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ACADEMIC

RISK PREDICTION OF UNIVERSITY STUDENTS USING COGNITIVE STRATEGIES

PREDICCIÓN DEL RIESGO ACADÉMICO DE LOS ESTUDIANTES UNIVERSITARIOS MEDIANTE ESTRATEGIAS COGNITIVAS

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ABSTRACT

Students dropout and failure are current problems in higher education, as students entering university may face academic risk. The objective of this work is to establish the predictive relationship between cognitive strategies and academic risk for students of Universidad Técnica del Norte of Ibarra, Ecuador. The research work was conducted with a quantitative approach, cross-sectional design and predictive scope through a pathway model. Based on a sample of 450 randomly selected first and second semester students, it was shown that students who did not properly manage their cognitive strategies were more likely to fall into academic risk. On the other hand, students who could develop metacognitive skills and manage to adjust themselves to the academic challenges were able to adapt themselves successfully to higher education demands.

Keywords: academic risk, academic risk factors, cognitive skills, metacognitive skills, cognitive strategies, cognitive processes, university students.

RESUMEN

La deserción y el fracaso escolar son problemas actuales en la educación superior, ya que los estudiantes que ingresan a la universidad pueden enfrentar riesgo académico. El objetivo de este trabajo es establecer la relación predictiva entre estrategias cognitivas y riesgo académico para estudiantes de la Universidad Técnica del Norte de Ibarra, Ecuador. El trabajo de investigación se realizó con un enfoque cuantitativo, diseño transversal y alcance predictivo a través de un modelo de vías. A partir de una muestra de 450 estudiantes de primer y segundo semestre seleccionados aleatoriamente, se demostró que los estudiantes que no manejaban adecuadamente sus estrategias cognitivas tenían mayor probabilidad de caer en riesgo académico. Por otro lado, los estudiantes que pudieron desarrollar habilidades metacognitivas y lograron ajustarse a los retos académicos fueron capaces de adaptarse con éxito a las exigencias de la educación superior.

Palabras clave: riesgo académico, factores de riesgo académico, habilidades cognitivas, habilidades metacognitivas, estrategias cognitivas, procesos cognitivos, estudiantes universitarios.

INTRODUCTION

In their study, Baker & Siryk (1986), they state that students must manage, among many other things, emotional, motivational, cognitive, behavioral and even economic resources to successfully obtain a university degree. When these resources are unbalanced, the authors suggest that students are subject to facing a situation of academic risk. In Latin America, only 40% of students graduate successfully even though this rate has steadily increased since 2000.

In Ecuador, 57% of students do not complete their degree within the expected time frame and in the right way. According to statistics provided by the National Council for Evaluation and Accreditation of Higher Education of Ecuador (CONEA), in 41.2% of universities, dropout rates exceed 16% for first-year students. At the Universidad Técnica del Norte in Ibarra, the academic vice-rectorate reports that the overall academic dropout rate is 46%. The analysis of the statistical data of the first level students of the Faculty of Education, Science and Technology (FECYT), shows that 4.75% of students lose a semester. This figure reaches 15.64% in the faculty of Administrative and Economic.

Science (FACAE). In the Faculty of Health Sciences (FCCSS), 6.10% of students repeat semester while the rate reaches 24.20% in the Faculty of Applied and Environmental Sciences (FICAYA) and 29.90%, in the Faculty of Engineering of Applied Sciences (FICA). The repetition rate is particularly high in the latter two faculties.

The above data show that non-compliance, repetition rate and dropping out highlight the current phenomenon of academic risk experienced by university students. This situation is increasing within university institutions in Ecuador as it becomes a major issue. At the Technical University of Norte de Ibarra, academic risk is greatly impacting the rates of educational training at the professional level, and consequently is also weakening the development of the nation, Ecuadorian society, the university and the professionalization of students, since most students are between eighteen (18) and thirty (30) years old and belong to the lower and lower-middle social class.

For these reasons, it is essential to define risk as a central part of the educational field. Academic risk is defined as "a tendency taking the form of school delay, low level of academic performance, poor school performance or, in the worst case, school failure" (Carpio, et al. 2016, p.4). According to Hernández (2015), academic risk depends on school, the social environment and physical conditions, since each student is different and their performance in the academic environment will depend on their efforts, their choices and their ability to adapt and act.

To better understand academic risk factors from a theoretical approach, social cognitive theory offers an interesting point of view. Learning from this point of view arises from the reciprocal determination of three elements: personal factors (including both cognitive and emotional variables), environmental factors and behavioral factors. It is emphasized that cognitive factors influence the student's expectations of success while social elements define how the environment perceives achievement.

It is broadly defined that academic risk is the probability that a student will fail, a student is considered at academic risk when he experiences a large loss of potential that leads to poor outcomes such as unemployment or delinquency, among others.

It is assumed that factors contributing to academic risk are related to the students' study strategies and learning methods. Thus, according to Gallego et al. (2021), contextual factors play a key role and constitute a specific pattern of behavior that can be identified early in order to prevent academic risk situations.

There are conditioning factors related to academic risk, such as the amount of time spent at the university in relation to the time spent on activities other than work or personal tasks); class attendance, punctuality in class related to the main subjects (including lectures and practice sessions), participation in specialized counseling sessions with the professor in charge of the subject for which the student is at risk, the number of additional study hours for each hour of master class dedicated to learning each university course, and the method of study. Add some factors related to academic risk such as the learning methodology used by the student, note-taking, questioning and consistent storage of ideas and concepts to ensure knowledge memorization, care and attention in the selection of classmates for class teamwork, and the adoption of strategies to monitor progress in academic assignment, final course work, midterm and final exams.

Finally, Pacheco, et al. (2019), state that academic risk should be defined as a state of predisposition that leads a student to behave in such a way that affects their level of academic performance. The authors attribute these causal factors to cognitive variables, which become a predictor of risk. This is due to the fact that, in the process of teaching and learning, a number of complex mental processes are involved, such as attention, perception, memory, thinking and reasoning. For this reason, it is important to define the concept of cognitive skills and strategies. Therefore, according to the analysis carried out,

there is reason to believe that academic risk can be predicted by personal factors such as cognitive processes.

According to Rodriguez (2005), cognitive skills are defined as abilities that make a person capable and that allow him to interact symbolically with his environment. He adds that cognitive skills include the abilities and processes of the mind necessary to perform a task, i.e., processes that prepare the human being to receive select, process, store and recover information carried out through transfer methods fostering a continuous construction of increasingly complex mental processes, towards the construction and reconstruction of cognitive strategies.

It is necessary to develop cognitive processes such as observation, attention and processing, which involve the ability to analyze, synthesize, compare and order information, as well as the ability to store and retrieve it. Such cognitive skills are particularly valuable, as they lead to developing even more specific skills. The latter are related to an established field of knowledge or even to specific tasks within them.

Spooner et al. (2022), state that cognitive skills can be classified into basic and advanced skills. Basic skills are considered core skills as they help develop advanced cognitive skills. They are related to the ability to concentrate and the collection and retrieval of information, while advanced cognitive skills focus on problem solving, decision making, critical thinking and creative thinking.

According to three-dimensional theory of Guilford (1961), cognitive skills have three dimensions which are known as operations, products and content. Cognitive elements, memoristic and divergent thoughts belong to the operations dimension while units, classes, relationships, systems, transformations and implications are included in the products one. Finally, figurative, symbolic, semantic and behavioral elements are gathered under the contents aspect. The fusion of the three categories results in different combinations that make the model flexible.

In the first dimension of cognitive skills known as "operations", Guilford (1961), describes 5 groups as follows: cognition, memory recording, divergent thinking, convergent thinking and evaluation. Cognition is linked to the process of discovery, which is defined as a set of mental processes associated with knowledge. Memory storage is the ability to acquire, store, and retrieve information. Its main objective is to provide a person with essential data to understand the world in which they live. Divergent thinking, on the other hand, is defined as the set of mental operations that move in different directions, while convergent thinking is synthesized as the ability to analyze information that leads to a single solution to a problem that is rightly or conventionally considered to be the best. Finally, the author defines evaluation as the scope of decision-making in relation to what is right or wrong, i.e. what is rejectable or appropriate from what is learned or what is memorized.

The second dimension, "products," is related to the type of material or content involved. Such content may include figurative, symbolic, semantic, and behavioral areas. The figural content is defined as the tangible material enabling the senses to perceive the environment. In turn, the symbolic component refers to component expressing meaning such as letters, signs and other conventional symbols. The semantic component corresponds to verbal meanings or ideas, and finally, the behavioral element is the broad area known as social intelligence. (Guilford 1961).

In the third dimension or the so-called "structure of the intellect" six categories arise according to the type of product involved. Depending on the type of content, these skills are referred as units, classes, relations, systems, transformation and implications.

In the process of learning, cognitive strategies are generally understood as "those sequential, planned and rule-oriented behaviors and procedures that enable a person to learn, think and be creative in order to make decisions and solve problems (Chadwick, 1988, p. 3)".

Weinstein & Mayer (1986), classify cognitive strategies into strategies of repetition, elaboration, organization and regulation, repetition strategies refer to the minimal cognitive control performed by a subject and are used as a memory mechanism, which drives data and keeps it in short-term memory and eventually transfers it to long-term memory. These strategies allow an individual to focus and store information in the working memory. However, González, et al. (2002), state that they do not provide significant learning by themselves.

Elaboration strategies contribute to the elaboration of learning processes, since they make sense of data while the individual adds new information and generates connections between different knowledge. Consequently, according to Ausubel (1976), this allows a true learning process and not only mechanical. Provides recovery and implementation of what has been learned. In their synthesis, Weinstein and Mayer (1986), show that subjects who use elaborate strategies remember information more efficiently, such as note-taking, outlines and summaries.

When an individual relies on organizational strategies, he has a high level of cognitive control because he can

categorize, order and structure the information to later store it into his memory. For González, et al. (2002), using such strategies requires the capability to transform the information into different formats to help understanding and assimilation. Finally, when it is spoken of regulation strategies, it is referred to the high cognitive control of the subject, to a certain extent it can be referred to metacognitive skills

Metacognition is understood as the process allowing the regulation of the learning activity. It includes abilities to plan, monitor and evaluate the execution of actions implied by the academic environment. For Díaz (2011), metacognition includes the planning strategies for a proper self-regulation of learning, which controls, assesses and recognizes failures in order to eventually transform the information into a new action.

Metacognitive knowledge includes human characteristics such as the skills used to think about our own cognitive processes and knowledge in relation to the aspects of the cognitive task. In this sense, the following three sub-processes of knowledge can be highlighted: the declarative knowledge, which is the degree of knowledge, management, organization and evaluation, including knowledge about the individual himself and the factors that influence learning when performing tasks; the procedural knowledge, which is the knowledge used to achieve an action, i.e. the skills and strategies the student has to use to implement the knowledge (Baker & Brown (1984), state that this knowledge is generally acquired through direct teaching or through daily experiences) and finally, the conditional knowledge which refers precisely to the knowledge of "when" and "why" to use strategies. With these three types of knowledge, it is assumed that an efficient learner is able to choose appropriate actions in order to achieve specific goals.

Valenzuela (2019), defines the regulation of cognition as the cognitive mechanisms responsible for guiding thinking and behavior in accordance with the objectives and purposes. This is made possible through planning activities, understanding knowledge and task performance, but also through the evaluation of the effectiveness of the processes and the use of monitoring strategies. Such process implies the development of skills allowing students to be aware of their own way of learning.

It isnecessary to define an important aspect of metacognition, which is the control of processes. These processes drive the cognitive activity inherent in the direction and self-regulation of thinking and learning processes. They are also responsible for the planning of processes and strategies to be used and they also evaluate available resources, distribute them and monitor activity while it is in progress. In this case, the activity is not considered stable. It is associated with all cognitive activity and therefore it depends on the situation and on the specific task that must be relatively independent. It may largely operate below the level of consciousness and it may be inaccessible and incommunicable Lozano & Cancino (2015).

In this way, the first step of the processes of metacognition control is the information planning, followed by its supervision and finally its evaluation. According to Jesús, A. de. (2020), information planning is defined as the prediction and anticipation of the results of one's own actions. It involves the processes of understanding and definition of tasks to be performed, the knowledge necessary to solve them, the ability to define objectives and the strategies to achieve them but also the conditions under which they must be undertaken and everything that will lead to a plan of action. On the other hand, supervision is understood as the capacity to implement the planned process. It implies the verification of the possible re-execution of operations previously carried out and the identification of mistakes. Finally, evaluation is described as the comparison of the results obtained with the applied strategies during which the subject reflects on the logic, truthfulness, importance and relevance of the results.

Another element that needs to be mentioned is monitoring. It refers to the ongoing awareness of the understanding and performance of the tasks. In terms of research on metacognitive control, it is generally defined as the willingness to direct the thought processes and memory recollection. It involves the activities of verification, rectification and revision of the strategy (Sarmiento, 2007).

The metacognitive analysis becomes meaningful as soon as the student develops an internal causality. Such causality has to be stable and controllable independently of the student' successes and failures and it must allow him to progress and to impact the way he handles his learning activity as well as his level of motivation. Metacognition is the result of self-observation and metacognitive regulation and it allows the individual to rethink the influence of both cognitive system and affective system in his performance of different tasks. Therefore, the metacognitive system exerts its influence on both cognitive and affective systems.

As mentioned earlier, it is assumed that learning strategies used by the student have a significant impact on academic risk. These learning strategies imply that the student makes decisions and smartly choose from a set of possible options. Such choice depends on the considered cognitive tasks and the complexity of the content.

An inappropriate use of the learning strategies may result in poor decision-making in relation to the academic field.

Garcia, et al. (2012), points out that implementation of cognitive strategies is commonly confused with simple techniques to learn. For this reason, they affirm that implementing these processes must be carried out in an intentional, conscious and controlled way through tacit metacognitive knowledge. Therefore, if such skills are not correctly acquired, learning will not be significant and problems resolution in the educational environment will be ineffective.

MATERIALS AND METHODS

Type of research: We used a quantitative approach. The scope of the research was correlational and cross-sectional, as the purpose of the study was to establish a degree of association or correlation between variables within a sample.

Methods: The research was carried out through the sine qua non method using inductive and deductive methods. In addition, documentary research was also carried out for the bibliographical study. Finally, the analytical method was also applied for the evaluation of the results.

Techniques: The following techniques and instruments were used: bibliographic review through files, scale-type survey to measure variables of the study and statistical analysis techniques.

Population and sample: The population studied was made up of first and second semester students from Universidad Técnica del Norte, from which a representative sample of 451 students was randomly extracted.

Instruments: A questionnaire called "Reasons for University Dropout" was submitted to students to determine academic risk. The questionnaire was written and validated by Flores, et al. (2019).

According to Flores, et al. (2019), the questionnaire "Reasons for University Dropout" intends to identify the reasons behind potential dropout among higher education students in order to provide an early picture of their perception regarding different educational environments. This allowed us to identify weak spots related to academic handling.

As a result, the questionnaire revealed the following psychometric characteristics. Flores et al. (2019), states that the instrument has a KMO of 0.639 and a Bartlett's sphericity test of X2=560.482; gl=231; p=0.000. Then, an exploratory factor analysis showed the existence of 8 components explaining 61.721% of the total variance. Concerning reliability, the questionnaire reported a Cronbach's alpha of 0.638, which indicates that the instrument was reliable for the sample studied.

In addition, in order to measure cognitive strategies, Fuente & Justicia (2003) propose using the ACRA Learning Strategies Scale, which allows to define academic risk factors. It is important to emphasize that this scale quantitatively evaluates various learning strategies used by students in the learning process, such as acquisition, codification, recovery and support in managing information. This scale was designed and validated by Román Sánchez and Gallego Rico, (2008).

The purpose of the ACRA scale is to analyze different learning strategies which compose the basic cognitive processes of acquisition, codification, recovery and support in managing information. This cognitive test analyzes how the information as a stimulus evolves from the moment students are exposed to it to the moment it is stored in their short-term memory.

To determine the validity of the instrument, the following indicators were calculated (Quispilaya, 2010, p. 43);

Validity of concept: According to experts and for each item, the criterion of data adequacy is determined thanks to the measure of correlation coefficients. For the scales of information acquisition (scale I), the correlation coefficient is 0.78, while it is 0.86 for information codification (scale II). This coefficient reaches 0.86 in relation with information recovery (scale III) and 0.88 regarding support in information management (scale IV).

Validity of content: This criterion determines to what extent the scale samples are representative of the areas constituting the learning strategies. The following values were respectively obtained for the information acquisition strategies, the information codification strategies, the information recovery strategies and the strategies for support in managing information: 0.85, 0.87, 0.86 and 0.88. According to the standardized Cronbach's alpha method, the reliability of the scales is as follow: scale I, 0.6130; scale II, 0.9075; scale III, 0.8384 and scale IV, 0.8990.

Escurra, et. al. (2004), agree with Quispilaya (2010) when they affirm that the review of the analysis of the ACRA learning strategies scale shows the psychometric results of the analysis of items in the areas of acquisition strategies, codification, recovery and support in information management. Thus, they conclude that the scale values are meaningful, and that the instrument is relevant since the items scores are consistent.

RESULTS

Descriptive statistics

Table 1. Academic Risk.

		University management	Academic proficency	Vocation and support	Student opinion	Student participation and work	Level of expectation	Academic risk
N	Valid	451	451	451	451	451	451	451
	Lost	0	0	0	0	0	0	0
Average		12,184	12,475	15,266	5,6208	10,789	7,834	75,5211
Median		12,000	13,000	16,000	5,0000	11,000	8,000	76,0000
Mode		12,0	15,0	16,0	5,00	12,0	8,0	76,00
Standard deviation		2,7470	2,7699	3,6460	1,79020	2,5117	1,6224	11,20025
Minimum		3,0	3,0	4,0	2,00	3,0	2,0	33,00
Maximum		15,0	15,0	20,0	10,00	15,0	10,0	99,00

Source: authors' elaboration

In terms of university management, the mean value is 12.18, which is close to the maximum scores obtained. It means that students are not in a situation of academic risk thanks to the university management offering a good level of organization but also to professors.

In relation to the academic proficiency component, the answers are quite scattered, therefore, we will take into account their median value (13.00). This figure is close to the maximum scores obtained, therefore, students are not considered in a situation of academic risk. Indeed, their expectations about the academic program are effectively fulfilled.

Regarding the vocation and support component which is related to students' choice of studies, the median value is 16.00. This number is very close to the maximum scores obtained. It means that students are not in a situation of academic risk since they benefit from support provided by their family environment. It shows that they are personally convinced that they have chosen the right vocation.

The median value corresponding to the student opinion component is 5.62. It is close to the maximum scores obtained, which means that students are not in a situation of academic risk during student protests. It also appears that such situation does not induce high stress levels.

Regarding the student participation and work component, the median value is 11.0, which is also close to the maximum scores obtained. Again, it means that students are not in a situation of academic risk, since they feel that they are involved in the decision-making process in the student center. They also think that they enjoy a high level of training compared to others and that their academic timetables allow them to have a job.

Regarding the student's level of expectation, again, the results show a great amount of variation. For this reason, the median value (8.0) was considered. It is close to the maximum scores. That indicates that even though students have high level of expectation, it doesn't not affect their mental health.

Finally, the median value for the academic risk component is 76.0, which is close to the maximum scores obtained. Thus, it can be said that students are not at academic risk, since they significantly present the characteristics mentioned in the previous components.

Table 2. Cognitive strategies

Statistics						
		Acquisition strategies	**Codification strategies**	**Recovery strategies**	**Support in managing information strategies**	**Cognitive strategies**
N	Valid	451	451	451	451	451
	Lost	0	0	0	0	0
Average		58,8869	127,0865	51,7783	104,1197	341,8714
Median		59,0000	126,0000	53,0000	105,0000	344,0000
Mode		60,00	138,00	54,00	105,00	476,00
Standard deviation		12,31794	29,80461	11,67541	22,52305	68,80621
Minimum		20,00	46,00	18,00	35,00	119,00
Maximum		80,00	184,00	72,00	140,00	476,00

Source: authors' elaboration

In relation to the acquisition strategies component, the calculated median is 59.00 which is close to the maximum scores obtained. In general terms, this means that students are not in a situation of academic risk because they use such strategies and they rely on different attention skills, such as exploration, fragmentation and repetition of information for the acquisition of knowledge.

The mean reported by the codification strategies component has a value of 127.08, which is moderately close to the maximum scores obtained. Even though, students are not considered at academic risk since they mostly use codification strategies that contribute to the creation of new knowledge from previous one, they show certain difficulties in the development of these strategies.

With regard to the recovery strategies, the calculated median value is 53.00, which is close to the maximum scores. Consequently, students are not in a situation of academic risk. However, there are problems to develop these strategies in an effective way. Nevertheless, most of the students are capable of selecting, transforming and transmitting knowledge through systems of search and generation of answers.

The median value for the support in managing information is 105.00, which is moderately close to the maximum scores achieved. This means that, although the students are not in a situation of academic risk, they have not fully developed support in managing information strategies that enhance the other scales of acquisition, codification and retrieval of information.

Thus, in general terms, it is assumed that university students are not in a situation of academic risk, since they properly apply cognitive strategies. The descriptive scale median value for cognitive strategies (344.00) clearly confirms such statement. However, there are obviously some difficulties in the use and proper functioning of the different scales offered by the instrument, such as codification strategies, as well as those of support in managing information.

Correlational Statistics

Table 3. Cognitive strategies vs. academic risk

			Acquisition strategies	Codification strategies	Recovery strategies	Support in managing information strategies	Acquisition strategies	Academic risk
Spearman's rank correlation coefficient	Acquisition strategies	Correlation coefficient	1,000	,744**	,637**	,622**	,815**	,239**
		Sig. (bilateral)	.	,000	,000	,000	,000	,000
		N	451	451	451	451	451	451
	Codification strategies	Correlation coefficient	,744**	1,000	,742**	,715**	,931**	,268**
		Sig. (bilateral)	,000	.	,000	,000	,000	,000
		N	451	451	451	451	451	451
	Recovery strategies	Correlation coefficient	,637**	,742**	1,000	,758**	,861**	,216**
		Sig. (bilateral)	,000	,000	.	,000	,000	,000
		N	451	451	451	451	451	451
	Support in managing information strategies	Correlation coefficient	,622**	,715**	,758**	1,000	,881**	,294**
		Sig. (bilateral)	,000	,000	,000	.	,000	,000
		N	451	451	451	451	451	451
	Cognitive strategies	Correlation coefficient	,815**	,931**	,861**	,881**	1,000	,300**
		Sig. (bilateral)	,000	,000	,000	,000	.	,000
		N	451	451	451	451	451	451
	Academic risk	Correlation coefficient	,239**	,268**	,216**	,294**	,300**	1,000
		Sig. (bilateral)	,000	,000	,000	,000	,000	.
		N	451	451	451	451	451	451

*. The correlation is significant at the 0.01 level (bilateral).

Source: authors' elaboration

The Spearman's rank correlation coefficient related to information acquisition strategies yields Rho=0.23, which means that there is a weak positive relationship between these strategies and academic risk. The value of the scale is $p < 0.05$, therefore, the hypothesis can be considered as true, i.e., students who develop strategies of information acquisition such as reading summaries and sidebars, searching and annotating important words and sentences, have a higher probability of academic success. However, students who do not develop acquisition strategies have a lower probability of academic success and a higher possibility of being at academic risk.

The Spearman's rank correlation coefficient of the information codification strategies yields Rho=0.26 which implies a weak positive relationship between these strategies and academic risk. The value of the scale is $p < 0.05$, and therefore, the hypothesis can be accepted as true This means that students who develop codification strategies (e.g. making graphs and diagrams to represent a relationship between important ideas, reorganizing, establishing and associating ideas with knowledge from other fields of study based on their own experience, using rhymes or mnemonics, etc.) have a greater probability to be academically successful. On the other hand, students who do not develop such codification strategies have a lower probability to succeed and, consequently, they have a higher probability of being at academic risk.

The Spearman's rank correlation coefficient for information recovery strategies yields Rho=0.21, which means that there is a weak positive relationship between these strategies and academic risk. The value obtained by the scale is $p < 0.05$, therefore, the hypothesis is considered as true. Thus, students who develop recovery strategies (e.g. use of nemotechnics, acronyms and crutches when they have to present a topic referring to concepts, facts and sequences requiring to recall information) are more likely to achieve academic success. On the other hand, students who do not develop such recovery strategies are less likely to achieve academic success and therefore, they are more likely to found themselves in conditions of academic risk.

The Spearman's rank correlation coefficient related to support in managing information strategies yields Rho=0.29 indicating a weak positive relationship between the strategies and the academic risk. The scale value is $p < 0.05$, therefore, the hypothesis can be accepted as true. Therefore, students developing strategies to support in managing information are more likely to succeed academically than those who do not understand the importance of the development of support in managing information strategies. This highlights the importance of being aware of the importance of the functions of the strategies of acquisition, codification and recovery of information and to strengthen such efficient strategies.

Finally, the Spearman's rank correlation coefficient with respect to cognitive strategies yields Rho=0.30, which means that there is a moderate relationship between these strategies and academic risk. The scale value is $p < 0.05$; therefore, the hypothesis is accepted as true. Academic success is directly correlated to the use of cognitive strategies i.e., the more a student uses each learning strategy, that is, acquires, codification and recovery of information through the techniques mentioned above, the higher the probability of academic success and the lower the possibility of being put in a condition of academic risk.

Table 4. Regression of cognitive strategies and academic risk

Summury of the model								
Model	R	Squared R	Adjusted squared R	Estimated standard deviation				
1	,339a	,115	,107	10,58270				
Prediction: (Constant), acquisition strategies, codification, recovery and support in information management Source: authors' elaboration								

Table 5. Cognitive strategies and academic risk ANOVA regressions

ANOVA[a]						
Model		Squared sum	gl	Root mean squared	F	Sig.
1	Regression	6501,445	4	1625,361	14,513	,000b
	Rest	49949,105	446	111,994		
	Total	56450,550	450			

Depending variable: Academic risk

Prediction: (Constant), acquisition strategies, codification, recovery and support in information management

Source: authors' elaboration

Analysis of Variance (ANOVA) produces a result $p < 0.05$, which means that cognitive strategies predict in a preponderant way the academic risk of the students. These cognitive strategies include a planned sequential procedure which is driven by rules helping the student to learn. It also includes acquisition strategies, involving attention, exploration, fragmentation and repetition skills. Retrieval strategies are also part of cognitive strategies and refer to the ability to recall data stored in long-term memory. Finally, it also includes processing strategies; those that affect the acquisition, encoding and retrieval of information.

DISCUSSION

This research intended to analyze the academic risk factors in university students with respect to the use of cognitive strategies. Academic risk is defined as a situation in which the student academic activity may be affected. Covington (1992) has shown that among other factors the use of cognitive strategies greatly determines academic risk in academic environment. Hence, using cognitive processes is associated with academic performance and, consequently, with academic success.

The research instruments used were the ACRA Learning Strategies Scale and the University Dropout Motives Questionnaire. Once validated and adapted to the context in which the research was conducted, both tools have greatly contributed to the study's relevance. It is necessary to emphasize that the sample was randomly chosen. This made it possible to study the variable in its natural state, thus guaranteeing reliable results which are free from interference or possible alterations.

CONCLUSIONS

It is concluded that students use acquisition strategies correctly. They use attention skills such as exploration, fragmentation and repetition of information. Likewise, based on the results obtained, it can be said that students make proper use of codification strategies through the adding of new knowledge to already existing knowledge. In relation to recovery strategies, it can be affirmed that students are able to make a selection, transformation and transmission of knowledge using searching systems to generate answers. Finally, the analysis of students' strategies related to the support in managing information shows a weaker capacity to regulate and maintain academic performance. Finally, it was demonstrated that students perform effectively in the university context thanks to the use of cognitive strategies.

Let's finally consider the initial question of this research work: Do cognitive strategies determine academic risk among first and second semester undergraduate students at the Universidad Técnica del Norte? Based on the information gathered, it is possible to confirm this hypothesis. The literature clearly demonstrates that students using little cognitive strategies show poor academic success and, consequently, their probability of being in conditions of academic risk is higher. On the other hand, it can be asserted that when students use cognitive strategies in an adequate manner, they have greater chances to complete successfully their university studies and, therefore, they are less likely to find themselves in situations of academic risk.

Finally, a word should be made regarding the limits of the research. Indeed, the project took place during the worldwide SARS-CoV-2 (Covid -19) sanitary crisis. Consequently, some aspects of the work study were carried out remotely. However, this outcome was not a significant blocking point for the research, since each process was carried out efficiently and in compliance with the respective sanitary guidelines.

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