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Dropout in Andalusian universities: prediction and prevention

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Problem and objective: University dropout is a major problem that affects more than 31,000 students each year in Andalusian universities, with serious personal and social consequences and an economic cost of more than 222 million euros for the region's public administration. As concluded from the review of explanatory models we reviewed, dropout has a multicausal origin. The purpose of our work is to test the efficacy of the use of a screening for the early detection of the risk of academic dropout in Higher Education in Andalusian universities.

Procedure: We applied a screening instrument adapted for incoming students in public universities in Andalusia. The survey was applied at the beginning of the second semester. In this article we present data from a sample composed of 976 subjects from the universities of Granada UGR, Jaén UJA and Pablo de Olavide de Sevilla UPO.

Results: With the data obtained we have established the dropout risk group, which includes those students who do not reach an average score of 3.00 in the total screening. There are 34 students representing 3.48% of the sample. Of these 34 students, 26 are women and 8 are men; 20 belong to the UGR, 8 to the UJA and 5 to the UPO. The detection of the risk group will allow the universities to apply preventive measures in a personalized and adjusted way to avoid possible dropout.

KEYWORDS

higher education, dropout, prediction, risk group, prevention

1 Introduction

Academic dropout is a very important problem in higher education with very negative social and personal consequences. There are many personal situations of a student that can be included in the concept of dropout: change of undergraduate degree, transfer of university, temporary pause in studies and total abandonment of the classroom and the university system. In this article we are going to focus on total dropout, which the Spanish [Ministry of Universities of the Government of Spain \(2022\)](#) defines as the situation of a student who has not graduated on time and is not enrolled in his or her undergraduate degree or in any other degree program at any other university for two consecutive years, so that the student has been left out of the system.

Consistent with this definition, the university system dropout rate is measured as the percentage of students in a cohort who, in year “X” in which they should have graduated, have not obtained their diploma and have not enrolled in any university degree program at in any university for two consecutive years (Ministry of Universities of the Government of Spain, 2022).

The dropout rate is excessively high in developed countries. International organizations such as the OECD (2019) put it at around 20%. The EU indicates for Spain a value that fluctuates around 18% of all university students: bachelor’s and master’s degrees (Eurostat, 2020).

The official data collected in the successive annual reports of Data and Figures of the Spanish University System published by the Government show the evolution of the phenomenon. Specifically, in the 2021 academic year, the rate rises to 13% of undergraduate students (Ministry of Universities of the Government of Spain, 2022). And a double-digit rate is highly worrisome for the University System. That 13% represents a total of 169,000 students who have dropped out of the system throughout Spain of which 31,850 correspond to universities in Andalusia (Ministry of Universities of the Government of Spain, 2022). If we estimate that the state was investing in 2021 about 7,000 euros per year per university position, the cost of dropout (as calculated by Colás Bravo, 2015) is amounting to a total of 1,183 million euros per year in Spain, of which 222 million euros correspond to Andalusia. These figures are lower than those estimated for the United States (Rumberger, 2020) and other regions of the world. Even so, they are unbearable.

In addition to the high economic impact, the negative effects are felt in job training, retraining, social and community assistance programs that must be put in place to care for unemployed young people and even those with social adaptation difficulties.

The social consequences of dropout are closely linked to the personal consequences: feelings of failure, depression, maladjustment or difficulty in finding a quality job in the immediate future.

As it is such a broad and widespread problem with pernicious consequences, many studies are converging to provide knowledge on the phenomenon and its causes (Aina et al., 2022). In his systematic review on the subject, Aljohani (2016) finds six theoretical models that try to explain the causes of dropout and to find the factors of persistence in study that are successful in retaining students.

Spady’s (1970) “Undergraduate Dropout Process” model is based on the assumptions (1) that satisfaction with the college experience will depend on the social and academic rewards available, and (2) that maintaining commitment to college requires both integration into the system and a significant number of positive rewards (academic or social). This theory is based on the idea of student interoperability with the academic system and the social system.

Tinto (1975) developed his “Institutional Departure Model” as an explanatory model of dropout in American universities and is based on a social integration perspective, attributing the cause of dropout to the interaction between the student’s personal attributes and the organizational structures of the institutions. Adjusting the above model for the European context, Heublein et al. (2003) include extra-university contextual factors, such as economic situation, living conditions, family support, and academic and professional guidance received, as causes that influence persistence in the face of dropping out of university studies.

Bean’s (1980) “Student Attrition Model” attempts to create a direct causal pathway so that administrators can point to a specific variable indicating why students drop out. Among the variables studied that

influence a student’s decision to persist in studies are: positive GPA, satisfaction with the institution, perceived added value of the education received, opportunities for participation in student life, and adequate organizational norms for effective integration.

With the “Student-Faculty Informal Contact Model,” Pascarella (1980) assumed that a more informal interaction of students with faculty could increase the level of their institutional commitment and, consequently, minimize the risk of dropout. Pascarella (1980) constructed his model of informal student-faculty contact by examining the dimensions: context, exposure, focus, and impact.

Meanwhile, in their “Non-traditional Student Attrition Model,” Bean and Metzner (1985) argue that, while previous models have emphasized the important role of social integration within the academic institution in the student persistence process, this factor has minimal impact on non-traditional students. Rather, nontraditional students appear to be affected primarily by environmental factors, such as family commitments and other external responsibilities.

The “Integrated Model of Student Retention” (Cabrera et al., 1993) analyzes all the statistically confirmed variables of the previous theories, while excluding from the model those that were not validated in the initial analysis and, in addition, merges similar constructs. Thus, the constructs “courses” and “institutional adequacy and quality” from Bean’s (1980) theoretical model are merged with the constructs “academic integration” and “institutional commitments” from Tinto’s theoretical model, respectively. In addition, some indicator variables were extracted from their original constructs and included in the current model as independent variables. For example, in their statistical analysis, Cabrera et al. (1993) found that the variable “GPA,” considered in Tinto’s model as an indicator variable of the construct “academic integration,” had a status equivalent to the construct “parent.” Finally, the variables “financial attitudes” and “encouragement from friends and family” from the construct “environment” of Bean’s theoretical model were included in his model as independent variables because they were found to significantly affect academic integration, institutional commitments, and the persistence decision.

Along with these six classic models, we find other explanatory theories of dropout such as the Theory of Student Involvement (Astin, 1975) which refers to the “quantity and quality of physical and psychological energy that students invest in the college experience” (p. 307). Astin postulated that the degree to which students are involved in college is positively related to their degree of learning and personal development. More recently, Kehm et al. (2019), point out the nine factors that, in their opinion, influence dropout: academic integration, social integration, personal efforts and motivations to study, admission information and requirements, previous academic performance in school, the student’s personal characteristics, the student’s sociodemographic background, and external conditions. Among these external conditions are: the economic situation and the need to make studies compatible with work, even if it is part-time (Argentin and Triventi, 2011).

With his systematic review, Barroso et al. (2022) makes a conceptual map of the factors involved in dropout: (1) Input attributes (mother’s academic level, family economic level, gender, mental health, previous academic path); (2) Goals and commitment (self-efficacy, autonomy, motivation, perspectives); (3) Institutional experiences (academic capacity, time dedicated to study, interaction with peers, extracurricular activities); (4) Academic and social integration (satisfaction, perceived social support); and (5) Measures

of identification of risk groups (use of screening, analytical learning, data mining, preventive measures).

We draw attention to the fourth factor referring to proactive institutional intervention in diagnosis and preventive intervention with risk groups, which is the one we focus on in this article. Considerations on the prediction of the phenomenon and the conditions of preventive actions are relevant to this study.

The identification and preventive intervention with students at risk of dropping out has been addressed by [Ambiel \(2015\)](#) who presented a study of construction and validation of the Higher Education Dropout Motivation Scale that considers risk factors and leads to an assessment of institutional, personal, interpersonal and professional motivations, autonomy, social support and academic performance. On the other hand, [Lin and Tang \(2015\)](#) report the construction of a dropout alert system in higher education using data mining strategies. [de Oliveira et al. \(2021\)](#) employs AL Analytic Learning, a strategy that relies on the availability of large amounts of student data (demographic information, grades, behaviors in information systems, grades, behaviors in learning management systems, etc.), to exemplify changes in the way educational institutions use data to address student retention, dropout, and success issues, and focus on the needs of individual students in a personalized, data-driven manner.

This system is used by [Ortigosa et al. \(2019\)](#) with their SPA (Dropout Prediction System), an early warning system that uses these algorithmic models to generate static predictions of early dropout risk and periodically updated dynamic predictions. The goal of its work is to prevent student dropout through retention actions focused on the most at-risk students, seeking to maximize the effectiveness of institutional efforts in this regard. It also supports the recording of the resulting retention-oriented interventions for subsequent analysis.

According to a study by [Martínez-López et al. \(2023\)](#), the use of data mining techniques makes it possible to identify dropout risk indicators in university students. By analyzing academic and sociodemographic factors, predictive patterns of dropout can be detected ([Martínez-López et al., 2023](#)).

On the other hand, [Moreno-Candil et al. \(2022\)](#) point out that implementing early warning systems and comprehensive monitoring of vulnerable students is a key strategy for prevention. Timely detection and support can avoid situations of academic failure ([Moreno-Candil et al., 2022](#)).

Likewise, [Moreno-Guerrero et al. \(2022\)](#) emphasize the importance of offering socioemotional support within preventive actions. The strengthening of soft skills and sense of institutional belonging reinforces the motivation and commitment of students ([Moreno-Guerrero et al., 2022](#)).

In short, we have seen how the phenomenon of university dropout has been studied from different disciplines: psychology ([Bakker et al., 2020](#)), sociology ([Samuel and Burger, 2020](#)) and economics ([Aina et al., 2022](#)). Each of these disciplines points to specific mechanisms and determinants of students' decisions and achievements. But what is certain is that the models work in an integrated manner and provide a multicausal explanation to the phenomenon ([López-Cózar et al., 2020](#)). It is clear, therefore, that to address the prediction of school dropout, as we intend to do in this study, we will have to pay attention to dimensions such as: the student's personality; the structures available for social integration; the investment in time, money and effort that the student must make to enter, persist and complete their

studies; the possible existence of institutional mechanisms for reception and tutorial and academic support; vocational aspects; as well as the effectiveness of the instructional model offered to students and the neurodidactic factors involved ([Álvarez et al., 2022](#)).

2 Objectives

In this article, we address dropout as a definitive cause of the absence or weakness in the factors that favor persistence. Thus, we understand that weakness in the factors whose strength causes persistence leads to dropout. The purpose of our work is to test the effectiveness of the use of a screening for the early detection of the risk of academic dropout in Higher Education in Andalusian universities.

To achieve this purpose we set the following objectives:

- (1) To select a screening instrument to detect the risk of dropping out of university studies.
- (2) To apply the instrument to a large sample of students from public universities in Andalusia.
- (3) To describe the dropout risk group and compare it with the total sample.

3 Methods

3.1 Design and process

The use of screening instruments to diagnose dropout in universities is increasingly common ([Casanova et al., 2021](#)). In this study we applied a screening instrument adapted from [Velázquez and González \(2017\)](#) for incoming students in public universities in Andalusia in order to delimit the risk group and provide data on that would allow institutions to develop policies and adjust actions for immediate attention. The design that is non-experimental, descriptive, explanatory and correlational.

The sample was accessed in 2021 through the opportunity provided by the professors in charge of teaching the second semester of the first course of any degree. For reasons of convenience, the application of the instrument was initiated at the Universities of Granada (UGR), Jaén (UJA) and Pablo de Olavide de Sevilla (UPO).

3.2 Sample

The sample is composed of 976 subjects. Of the 970 who identified their gender, 755 were women (77.35%) and 215 were men (22.02%). Out of the total, 642 study at the University of Granada (65.77%), 260 at the University of Jaén (26.63%) and 73 at the Pablo de Olavide University in Seville (7.47%), with one student not answering to which university he/she belonged. The students belong to a wide range of programs taught at the Andalusian universities mentioned: from Primary Education studies, which reaches the highest level of presence in the sample with 34.3%, to Criminology or different Engineering programs, which have one or more representatives in the sample. The subjects belong to the first year of the different undergraduate courses.

The instrument was applied to the students at the beginning of the second semester of their university studies. The students were contacted through their professors. For this purpose, a request for collaboration was sent to all professors with classes in the second semester of studies at the Universities of Granada, Jaén and Pablo Olavide in Seville.

3.3 Instrument

For the diagnosis of subjects at risk of dropping out, we have used the “Survey on successful student retention” by Velázquez and González (2017) validated, in the first instance, by applying it to a population of nursing students from the Matamoros Multidisciplinary Academic Unit of the Autonomous University of Tamaulipas and which we have adapted to the academic context of the Spanish university (Álvarez et al., 2022). This survey has been slightly modified in the wording of the items to adapt it to the Spanish student reality, and two of the initial 73 items have been eliminated because they were not considered applicable in our context. In its final application format, the survey consists of 71 items and 6 questions for the sociodemographic identification of the student. The survey takes the form of a five-point Likert-type scale in which the student expresses their degree of agreement or disagreement with the opinion expressed.

Although it already had an excellent content validation, the instrument was again submitted to a content evaluation, with the participation of 12 judges, with the rank of PhD and specialists in the subject (professionalism coefficient $k=0.9$), who provided some suggestions on the form of the items. Similarly, a pilot test was carried out using a sample group, from which slight changes were made in the formulation of some items (two in particular), without affecting the structural basis of the items.

The usefulness of using this survey on persistence in studies to diagnose at-risk groups is evident: to the extent that the factors shown to be effective for persistence do not appear in a student, he/she belongs to the at-risk group and is a candidate for corrective measures that enhance the persistence factors and decrease the predictors of dropout (Boyras et al., 2013). In addition, the survey is easy to apply by the professors themselves in the classroom, which makes it an excellent screening system.

The original survey establishes five dimensions of university studies:

- A. -Motivation;
- B. -Commitment;
- C. -Attitude and behavior;
- D. -Socioeconomic conditions;
- E. -Continuity.

These dimensions group 10 categories that, according to the authors, represent the theoretical model of persistence vs. dropping out of university studies (Table 1).

3.4 Data processing and analysis

With the data collected, we performed a descriptive analysis, a correlation analysis between dimensions using Spearman’s Rho coefficient and an analysis of variance using the Kruskal-Wallis test to study the distribution of each dimension by university. The results of the descriptive analysis were used to make the sensitivity and specificity decisions necessary to estimate the risk group. The following software was used: SPSS V22.0.

4 Results

4.1 Descriptives

The descriptive analysis of the data shows that all dimensions (Table 1) receive a mean score above 3.00, therefore positive. Dimension C-Attitude and behavior has the highest mean (4.35), followed by dimensions E-Continuity (4.11), D-Socio-economic conditions (4.09), B-Commitment (3.88). Dimension A-Motivation has the lowest mean (3.86). The data distribution, as will be seen below, is not normal, so the median should be taken as the main statistic; however, since both coincide, the mean has been shown as the preferred statistic.

The overall mean score achieved by the set of all the items of the entire sample is 3.83, i.e., the student population surveyed seems to be oriented toward persistence in the studies rather than toward dropping out. However, there are seven items that do not reach the mean score of 3.00, i.e., they indicate a certain level of

TABLE 1 Dimensions and category of the survey on persistence in university studies.

Dimension/items	Categories
A.- Motivation (1–17)	Internal External
B.- Commitment (18–41)	For the institution Personal
C.- Attitude and behavior (42–60)	Academic integration
D.- Socioeconomic conditions (61–64)	Social and family interaction Economic conditions
E.- Continuity (65–71)	Successful completion of subjects Regular attendance Uninterrupted academic path

Source: Velázquez and González (2017).

dissatisfaction with the personal situation in the degree program. These items are presented in Table 2.

Of the seven items not oriented to persistence, three of them, 37, 26 and 19 belong to dimension B.- Commitment, while the other four items (2, 4, 7, and 6) refer to dimension A.-Motivation.

As we had already discussed in Table 3, motivation and commitment are the traits that stand out the least in the students surveyed.

4.2 Correlations between dimensions

To calculate the correlation between dimensions, the Kruskal-Wallis test was previously applied, since there were more than three samples, with the result that the data distribution was not normal, so we proceeded to study the correlation between dimensions using Spearman's Rho coefficient, obtaining the results shown in Table 4.

Table 4 shows the two-by-two correlations of all dimensions. All pairs correlate positively and significantly at level 0.01 (bilateral). These correlations vary in degree of significance. Moderately significant are the correlations (Rho between 0.40 and 0.59) between dimensions A/B (Motivation and Commitment) with a coefficient of 0.563; A/C (Motivation and Attitude and Behavior) with a coefficient of 0.412; and B/C (Commitment and Attitude and Behavior) with a coefficient of 0.431. The dimensions B/E (Attitude and Behavior and Continuity) with coefficient 0.378; C/E (Attitude and Behavior and Continuity) with

coefficient 0.373; C/D (Attitude and Behavior and Socioeconomic Conditions) with coefficient 0.352; D/E (Socioeconomic Conditions with Continuity) with coefficient 0.342 appear with a low significant minor correlation (Rho between 0.20 and 0.39); A/E (Motivation with Continuity) with coefficient 0.272; and B/D (Commitment and Socioeconomic Conditions) with coefficient 0.254; Finally, we consider that the correlation A/D (Motivation and Socioeconomic Conditions) with coefficient 0.157, is a very insignificant correlation (Rho greater than 0.00 and up to 0.19).

We have studied the effect that belonging to a different university has on each dimension. To do this, we performed the Kruskal-Wallis test, finding that there are two dimensions that correlate positively with the university variable. These are dimensions A.-Motivation and E.-Continuity with values of 0.007 and 0.012 respectively, as shown in Table 5. Both are significant at a confidence level of 95%.

Studying dimension A.-Motivation (Tables 6, 7), we find that the responses differ between UPO and UGR students, as well as between UPO and UJA students, while there are no significant differences in the responses given by UGR and UJA students. The motivation to persist among UPO students is lower than that of students from other universities and, therefore, the dropout rate at UPO is more likely to be higher.

Each row tests the null hypothesis that the distributions of the UPO/UGR/UJA subsamples taken in pairs, two by two, are equal. Asymptotic significances (bilateral tests) are shown. The significance

TABLE 2 Lowest scoring items in la muestra general.

No	Item	Dimension	Mean
37	The program coordinator takes action to ensure there are no free hours between classes.	B.- Commitment	2.47
2	My professors use assessment strategies that favor my creativity.	A.- Motivation	2.77
26	I consider my undergraduate courses not too difficult.	B.- Commitment	2.80
4	My lecturers care about my work in class.	A.- Motivation	2.82
7	In general, I feel motivated by my professors.	A.- Motivation	2.88
6	I feel that my effort is recognized by my professors.	A.- Motivation	2.92
19	I participate actively in class	B.- Commitment	2.97

Source: FEDER B-SEJ-516-UGR18.

TABLE 3 Descriptive data by dimension.

	A Motivation	B Commitment	C Attitude and behavior	D Socio-economic conditions	E Continuity
N valid	922	885	906	951	935
Missing	54	91	70	25	41
Mean	3.8616	3.8813	4.3566	4.0917	4.1144
Median	3.8824	3.9167	4.4737	4.2500	4.4286
Skewness	-0.443	-0.325	-0.298	-0.761	-0.961
Standard error skewness	0.81	0.82	0.81	0.79	0.80
Kurtosis	0.591	-0.057	2.389	0.035	0.126
Standard error kurtosis	0.161	0.164	0.162	0.158	0.160

Source: FEDER B-SEJ-516-UGR18.

TABLE 4 Correlations between dimensions.

Spearman rho		A Motivation	B Commitment	C Attitude and behavior	D Socio-economic conditions	E Continuity
A Motivation	correlation Coeff	1.000	0.563	0.412	0.157	0.272
	Sig. (bilateral)		0.000	0.000	0.000	0.000
	N	922	843	863	902	885
B Commitment	correlation Coeff	0.563	1.000	0.431	0.254	0.378
	Sig. (bilateral)	0.000		0.000	0.000	0.000
	N	843	885	840	875	862
C Attitude and behavior	correlation Coeff	0.412	0.431	1.000	0.352	0.373
	Sig. (bilateral)	0.000	0.000		0.000	0.000
	N	863	840	906	896	880
D Socio-economic conditions	correlation Coeff	0.157	0.254	0.352	1.000	0.342
	Sig. (bilateral)	0.000	0.000	0.000		0.000
	N	902	875	896	951	928
E Permanence	correlation Coeff	0.272	0.378	0.373	0.342	1.000
	Sig. (bilateral)	0.000	0.000	0.000	0.000	
	N	885	862	880	928	935

Source: FEDER B-SEJ-516-UGR18.

TABLE 5 Correlation coefficient Kruskal-Wallis.

	Null hypothesis	Test	Sig.
1	The distribution of Dimension A.-Motivation is the same across UNIVERSITY categories.	Kruskal-Wallis test for independent samples	0.007
2	The distribution of Dimension B.-Commitment is the same across UNIVERSITY categories.	Kruskal-Wallis test for independent samples	0.129
3	The distribution of Dimension C.-Attitude and behavior is the same across UNIVERSITY categories.	Kruskal-Wallis test for independent samples	0.627
4	The distribution of Dimension D.-Socio-economic conditions is the same across UNIVERSITY categories.	Kruskal-Wallis test for independent samples	0.225
5	The distribution of Dimension E.-Permanence is the same across UNIVERSITY categories.	Kruskal-Wallis test for independent samples	0.012

Source: FEDER B-SEJ-516-UGR18.

level is 0.05. Significance values have been adjusted by Bonferroni correction for several tests. Regarding the E.-Continuity dimension (Tables 8, 9), we again find that the behavior of UPO students is different from that of UGR and UJA students. The data show that UPO students have a lower tendency to continuity than students from the other two universities and, therefore, a higher risk of dropping out.

4.3 Risk estimation

To establish the at-risk group, we have decided to include those students who do not reach an average score of 3.00 in all their responses to the 71 items. With this cut-off score, we found that there are 34 students who do not reach the minimum value of 3.00. This

TABLE 6 Kruskal-Wallis statistics for independent samples dimension A.- Motivation/University.

Total N	919
Test statistic	16.056 ^a
Degree of freedom	5
Asymptotic sig. (bilateral test)	0.007

Source: FEDER B-SEJ-516-UGR18.

represents 3.48% of the sample. Of these 34 students, 26 are women and 8 are men; 20 belong to the UGR, 8 to the UJA and 5 to the UPO. The average score achieved by the at-risk group is 2.21 for all their responses. The characteristics of the risk group are shown in Table 10.

TABLE 7 University-peer comparisons on dimension A.-Motivation.

Sample 1-Sample 2	Test statistic	Deviation error	Dev. test statistic	Significance	Adjusted significance ^a
UPO-UGR	108,894	34,435	3.162	0.002	0.023
UPO-UJA	144,439	36,879	3.917	0.000	0.001
UGR-UJA	-35,545	20,355	-1.746	0.081	1.000

Source: FEDER B-SEJ-516-UGR18.

TABLE 8 Kruskal-Wallis statistics for independent samples dimension E.- Permanence/pairs University.

Total N	932
Test statistic	14,613 ^a
Degree of freedom	5
Asymptotic significance (bilateral test)	0.012

Source: FEDER B-SEJ-516-UGR18.

TABLE 9 University peer comparisons in dimension E.-Continuity.

Sample 1-Sample 2	Test statistic	Deviation error	Dev. test statistic	Significance	Adjusted significance ^a
UPO-UJA	100,942	37,370	2.701	0.007	0.104
UPO-UGR	116,017	35,063	3.309	0.001	0.014
UJA-UGR	15,076	20,275	0.744	0.457	1.000

Source: FEDER B-SEJ-516-UGR18.

TABLE 10 Characteristics of the risk group.

	N	Percentage
Risk group	34	3.48%
Gender	26 female	76.47%
	8 males	23.52%
University	20 UGR	58.82%
	8 UJA	23.52%
	5 UPO	14.70%
Average score achieved	2.21	

Source: FEDER B-SEJ-516-UGR18.

TABLE 11 Comparison between the characteristics of the at-risk group and the general sample.

	Total sample		Risk group	
Mean	3.83		2.21	
Subjects	976	100%	34	3.48%
Women	755	73.35%		76.47%
Men	215	22.02%		23.52%
UGR	642	65.77%		58.82%
UJA	260	26.63%		23.52%
UPO	73	7.47%		14.70%

Source: FEDER B-SEJ-516-UGR18.

Table 11 shows a comparison between the characteristics of the total sample and the characteristics of the risk group, on which we can make the following comments:

- 1 As already mentioned the overall mean of the risk group drops to 2.21 from the 3.48 points it reaches in the total sample.
- 2 In the risk group women are overrepresented by 3.12%,

TABLE 12 Items with the highest scores for the at-risk group.

No	Item	Dimension	Mean
9	I want to graduate.	A.- Motivation	4.11
11	To be a good professional is a personal goal.	A.- Motivation	3.88
12	I want to practice my profession when I finish my studies.	A.- Motivation	3.82
10	Completing my studies on time is important to me.	A.- Motivation	3.55
8	I am interested in obtaining an outstanding grade in my subjects.	A.- Motivation	3.44
18	I can complete the tasks I am given in my different subjects.	B.- Commitment	3.41
14	I consider myself an intelligent and capable person.	A.- Motivation	3.23
17	I see myself as a person with the necessary skills to succeed professionally.	A.- Motivation	3.20
13	I see myself as a successful professional.	A.- Motivation	3.05
20	I give priority to fulfilling my obligations as a student.	B.- Commitment	3.02
27	I have to spend time every day studying or doing academic work.	B.- Commitment	3.00

Source: FEDER B-SEJ-516-UGR18.

- Men, on the other hand, are underrepresented by 1.5%.
- The students of the University of Granada are underrepresented in the risk group by 6.95%.
- Students from the University of Jaén are also underrepresented in the risk group by 3.11%.
- Students at the Pablo de Olavide University in Seville are overrepresented in the risk group by almost twice as much as the sample, from 7.47 to 14.70%, i.e., 7.23% more.

That is, the at-risk group has an overrepresentation of female UPO students.

In Table 12 we present the items with the highest scores for at-risk students, i.e., the items that are persistence-oriented since they score above 3.00. These are 11 out of the total of 71 items that make up the survey. This means that, in 60 items, at-risk students score below the mean of 3.00. Interestingly, the items with the highest scores for the at-risk group belong to dimensions A.-Motivation and B.-Commitment.

Table 13 shows the items with the lowest scores for at-risk students, and which should guide the corrective measures to be proposed. There are 28 items corresponding to all dimensions except the first one: motivation.

5 Discussion and conclusion

Our diagnosis of dropout risk focused on dimensions that have been frequently analyzed in the literature. Motivation to study, both external (for rewards) and internal (student autonomy) has been studied by Barroso et al. (2022) and by Aina et al. (2022) in their cost-benefit analysis of the effort made in the study. In our study we have found that motivation maintains a close relationship with permanence. The Commitment dimension already appears in the model of Spady (1970), Tinto (1975), Pascarella (1980), Cabrera et al. (1993), and Kehm et al. (2019). In all of them it is related to permanence in the same line as evidenced by our results. Positively correlated with permanence, although to a lesser degree, is our dimension Socioeconomic conditions. This same dimension has been addressed in the studies of Heublein et al. (2003), Kehm et al. (2019), and Barroso et al. (2022) as a predictor variable of academic dropout. Our

Attitude and Behavior dimension refers to the individual psychological coping variables of the study that are included in most of the models analyzed, such as Astin (1975) or Cabrera et al. (1993).

Same as what has happened to us, Velázquez and González (2017) found that there are significant correlations between the five dimensions that make up the instrument. In their case, the strongest correlation is established between E/A (Continuity and Motivation) followed by the pairs: E/B (Continuity and Commitment); E/D (Continuity and Socioeconomic Conditions) and E/C (Permanence and Attitude and Behavior). The latter with a very low correlation. They preferentially study the pairs integrated with the E/Continuity dimension.

In our case, we have studied all the pairs and have observed that A/B (Motivation and Commitment) and A/C (Motivation and Attitude and behavior) are the most strongly related pairs.

In any case, we agree with Velázquez and González (2017) that the strongest correlation is between the A/B (Motivation and Commitment) dimensions. In their Mexican application, dimensions A.-Motivation and D.-Socioeconomic conditions are strongly correlated and, in our case, the correlation is very low.

With their research, Velázquez and González (2017) wanted to identify risk factors around those items that obtained a lower standardized weight and that are grouped in the categories: internal motivation, personal commitment to study and socioeconomic conditions. This does not coincide with studies such as Pintrich (2004) and Solberg Nes et al. (2009) that point to the important effect of motivation and self-reported learning as retention factors in studies. Indeed, in our total sample, internal motivation scores very low. But there are no significant differences between the total sample and the at-risk group. Moreover, our results coincide with the findings of international and classical studies reported by Tinto (2022).

We have established criteria for diagnosing students at risk of dropping out. We choose a high sensitivity at the expense of a strong specificity. That is, in a first analysis we have opted for the risk group to include those students with a strong prediction of dropping out (high sensitivity), leaving out those students that had a moderate prediction but who will eventually drop out. The latter have not been included in our risk group (low specificity). The advantage of this decision, which has led us to set the cut-off point at 3.00, is that it does not alarm the authorities and allows us to test corrective measures

TABLE 13 Worst-scoring items by students at risk: below 2.00 (1.02–1.97).

No	Item	Dimension	Mean
64	The means of transport I use to travel to the faculty does not represent a problem for me to attend my classes on time.	D.-Socio-economic conditions	1.17
38	I feel that there is a commitment on the part of the academic authorities to attend to my needs as a student.	B.-Commitment	1.17
65	I have never interrupted my studies for one semester or more.	E.-Continuity	1.17
68	Currently I do not have any subjects pending from previous semesters.	E.-Continuity	1.23
41	I consider tutorial activities have had a positive impact on my academic performance.	B.-Commitment	1.32
66	I have never considered suspending my university studies temporarily or permanently.	E.-P Continuity	1.38
39	The library hours are in line with my academic schedule.	B.-Commitment	1.40
43	I have no family problems that affect my concentration or performance.	C.-Attitude and behavior	1.47
70	I have never failed one or more subjects for not reaching the compulsory attendance percentage.	E.-Continuity	1.50
48	I feel morally supported by my family members.	C.-Attitude and behavior	1.50
46	At home, household activities are shared by all members of the family.	C.-Attitude and behavior	1.50
36	The coordination of my undergraduate studies facilitates the execution of my academic activities.	B.-Commitment	1.50
35	The administrative procedures I have requested from the corresponding area have been solved satisfactorily.	B.-Commitment	1.50
37	The coordinator of my undergraduate studies takes action to ensure that there are no free hours between classes.	B.-Commitment	1.50
45	Communication with my family members is positive and open.	C.-Attitude and behavior	1.55
69	I am keeping up to date with my English language levels.	E.-Continuity	1.58
40	I have a tutor in my faculty.	B.-Commitment	1.61
44	The values of study and hard work are encouraged and practiced at home.	B.-Commitment	1.64
63	I do not need to work to pay for my university education.	D.-Socio-economic conditions	1.70
47	I identify my parents as authority figures.	C.-Attitude and Behavior	1.73
62	I have external financial support such as family income, funding, or scholarships for my studies.	D.-Socio-economic conditions	1.76
51	I feel proud of the studies I am taking.	C.-Attitude and behavior	1.82
49	I feel fully integrated in my group of fellow students at the university.	C.-Attitude and behavior	1.89
56	I feel accepted and valued by my classmates.	C.-Attitude and behavior	1.94
60	I consider myself a productive and socially accepted person.	C.-Attitude and behavior	1.94
61	At home I have adequate space, services, and equipment to carry out my university tasks.	D.-Socio-economic conditions	1.94
67	I have taken all my subjects as an on-campus student at the University.	E.-Continuity	1.94
42	My relationship with my family is friendly and respectful.	C.-Attitude and behavior	1.97

Source: FEDER B-SEJ-516-UGR18.

with those most in need knowing that they can later be extended to larger groups.

With adequate follow-up of the surveyed students and with future annual applications of the screening, we will be able to adjust the diagnostic criteria to a reasonable and efficient balance between sensitivity and specificity values in line with the work of [Ávalos Ruiz and Fernández Cruz \(2022\)](#), varying, if necessary, the cut-off point. With our decision, the risk group has a size of 3.48% when the contrasted data offer real dropout data of 13% in Spain ([Ministry of Universities of the Government of Spain, 2022](#)). The high sensitivity is far from the real size, so it is our intention to increase the specificity with periodic screening applications.

As pointed out by [Aina et al. \(2022\)](#) and as we have reviewed in our study, university dropout is the result of a sequential process carried out under gradually decreasing levels of uncertainty and students' awareness of the costs of education and future returns, as well as the level of integration of that student into their academic system.

In short, university dropout is a multivariate phenomenon in which the final decision is mediated by different determinants. The application of screening has made it possible to establish a baseline on the risk factors for dropout in Higher Education in Andalusian universities. Both [Ambiel \(2015\)](#) and [Ortigosa et al. \(2019\)](#) are examples of good practice in establishing dropout risk groups by

assessing predictive dimensions such as those we have donated. Ortigosa et al.'s (2019) own work, as previously done by Lin and Tang (2015), uses data mining and learning analytics along with assessment scales to perform the diagnosis. We have limited ourselves to the application of screening. We left the use of data mining for later. We have established the response profile of the student body by gender, degree studies and university of origin. We have established which are the items best rated by the students, which become protective factors, which are the items worst rated by the students and which become risk factors. In addition, we have established the level of correlation between the dimensions that make up the instrument. This constitutes the baseline of the risk of academic failure and dropout in Andalusia.

This is the line followed by those scholars who call for joining academic and scientific efforts to offer predictive strategies and solutions (Gairín et al., 2015). Preventive measures should consider preventing dropout, for example, increasing institutional resources and/or creating interventions to improve academic and social integration, motivation, study skills and study effort.

At the same time, the preventive or corrective measures to be applied in the at-risk population will focus on reversing the orientation of those same factors that, as we have already seen, generate persistence. The descriptive analyses that have been carried out on dropout prevention models reveal that the situation can be alleviated. Different programs and extraordinary measures of attention are being experimented in Higher Education Institutions around the world. These are intended to increase the persistence of students in their studies and minimize the negative effects for the institutions and for the public administrations themselves. To this end, the unproductive expenditure that would be generated by potential dropouts must be transformed into investment that generates productive returns and economic growth, i.e., that applies productive expenditure for graduate students (Tinto, 2022). In short, it is a matter of adjusting university educational policies and their curricular and organizational practices and including palliative, remedial and preventive actions to alleviate the situation (Olmos, 2021).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

References

- Aina, C., Baici, E., Casalone, G., and Pastore, F. (2022). The determinants of university dropout: a review of the socio-economic literature. *Soc. Econ. Plan. Sci.* 79:101102. doi: 10.1016/j.seps.2021.101102
- Aljohani, O. (2016). A comprehensive review of the major studies and theoretical models of student retention in higher education. *High. Educ. Stud.* 6, 1–18. doi: 10.5539/hes.v6n2p1
- Álvarez, D., Arias, M., González, E., and Fernández Cruz, M. (2022). Neurodidactics factors in the prediction of academic dropout in Andalusian university students: preventive actions based on ICT. *Texto Livre* 15, 1–12. doi: 10.35669/1983-3652.2022.40502
- Ambiel, R. A. M. (2015). Construção da escala de motivos para evasão do ensino superior. *Avaliação Psicológica* 14, 41–52. doi: 10.15689/ap.2015.1401.05
- Argentin, G., and Triventi, M. (2011). Social inequality in higher education and labour market in a period of institutional reforms: Italy 1992–2007. *High. Educ.* 61, 309–323. doi: 10.1007/s10734-010-9379-6
- Astin, A. W. (1975). *Preventing students from dropping out*. San Francisco: Jossey-Bass.
- Ávalos Ruiz, I., and Fernández Cruz, M. (2022). Validación de un instrumento de cribado para la detección de alumnado en riesgo de exclusión social. *Educar* 58, 481–499. doi: 10.5565/rev/educar.1519
- Bakker, E. J., Kox, J. H., Boot, C. R., Francke, A. L., van der Beek, A. J., and Roelofs, P. D. (2020). Improving mental health of student and novice nurses to prevent dropout: a systematic review. *J. Adv. Nurs.* 76, 2494–2509. doi: 10.1111/jan.14453
- Barroso, P. C. F., Oliveira, Í. M., Noronha-Sousa, D., Noronha, A., Mateus, C. C., Vázquez-Justo, E., et al. (2022). Dropout factors in higher education: a literature review. *Psicologia Escolar e Educacional* 26:e228736. doi: 10.1590/2175-35392022228736t
- Bean, J. P. (1980). Dropouts and turnover: the synthesis and test of a causal model of student attrition. *Res. High. Educ.* 12, 155–187. doi: 10.1007/BF00976194
- Bean, J., and Metzner, B. (1985). A conceptual model of non-traditional undergraduate student attrition. *Rev. Educ. Res.* 55, 485–540. doi: 10.3102/00346543055004485

Ethics statement

The studies involving humans were approved by Comité de Ética en Investigación Humana de la Universidad de Granada. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MFC: Investigation, Supervision, Validation, Writing – review & editing. DÁ: Data curation, Formal analysis, Software, Writing – original draft. FBF: Data curation, Software, Validation, Writing – original draft. EG: Methodology, Resources, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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- Boyratz, G., Horne, S. G., Owens, A. C., and Armstrong, A. P. (2013). Academic achievement and college persistence of African American students with trauma exposure. *J. Couns. Psychol.* 60, 582–592. doi: 10.1037/a0033672
- Cabrera, A., Nora, A., and Castaneda, M. (1993). College persistence: structural equations modeling test of an integrated model of student retention. *J. High. Educ.* 64, 123–139. doi: 10.2307/2960026
- Casanova, J. R., Assis, C. M., Bernardo, A. B., Núñez, J. C., and Almeida, L. S. (2021). Dimensionality and reliability of a screening instrument for students at-risk of dropping out from higher education. *Stud. Educ. Eval.* 68:100957. doi: 10.1016/j.stueduc.2020.100957
- Colás Bravo, P. (2015). Strategies of action: improving employability. *Revista Fuentes* 16, 9–14. doi: 10.12795/revistafuentes.2015.i16
- de Oliveira, C. F., Sobral, S. R., Ferreira, M. J., and Moreira, F. (2021). How does learning analytics contribute to prevent students' dropout in higher education: a systematic literature review. *Big Data Cogn. Comput.* 5:64. doi: 10.3390/bdcc5040064
- Eurostat (2020). Tertiary education statistics. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tertiary_education_statistics
- Gairín, J., Rodríguez, D., Navarro, M., Muñoz, J. L., and Feixas, M. (2015). Hacia la comprensión del abandono universitario en Catalunya: el caso de la Universitat Autònoma de Barcelona. *Estudios Sobre Educación* 28, 117–138. doi: 10.15581/004.28.117-138
- Heublein, U., Spangenberg, H., and Sommer, D. (2003). *Ursachen des Studienabbruchs: Analyse 2002* Hannover: HIS.
- Kehm, B. M., Larsen, M. R., and Sommersel, H. B. (2019). Student dropout from universities in Europe: a review of empirical literature. *Hungarian Educ. Res. J.* 9, 147–164. doi: 10.1556/063.9.2019.1.18
- Lin, Y. P., and Tang, K. T. (2015). An inductive power and data telemetry subsystem with fast transient low dropout regulator for biomedical implants. *IEEE Trans. Biomed. Circ. Syst.* 10, 435–444. doi: 10.1109/TBCAS.2015.2447526
- López-Cózar, C., Benito, S., and Priede, T. (2020). Un análisis exploratorio de los factores que inciden en el abandono universitario en titulaciones de ingeniería. *Rev. Docencia Universitaria* 18, 81–96. doi: 10.4995/redu.2020.13294
- Martínez-López, Z., Gázquez-Linares, J. J., Sainz-de-Abajo, B., and Cejudo-Macias, R. (2023). Predictive models for identifying at-risk students in higher education using data mining techniques. *Appl. Sci.* 13:1336. doi: 10.3390/app13031336
- Ministry of Universities of the Government of Spain (2022). *Estudio sobre el Abandono de los Estudios de Grado en el Sistema Universitario Español*.
- Moreno-Candil, D., Garzón-Umerenkova, A., and Vera-Baceta, M. A. (2022). Early warning and monitoring systems to reduce dropouts at universities: tools for educational guidance. *MDPI Proc.* 88:9. doi: 10.3390/proceedings2022088009
- Moreno-Guerrero, A. J., López-Belmonte, J., and Hinojo-Lucena, M. Á. (2022). Dropout prevention in higher education through socio-emotional mentoring. *Int. J. Environ. Res. Public Health* 19:10285. doi: 10.3390/ijerph191610285
- OECD (2019). *Education at a glance 2019: OECD indicators*. OECD Publishing, Paris.
- Olmos, E. (2021). Análisis de los factores relacionados con la deserción escolar en el Instituto Tecnológico de Tlalpan. *TecNM, 2015–2019*. Universidad Autónoma de Morelos (Mex), Magister Disertation.
- Ortigosa, A., Carro, R. M., Bravo-Agapito, J., Lizcano, D., Alcolea, J. J., and Blanco, O. (2019). From lab to production: lessons learnt and real-life challenges of an early student-dropout prevention system. *IEEE Trans. Learn. Technol.* 12, 264–277. doi: 10.1109/TLT.2019.2911608
- Pascarella, E. T. (1980). Student-faculty informal contact and college outcomes. *Rev. Educ. Res.* 50, 545–595. doi: 10.3102/00346543050004545
- Pintrich, P. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educ. Psychol. Rev.* 16, 385–407. doi: 10.1007/s10648-004-0006-x
- Rumberger, R. W. (2020). The economics of high school dropouts. *Econ. Educ.* (2ª Ed), (Academic Press), 149–158.
- Samuel, R., and Burger, K. (2020). Negative life events, self-efficacy, and social support: risk and protective factors for school dropout intentions and dropout. *J. Educ. Psychol.* 112, 973–986. doi: 10.1037/edu0000406
- Solberg Nes, L., Evans, D. R., and Segerstrom, S. C. (2009). Optimism and college retention: mediation by motivation, performance, and adjustment. *J. Appl. Soc. Psychol.* 39, 1887–1912. doi: 10.1111/j.1559-1816.2009.00508.x
- Spady, W. (1970). Dropouts from higher education: an interdisciplinary review and synthesis. *Interchange* 1, 64–85. doi: 10.1007/BF02214313
- Tinto, V. (1975). Dropout from higher education: a theoretical synthesis of recent research. *Rev. Educ. Res.* 45, 89–125. doi: 10.3102/00346543045001089
- Tinto, V. (2022). “Exploring the character of student persistence in higher education: the impact of perception, motivation, and engagement” in *Handbook of research on student engagement*. eds. A. L. Reschly and S. L. Christenson (Cham: Springer), 357–379.
- Velázquez, Y., and González, M. (2017). Factores asociados a la permanencia de estudiantes universitarios: caso UAMM-UAT. *Revista de la Educación Superior* 46, 117–138. doi: 10.1016/j.resu.2017.11.003