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# Development and validation of a measure for academic locus of control

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Previous research highlighted the significant role of locus of control in predicting academic achievement and dropout, emphasizing the need for reliable measures to identify factors that foster academic success. This study aimed to develop an academic locus of control (ALoC) measure. Participants were 432 Italian university students (69 males, 363 females) pursuing bachelor's ( $N = 339$ ) and master's ( $N = 123$ ) degrees in Italy. The ALoC scale resulted in two factors, internal (6 items) and external ALoC (12 items), which demonstrated satisfactory dimensionality and invariance across students' gender and attending degree. Internal and external ALoC were, respectively, negatively, and positively associated with academic dropout. This study confirmed the importance of locus of control for academic achievement, suggesting that university programs should address students' personal sense of failure while promoting a sense of mastery and responsibility for academic outcomes.

## KEYWORDS

locus of control, academic achievement, dropout, university students, higher education

## Introduction

The locus of control is an important predictor of academic achievement and dropout. Having an internal rather than external locus of control can positively affect constancy in studies. This research aims to develop and validate a measure for academic internal and external academic locus of control in university students. To this purpose, two studies were conducted. The first study explored the latent structure of the data to determine the number of latent dimensions of the scale. The second study tested the dimensionality of the scale, its replicability, and concurrent validity.

## Academic locus of control

Several countries in Europe are characterized by high percentages of students' dropout in higher education (Vossensteyn et al., 2015). Italy is one of the countries with the lowest rates of graduates and the highest rates of university dropout (Istat, 2019; Eurostat, 2020). Constructing reliable measures able to identify the factors that promote academic achievement represents a fundamental strategy for improving the Europe standards of higher education.

Previous research found an important role of locus of control (LoC) in predicting academic achievement and dropout (Joo et al., 2013; Kovach, 2018). LoC has been defined as the belief regarding one's level of control over one's life outcomes (Rotter, 1966). Individuals who attribute their life outcomes as depending on their behavior have an internal LoC, whereas individuals who perceive that life outcomes depend on environmental factors have an external LoC (Galvin et al., 2018). Levenson (1973, 1981) conceived LoC as composed of three dimensions: internal, powerful others, and chance. According to this model, people with an external LoC may perceive that their life is controlled by powerful others or rather that events are unpredictable and determined by chance (Levenson, 1981).

Locus of control (LoC) represents a pivotal construct concerning performance within achievement contexts. Consequently, contemporary psychological research has exhibited a growing interest in comprehending its predictive significance across diverse domains, including the realms of employment (Ng et al., 2006), higher education (Ghasemzadeh, 2011), and health-related outcomes (Kesavayuth et al., 2020). Given that the academic domain serves as an exemplary context for the pursuit of various outcomes, it becomes imperative to investigate the role of LoC within this specific sphere.

Rotter (1975) proposed that greater predictive accuracy within specific contexts could be achieved through the development of context-specific measurement scales. Subsequently, in 1985, Trice developed the Academic Locus of Control Scale for College Students, which offered a valuable instrument for exploring students' LoC within the academic domain. The work of Trice's (1985) provided a clear definition of academic LoC, characterizing it as a set of expectations concerning the influence of one's efforts and behaviors on academic performance. In 2013, Curtis and Trice conducted a study aimed at revisiting the scale's structure and validity, 30 years after its initial development, resulting in an updated version of this measurement tool. Both the original scale and its updated version utilized a True/False response format, which posed a potential limitation in capturing the full spectrum of participants' responses.

For what concern the Italian context, several prior studies have established the predictive power of LoC on various academic variables, including learning (Cascio et al., 2013), academic self-efficacy (Sagone and Caroli, 2014), and procrastination (Sagone and Indiana, 2021). Notably, these studies relied on generic measurement tools for LoC, primarily due to the absence of a dedicated scale specifically designed for assessing academic locus of control. The existence of a specific measure of academic LoC can provide researchers with a more precise and comprehensive understanding of the role of LoC in educational outcomes.

## Current study

This research aimed to develop a measure for academic internal and external LoC in university students. Specifically, it was intended to create a contemporary measurement scale, drawing upon the foundations of prior instruments that have demonstrated robust construct validity and reliability. In doing so, we provided participants with the option to respond using a Likert scale, as opposed to a dichotomous true/false format. The adoption of the Likert scale offers a more comprehensive and nuanced insight into participants' responses, enabling the capture of the full spectrum of variance in their answers. Consequently, this approach provides enhanced

opportunities for conducting correlational analyses and delving deeper into the data.

To this end, the Levenson scale was adapted to the academic context, leaving the item structure unchanged while replacing generic concepts such as "life" or "interests" with academic-related concepts such as "academic success" or "exam outcomes." The scale was then administered to university students through two studies: The first was conducted to explore the latent structure of the scale and its reliability; the second was performed to confirm the scale dimensionality and test the invariance of the structure across gender (males versus females) and students attending degree, such as Bachelor of Art (BA) vs. Master of Art (MA), running a multigroup Confirmative Factor Analysis (CFA). Furthermore, the concurrent validity of the scale was tested investigating the association with the intention to dropout.

## Method

### Study 1

The aim of the first study was to explore the latent structure of the data to determine the number of latent dimensions of the scale. Therefore, an Exploratory Factor Analysis (EFA) was performed. Further item analysis was conducted to assess the reliability of the scales as emerged from the EFA. The study was approved by the Ethics Committee of the Department of Sapienza, University of Rome. Informed consent was obtained from all the participants included in the study.

### Participants

Participants of the study consisted of 206 University students (36 males and 170 females), with an average age of 22.9 y.o. (SD = 4.97). One hundred and forty-two participants were attending a BA, whereas 64 were attending a MA.

### Instruments

The Academic Locus of Control (AloC) scale of 24 items was administered. Participants had to answer to each item with a 5-point Likert scale that ranged from (1) Completely disagree to (5) Completely agree. Items wording and psychometrics are showed in the result section (Table 1).

## Results

An Explorative Factor Analysis (EFA) on the initial 24 items of the scale was performed to investigate the latent structure of the data (Principal Axis Factoring). Assumptions check on the correlation matrix revealed that Bartlett's Test of Sphericity was statistically significant, chi-square (153) = 1,174,  $p < 0.001$ , outlining that items were correlated enough so that the correlation matrix diverges significantly from the identity matrix. Both scree-plot and eigenvalue greater than 1 suggested a two-factor solution (first eight eigenvalues were: 5.18, 1.56, 0.78, 0.59, 0.39, 0.33, 0.33, and 0.21). After Oblimin rotation, the factor loading matrix was examined. Six items with high factor loadings on both factors (greater than 0.40), or which loaded lower than 0.40 on one factor, were deleted from the analysis (items #9, 13, 17, 8, 24, 5). Afterwards, the EFA was run on the remaining 18 items. The two-factor solution was once again confirmed by the scree

TABLE 1 Factor loading matrix after Oblimin rotation, items wording, descriptive, and reliability of the scales.

Item#	Items wording	Loadings	
		1	2
LoC12	Failing an exam or avoiding failure is mostly a matter of luck	0.79	
LoC11	My academic success is chiefly controlled by the teachers	0.69	
LoC16	Whether or not I pass an exam depends on whether I'm lucky enough to be in the right place at the right time (e.g., with the right professor or assistant)	0.69	
LoC15	To pass an exam I have to please my teachers	0.62	
LoC3	I feel like success and failure in examinations are mostly determined by teachers	0.61	
LoC20	Failing an exam largely depends on how teachers evaluate students	0.59	
LoC14	It is not very wise for me to plan the preparation for an exam too far in advance because the outcome are a matter of good or bad fortune	0.58	
LoC6	Often there is no chance of protecting the outcome of my exams from bad luck happenings	0.57	
LoC7	When I pass an exam, it is usually because I am lucky	0.53	
LoC2	To a great extent my academic success is controlled by accidental happenings	0.51	
LoC10	I have often found that what is going to happen will happen	0.41	
LoC22	In order to make my degree project come true, I ensure that it fits with the desires of my teachers	0.40	
LoC23	My academic success is determined by my own actions		0.62
LoC18	I can pretty much determine what will happen in my life		0.61
LoC4	Passing or failing an exam depends mostly on my study skills		0.54
LoC21	When I achieve the grade I desire, it is because I worked hard for it		0.50
LoC1	Whether or not I get a bachelor's degree depends mostly on my abilities		0.46
LoC19	I am usually able to protect my personal interests		0.40
Eigenvalues		4.50	1.37
Variance explained		24%	10.1%
Means and SD		2.15 (0.65)	4.25 (0.50)
Alpha		0.86	0.69
Omega		0.86	0.70

Principal axis factoring extraction method with Oblimin rotation. Descriptives: means and standard deviation (between brackets).

plot inspection (first eight eigenvalues were: 4.50, 1.37, 0.53, 0.49, 0.29, 0.09, 0.07, and 0.00).

Factor 1 was composed by 12 items, with good factor loadings that ranged between 0.79 and 0.40, with an average factor loading of 0.58, which referred to External AloC covering both chance and powerful-others aspects of the construct (about 24% of the variance explained). Factor 2 was composed by the remaining 6 items with good loadings ranging between 0.62 and 0.40, with an average factor loading of 0.52, and that regarded the Internal AloC dimension (about 10.1% of the variance explained). Overall, the two factors accounted for the 34.1% of variance and were moderately and negatively correlated ( $-0.24$ ). The full loading matrix is given in [Table 1](#).

Descriptives and internal consistency of both the External and Internal AloC scales were reported in [Table 1](#). Both Cronbach's Alpha and McDonald's Omega converged and proved to be good, revealing that the scales were fairly reliable. In [Table 2](#), items descriptive and reliability statistics of both scales are reported. The statistics of reliability if a given item would be deleted clearly indicated that none of the items would substantially increase the reliability of the scales if dropped out.

## Study 2

The aim of the study two was to further test the dimensionality of the scale and its replicability employing a CFA. To this purpose, a multigroup CFA was conducted to investigate whether the factor model, emerged from the previous EFA, could be generalized showing measurement invariance across the independent sub-populations of males and females' students and students attending a BA or a MA. Reliability was assessed, and concurrent validity of the scales was eventually tested against an external criterium, namely intentions to dropout university career. If the AloC scales would exhibit concurrent validity, we expect that an internal AloC would be negatively related to dropout intentions while external AloC would be positively related.

## Participants

Participants of the study consisted of 226 University students (33 males and 193 females), with an average age of 23.2 y.o. ( $SD=6.02$ ). One hundred and ninety-seven participants were attending a BA, whereas 59 were attending a MA.

### Instruments

The final reduced version of the AloC scale of 18 items was administered. The items of the scales were given in Table 1. Intention to dropout of university was measured using a six-item scale based on an earlier-developed measure by Bonino et al. (2005) and already used in previous studies (Morelli et al., 2021, 2023b). An example item is: “Have you ever seriously thought about dropping out of university?” Participants had to answer each item of the questionnaires with a 5-point Likert scale that ranged from (1) Completely disagree to (5) Completely agree. The total score, obtained summing the scores of each item, was used. The Cronbach’s Alpha was 0.77 and McDonald’s Omega was 0.79.

### Results

A CFA was conducted to test the structure of the scale in an independent sample, showing good fit indexes, chi-square (8)=24.4,  $p=0.002$ , CFI=0.98, TLI=0.96, SRMR=0.036, RMSEA=0.069. Measurement invariance across gender was then assessed. Firstly, we examined the configural invariance ( $M_0$ ), i.e., an unconstrained baseline model in which all parameters freely differ between males and females’ students. Secondly, the metric invariance was examined ( $M_1$ ), i.e., a model in which all factor loadings are simultaneously constrained across gender groups. Finally, the scalar invariance  $M_2$  was tested, i.e., a model in which the intercepts are constrained to be equal across groups. As can be noted in Table 3, all models exhibited good fit indexes.

All nested models were formally contrasted via the  $\Delta\chi^2$  comparison. The comparison  $M_1$  versus  $M_0$  showed a non-significant  $\Delta\chi^2$ : this result suggests no significant group differences for factor loadings supporting metric invariance (Table 3). In other words, males and females’ students attributed the same meaning to the latent constructs under investigation. Furthermore, both the  $M_0$  and  $M_1$  were also tested and compared to the scalar invariance model  $M_2$ . Result always showed a non-significant  $\Delta\chi^2$ . Therefore, scalar invariance was supported meaning that also the levels of the underlying items (intercepts) may be considered equal in both groups.

The same pattern of analyses was replicated considering BA vs. MA students as grouping variable. Results are reported in Table 4 confirming the measurement invariance of the scale also for these two groups.

Internal consistency for both scales were satisfactory and Cronbach’s Alpha and McDonald’s Omega substantially converged. External AloC had an Alpha of 0.83 and an Omega of 0.84, while Internal AloC showed an Alpha of 0.77 and an Omega of 0.79. An item analysis for each item was performed revealing that none of the items would increase the reliability of each of the scales in case it would have been dropped out.

Concurrent validity was tested against an external academic outcome, namely intentions to dropout the university career. At bivariate level, it was found that External AloC was positively related to dropout,  $r=0.30$ ,  $p<0.001$ , while Internal AloC was negatively related,  $r=-0.21$ ,  $p<0.001$ . A SEM with latent variables was performed to test the predictions including External AloC and Internal AloC as exogenous variables and dropout as endogenous variable. The model exhibited good fit indexes, chi-square (24) = 24.4,

TABLE 2 Item reliability statistics of the academic locus of control scales.

External academic locus of control	If item dropped			
	Items	Mean	Std. Dev.	Alpha
LoC12	1.91	0.96	0.83	0.84
LoC11	2.11	1.06	0.84	0.85
LoC16	2.00	1.05	0.84	0.85
LoC20	2.70	1.05	0.84	0.85
LoC3	2.53	1.09	0.84	0.85
LoC6	2.45	1.19	0.84	0.85
LoC15	1.73	1.01	0.84	0.85
LoC14	1.48	0.83	0.84	0.85
LoC7	1.74	0.93	0.85	0.86
LoC2	2.03	1.15	0.85	0.86
LoC22	1.83	0.99	0.85	0.86
LoC10	3.33	1.21	0.86	0.86
Internal academic locus of control				
Items	Mean	Std. Dev.	Alpha	Omega
LoC23	4.33	0.77	0.64	0.65
LoC18	4.32	0.85	0.64	0.66
LoC21	4.43	0.72	0.64	0.65
LoC19	4.06	0.85	0.69	0.70
LoC1	4.17	0.87	0.66	0.67
LoC4	4.20	0.75	0.64	0.65

TABLE 3 Multigroup confirmative factor analysis and comparison between the models of measurement invariance (males vs. females).

Multigroup males vs. females	Chi-square	df	CFI	TLI	RMSEA	SRMR
Configural	29.02*	16	0.97	0.95	0.06	0.042
Metric	38.00*	20	0.96	0.95	0.089	0.047
Scalar	40.00*	24	0.97	0.96	0.077	0.048
Model comparison (males vs. females)	Chi-square-diff	$\Delta$ df	p-value			
Metric against configural	8.98	4	0.06			
Scalar against configural	10.98	8	0.20			
Scalar against metric	2.00	4	0.74			

\* $p<0.05$ . df, degrees of freedom; Models: Configural, no constrains; Metric, factor.

$p=0.002$ , CFI=0.98, TLI=0.98, SRMR=0.033, RMSEA=0.053 (see Figure 1).

## Discussion

The present study was aimed at developing and validating a measure to investigate ALoC in university students based on previous

TABLE 4 Multigroup confirmative factor analysis and comparison between the models of measurement invariance (BA vs. MA).

Multigroup BA vs. MA						
Model	Chi-square	df	CFI	TLI	RMSEA	SRMR
Configural	30.30*	16	0.97	0.95	0.089	0.05
Metric	33.20*	20	0.97	0.96	0.076	0.055
Scalar	36.20*	24	0.98	0.97	0.067	0.057
Model comparison (BA vs. MA)	Chi-square-diff		Δdf		p-value	
Metric against configural	2.90		4		0.57	
Scalar against configural	5.90		8		0.66	
Scalar against metric	2.90		4		0.57	

df = degrees of freedom; Models: configural = no constraints; Metric = factor loadings constrained equal; Scalar = strong invariance factor loadings and intercepts constrained equal. df-diff = degrees of freedom difference between the compared models; Models: configural = no constraints; Metric = factor loadings constrained equal; Scalar = strong invariance factor loadings and intercepts constrained equal.  
\* $p < 0.05$ .

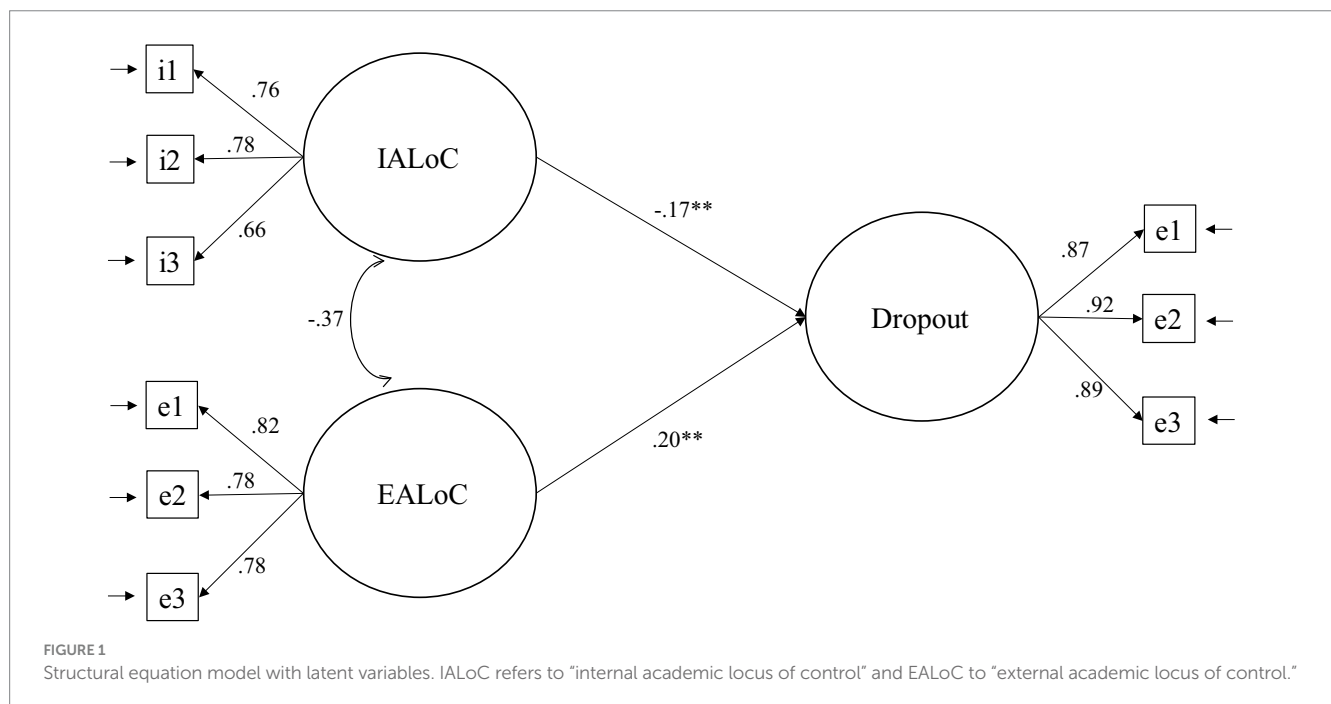
scales of LoC (Levenson, 1973, 1981). While Levenson scale consisted of three dimensions, the ALoC scale resulted in two factors meeting the criteria of the internal (6 items) and external ALoC (12 items), where the latter included the two dimensions of powerful others and chance. Explorative analysis revealed a final scale composed of 18 items.

The second study confirmed the factor model of the ALoC and its generalizability. The two factors were confirmed by the invariance across students' gender and attending degree. Males and females, as well as BA and MA students, assigned the same interpretations to external and internal ALoC. Consistently with previous research, internal and external ALoC resulted, respectively, negatively, and positively associated with the intention to dropout (Arslan and Akin, 2014). Internal ALoC can be considered a protective factor for university students as it relates to academic achievement, motivation, and success (Anderson and Hamilton, 2005; Gifford et al., 2006; Ghazemzadeh, 2011). On the contrary, external ALoC can hinder the university path as it relates to poor academic aspiration, low-grade point average, absenteeism, and academic withdrawal (Nordstrom and Segrist, 2009; Landrum, 2010).

Students with internal ALoC exert more effort compared to those with external ALoC due to their belief in their ability to influence university outcomes. The ALoC proved to be a good instrument to understand the extent to which students attribute their academic success or failure to their commitment. Such understanding equips educators with the potential to predict academic outcomes and proactively guide students toward success.

## Conclusion

In Europe, the academic career is generally pictured as an important and prestigious developmental task to achieve for young adults. However, there is a lack of attention on those factors that may



facilitate or, conversely, hinder the attainment of academic goals. The innovative aspect of the present study lies in the development of a scale that measures the orientation of internal or external LoC within the academic domain. Prior research has employed generic scales of locus of control, such as Rotter's Internal-External Locus of Control Scale (Rotter, 1966) and Levenson's Questionnaire (Levenson, 1973), to assess LoC. In other cases, specific scales on academic LoC have been used but, to date, can be considered dated in some of their aspects (Trice, 1985; Akin, 2007; Curtis and Trice, 2013). To the best of our knowledge, this study is the first to introduce and validate a scale for measuring AloC after a significant time gap since the revision and validation of previous instruments. Furthermore, the AloC scale introduced in this study is grounded in Levenson's original scale pertaining to the LoC construct. This approach ensures a robust conceptual framework encompassing both the external and internal dimensions of the construct while tailoring it to the unique context of the academic setting.

Additionally, the factorial structure of the AloC scale demonstrated robustness and consistency across students' gender and degree programs. This finding suggests that the AloC scale exhibits validity and reliability across diverse groups, thus further strengthening the overall validity and generalizability of the AloC scale. Ultimately, the AloC is presented as an instrument that is easy and quick to administer, yet comprehensive. From our perspective, the scale presented in this study represents an outstanding tool for assessing and comparing AloC within university environments, eliminating the need for employing multiple instruments simultaneously and ensuring that the items are perceived as representative across diverse student groups.

## Implications for practice

The development and validation of the AloC scale offer a valuable tool for early identification of students who may be at greater risk of dropping out of university. As our study has shown, students with external AloC tendencies tend to exhibit characteristics such as poor academic aspiration, low-grade point averages, absenteeism, and academic withdrawal—factors strongly associated with the intention to drop out. Identifying these students early in their academic career can enable timely interventions to provide the necessary support and resources to improve their academic outcomes.

Academic dropout is generally experienced as a personal failure that negatively impacts the overall quality of the university experience (Heublein and Wolter, 2011; Cattellino et al., 2021; Morelli et al., 2023a,b). University programs should reduce the personal sense of failure and improve the sense of mastery and responsibility of students in academic outcomes. Understanding the significance of AloC is fundamental to improving achievement within the context of higher education (Morelli et al., 2021). Integrating the notion of autonomy and responsibility for achievement into programs can enhance students' academic engagement and retention.

Incorporating the AloC scale into university programs could enhance the effectiveness of prevention and intervention strategies. For instance, academic advisors, counselors, and educators could use this scale to assess a student's orientation towards internal or external AloC. Based on the results, personalized interventions and supportive

trainings can be tailored to promote students' academic motivation and sense of mastery. Empowering students with a sense of personal agency and control over their academic outcomes can contribute to reducing the feelings of personal failure often associated with academic dropout.

## Data availability statement

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

## Ethics statement

The studies involving humans were approved by Ethical Committee of the Sapienza University of Rome. 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

MM: Conceptualization, Data curation, Investigation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. EC: Conceptualization, Data curation, Investigation, Methodology, Project administration, Supervision, Writing – review & editing. FR: Writing – original draft, Writing – review & editing. RB: Conceptualization, Writing – review & editing. SA: Writing – review & editing. AC: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing.

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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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