conclude that, on average, the performance variables have different behaviors when we compare the career officers who requested early dismissal (resignation = 1) to the others (resignation = 0). Thus, the cited performance variables can effectively distinguish these two main groups (resignation versus non-resignation).

Figure 3 exhibits the resignation pattern by school of origin and rank. It shows that from 2009 to 2014, the ranks with the most voluntary resignations were Lieutenant and Captain. This feature can be explained given that they are the initial career ranks, and most military personnel at this level do not have children and earn the lowest wages. The opposite situation occurs with colonels, who showed virtually no requests for resignation, which is not surprising given that most colonels already have sufficient time to request remunerated reserve. At the Lieutenant rank, almost 50% of all resignation requests are from Instituto Militar de Engenharia (IME). This finding may be related to the fact that IME is a highly regarded school in Brazil, not only in the military but also in the civilian environment. It trains highly qualified military engineers who can be directly absorbed by the civilian environment (DAProm, 2014; Souza, 2014).

Figure 3. Resignation (2009 to 2014) by rank and school of origin

School	Lieutenant	Captain	Major	Lieutenant Colonel	Colonel	Total
AMAN	(24%) 161	(47%) 328	(26%) 24	(17%) 4	(41%) 12	529
IME	(46%) 310	(26%) 181	(29%) 27	0%	0%	518
EsFCEx	(9%) 62	(3%) 20	(27%) 25	(50%) 12	0%	119
EsSEx	(21%) 147	(24%) 175	(18%) 16	(33%) 8	(59%) 17	363
Total	680	704	92	24	29	1529

Source: prepared by the authors.

3.1 Resignation in the Health Care Line

In EsSEx, the length of service of military personnel who resigned upon request differed between physicians and pharmacists/dentists. For physicians, the average time of service was nine years, while for pharmacists and dentists it was 15 years. Therefore, we chose to distinguish between EsSEx, which includes pharmacists and dentists, and EsSEx-Med, which includes only physicians of various specialties. This difference in behavior was anticipated in light of the great demand in the civilian world for specialist doctors. Hereafter, the analysis of the Health group will be divided into two subsets: EsSEx and EsSEx-Med.

3.2 Fitting the Generalized Linear Mixed Logistic Regression Model

We adjusted a generalized linear mixed-effects logistic regression model to the data under analysis. The random effects considered the combination of the school of origin (five groups)

and the rank (five groups), thereby obtaining 25 groups. Using the likelihood ratio test, we compared the model with a random structure to describe the School/Rank and the model without this random structure, which resulted in the observed chi-square test value equal to 30.8 (p-value = 0.00), meaning that the null hypothesis is rejected for all significance levels. Thus, the model with the random structure was employed.

The variables included in the GLMM model included Years of Service, Military Attitude, Military Leadership, Military Posture, and Military Discipline. Table 3 illustrates the values of the estimated coefficients (standard errors and p-values) for the variables associated with the military spirit; odds ratio and the respective 95% confidence intervals are also displayed. All variables are statistically significant.

Table 3. Results from the GL MM adjusted to the data (fixed effects): coefficient estimates, standard errors (SE), *p*-values, odds ratio (OR), and respective 95% confidence intervals

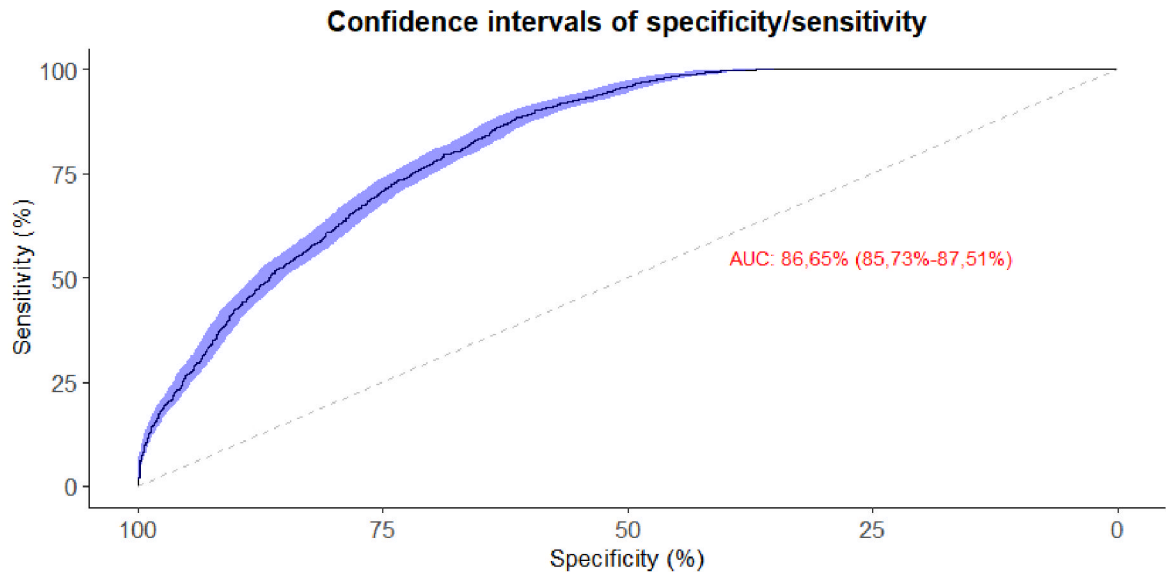| Military Spirit	Estimate	SE	*p*-value	OR (95% CI)
(Intercept)	−0.37	0.07	0.0000	0.69 (0.61−0.76)
Military Attitude	−0.26	0.08	0.0011	0.77 (0.70−0.85)
Military Leadership	−0.22	0.06	0.0002	0.80 (0.75−0.87)
Military Posture	−0.40	0.10	0.0000	0.67 (0.61−0.73)
Military Discipline	−1.78	0.19	0.0000	0.41(0.36−0.46)

Source: prepared by the authors.

From Table 3, we point that an increase of one unit in the score of Military Attitude decreased the risk of resignation from the Army by 23%. An increase of one unit in the score of Military Leadership decreased the risk of resignation from the army by 20%. Every increase of one unit in the score of Military Posture was associated with a 33% decrease in resignation from the Army. Finally, an increase of one unit in the score of Military Discipline decreased the risk of resignation from the Army by 59%.

We found that the probability of early exit varies according to the school of origin, even when values, ranks, and years of service are the same. For example, for a lieutenant at the beginning of their school career, with a score of eight in each of the variables, the probability of voluntary resignation from IME is 46.27%; being 2.7% for AMAN; 5.88% for EsFCEx; 1.54% for EsSEx; and 15.08% for EsSEx-Med. These conclusions align with the expected results because military graduates at IME and EsSEx-Med have historically had a high dropout rate. The highest probability of early exit is for lieutenants and captains from the IME, followed by physicians from the EsSEx.

The conditional R2 was 84.9%, which reveals that the estimated model fits the data well. Considering the ROC curve, the Area Under the curve (AUC) represents the degree or measure of separability. Thus, higher AUC leads to better model predictions. Figure 4 depicts the ROC curve, and the respective AUC with the 95% confidence interval. In our model, we obtained an AUC of

86.6% (95% CI: 85.7% – 87.5%), suggesting that the estimated model has an excellent capacity to distinguish the military who resign from those who do not. In other words, this model can be of significance to the Brazilian Army and aid in addressing the issue of early resignation. Additionally, for the optimal cutoff point, the estimated model has a sensitivity of 85% and a specificity of 97%.

Figure 4. Results from fitting a generalized linear mixed model: ROC curve, AUC, and respective 95% confidence interval

Source: prepared by the authors.

4   DISCUSSION

Resignation from the Brazilian Army can be considered significant challenges for Human Resources management in the Brazilian Army. For several years, the Brazilian Army has invested in the training and improvement of its officers, and this investment has been made with the expectation is that career officers remain in the Institution for at least 35 years of service. This study analyzed the probability of voluntary resignation of military personnel, mainly based on certain performance variables describing affective commitment to the Institution. The ability to predict the probability of a commissioned officer leaving the Army before the end of the completion of their total length of service could enable the Army leadership to intervene and prevent. To attain this goal, we studied the database from the Brazilian Army that comprises 16,540 officers evaluated every year from 2009 to 2014. To the best of our knowledge, this is the first study that deals with the issue of voluntary resignation in the Brazilian Army in the context of panel data, making this study a pioneering approach.

Previous studies used questionnaires to survey groups of soldiers who have resigned (DAProm, 2014). However, the results obtained from these studies were very incipient. Thus, we decided to examine a set of performance variables regularly collected since 2009 by the Brazilian Army to evaluate their career officers. The goal was to analyze the impact of these variables on the officers' likelihood of leaving the army. The performance variables under consideration

constitute a group of related behaviors that are required for successful work performance in an organization (Goffin, 2006).

Using a generalized linear mixed model (Laird; Ware, 1982), it was possible to identify the relationship between the probability of early exit and the variables of Military Attitude, Military Leadership, Military Posture, and Military Discipline.

From the estimated model, we found that higher evaluations of Military Attitude, Military Leadership, Military Discipline, and/or Military Posture lead to lower chances of leaving the Brazilian Army early (Table 3).

Our results, regarding the variables used and their relationship with resignation, coincide with the results obtained by Schreurs and Lescreve (2001) concerning the variables of Military Attitude; Randall (2006), in relation to the variable of Military Leadership; and Lesieur (2011), with respect to the Military Discipline variable.

The highest probability of early exit has been previously found for lieutenants and captains from the IME, followed by physicians from the EsSEx (DAProm, 2014; Souza, 2014), which agrees with our results.

The decrease in the probability of voluntary dismissal as the length of service increases also coincided with the results obtained by L'Abbate (2019), in which she described an increase in organizational commitment as the commissioned officer acquired more time in the service. This conclusion also follows that of Sinaiko et al. (1981).

The IME trains highly skilled military engineers, and the EsSEx trains doctors, both of which the general population also requires. Even for IME, which has, as we have seen, a high dropout rate (DAProm, 2014; Souza, 2014), the model was found capable of analyzing the service personnel's exit propensity.

The limitations of this study include the following:

1. We could not analyze whether there would be any difference in the final model by including the variable of gender, as women were only allowed to enroll in the combat career path in 2017 and given that it is a 5-year course, they have not yet graduated. Future studies are required to address this issue.

2. We did not examine other possible predictors, such as job satisfaction (Mayer et al., 2008), quality of work, quality of life, quality of leadership (Sminchise, 2016), or specific types of military experiences.

All Armed Forces worldwide have an evaluation system for service personnel, and as illustrated in the Introduction, several of them have issues with the early departure of their staff. The methodology employed in this research can also be applied to data from the armed forces of other countries to assess the possibility of minimizing the dismissal of their personnel.

As aforementioned, the main strength of this study was the identification of the performance variables intrinsically related to the early departure of commissioned Brazilian Army officers.

5 CONCLUSIONS

This study aimed to develop a predictive model to describe the voluntary resignation of military personnel in the Brazilian Army based on affective commitment. We suggest that affective commitment variables, by which the soldier is evaluated, can predict the probability of military personnel resigning early.

The results show that the Army is failing to retain its talent due to the high dropout rate in the Brazilian Army. Thus, it is undoubtedly a challenging issue for the Human Resources management of the Brazilian Army Institution.

Future studies should consider the inclusion of women, as well as other possible predictors, such as job satisfaction, quality of work, quality of life, quality of leadership, and/or specific types of military experiences.

Lieutenants and captains are more likely to leave the Army voluntarily. This conclusion was expected because, at this stage of their careers, service personnel frequently consider whether they have a genuine organizational commitment to the military, or only remain at the institution because they cannot leave. That is to say, to confirm whether they hold deep rooted military ideals or if they should leave the Army for civilian life.

Further actions that military leadership could adopt using these methods would involve targeting lieutenants and captains. A decrease over time in performance variables mainly related to Military Spirit (attitude, leadership, and discipline), combined with the officer's rank, could suggest a risk of early departure from the Army. Officers with this profile would undergo a period of closer monitoring by military psychologists to assess their reasons for wanting to leave. Moreover, they should be guided by mentors, preferably from within their own career paths.

The model presented in this article, in addition to enabling the leadership of the Brazilian Army to assist career officers who are at risk of abandoning their military careers, may also be applicable in the Navy and Air Force; in addition, it could be used to assist military leaders in other countries. We found that generalized linear mixed models are a suitable approach for predicting dropout rates. As such, this decision model represents a useful tool for policymakers to employ in the future, and within numerous Armed Forces worldwide, as the model can accommodate each country's specificities.

AUTHORSHIP AND CONTRIBUTIONS

All authors contributed equally to this work.

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APPENDIX

The mixed-effects logistic regression model with random intercept, used to estimate the probability of resignation from the army, is given by the following expression:

$$\text{logit } P\left(Y_{ij|k}=1\right) = \beta_0 + u_{ij|k} + \sum_{l=1}^{p} \beta_l \, x_{ijl|k}$$

In which the observed binary outcome (the value one means resignation, and zero otherwise) $y_{ij|k}$, the j-th observation for the i-th officer that belongs to the k-th school/rank, is a realization of the random variable $Y_{ij|k}$ that follows a Bernoulli distribution with parameter $p_{ij|k} \equiv P\left(Y_{ij|k}=1\right)$, i.e., the probability of resignation. This probability takes the form:

$$p_{ij|k} \equiv P\left(Y_{ij|k}=1\right) = \frac{\exp\left(\beta_0 + u_{ij|k} + \sum_{l=1}^{p} \beta_l \, x_{ijl|k}\right)}{1 + \exp\left(\beta_0 + u_{ij|k} + \sum_{l=1}^{p} \beta_l \, x_{ijl|k}\right)},$$

$k = 1,\ldots, 25;\ i = 1,\ldots, m_k;\ j = 1,\ldots, n_i;$ m_k is the number of officers for the k-th school/rank, and m_k is the number of repeated observations for the i-th officer. It is worth noting that if the officer did not resign during the period under analysis, the outcome variable was always equal to zero. If the officer left the army, the outcome variable took the value one at the officer's last observation available, whereas its former observations were considered equal to zero. The l-th predictor takes the value $x_{ijl|k}$, for the j-th observation of the i-th officer, within the k-th school/rank, and β_l is the associated parameter; p is the number of explanatory variables, including the intercept. The random effects term associated with the school/rank is denoted by $u_{ij|k}$, and it is assumed that it follows a normal distribution with zero mean and variance equal to σ_u^2.

In terms of the first and second moments of the distribution under consideration,

$$\text{E}\left(Y_{ij|k}\right) = p_{ij|k}, \ Var\left(Y_{ij|k}\right) = p_{ij|k}\left(1 - p_{ij|k}\right) \equiv \sigma_{ij}^2 \ \text{ and } \ Cov\left(Y_{ij|k}, Y_{ij'|k}\right) = \sigma_{ij}\,\sigma_{ij'}\,\rho_{|j-j'|}, j \neq j'.$$

The heterogeneous Toeplitz (TOEPH) covariance matrix assumes that the structure of correlation between pairs of observations separated by the same time lag is equal.