






## Factorial structure of the academic buoyancy scale: A psychometric study on a sample of Jordanian university students

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### ABSTRACT

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#### Keywords

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The study aimed to investigate the factorial structure of the Academic Buoyancy Scale (ABS) and verify the validity and reliability of the scale on a sample of Jordanian university students from public and private institutions. The study employed the analytical descriptive approach. The scale consisted of 50 items distributed over five dimensions, which are self-efficacy, uncertain control, anxiety, faculty-student relationship, and academic integration. The results of the confirmatory factor analysis showed the presence of five factors of academic buoyancy. All indicators of the confirmatory factor analysis were appropriate ( $\chi^2/df = 2.83$ , RMSEA = 0.06, GFI = 0.89, CFI = 0.91 and TLI = 0.92). The loadings of the items on the scale's dimensions were all statistically significant and had high values. The psychometric properties of the scale were verified using several procedures. The results showed that the scale has acceptable validity and reliability indications. The values of the reliability coefficients using Cronbach's alpha ranged between 0.82 and 0.93. This study is a vital step to provide accurate and objective data that helps improve students' academic experience. Researchers and teachers can provide scientifically based interventions that contribute to enhancing students' academic success and psychological well-being by developing a valid and reliable scale.

**Contribution/Originality:** The study is distinguished by being one of the few studies in the local context that addresses the academic buoyancy of university students and relies on a theoretical framework and psychometric criteria that were not given sufficient attention by previous studies conducted on school students.

## 1. INTRODUCTION

The university stage is crucial as it provides opportunities for personal growth and academic development. This stage is interspersed with many daily academic difficulties and challenges, such as solving difficult assignments and receiving low grades. According to the results of Almousa et al. (2022) academic difficulties are the most common difficulties among students followed by family difficulties. Alnasraween, Ayasrah, Hanandeh, and Aljarrah (2025) identified student attitudes as a key factor influencing academic achievement. Academic stress is a predominant issue affecting students' well-being and academic achievement in today's challenging educational environment (Ibrahim et al., 2024). Some students successfully navigate these challenges and achieve high academic performance. Conversely, some students struggle with these challenges leading to reduced self-confidence and lower academic performance (AB) which is defined as a psychological trait that indicates an individual's ability to

respond effectively or recover from simple academic difficulties and challenges (Putwain, Wood, & Pekrun, 2022). Through this definition, AB is linked to important Psychological indicators, such as hope and engagement in learning behaviors. On the academic side, AB is associated with higher academic results, greater engagement in learning (Wu, 2024).

These difficulties include the pressures of taking tests, relationships with colleagues and faculty dealing with multiple deadlines, schoolwork, and motivation (Granziera et al., 2022).

According to Xu and Wang (2022), AB's theoretical roots lie in positive psychology which seeks to understand the components of a positive life, such as positive emotions and developing positive qualities like resilience, tolerance, and self-knowledge. This science emphasizes the role of emotions in the teaching process and the experiences provided to students in academic aspects with opportunities to become more resilient.

Similarly, Thomas and Allen (2021) pointed out that AB helps students deal with academic difficulties and risks. AB can also be used by parents and faculty members to support students effectively navigating academic difficulty when it arises to overcome it.

Datu and Yang (2021) regarded AB as the foundation of academic success and personal well-being as it enables students to face challenges and difficulties that may arise in their academic careers. The results of Anderson (2019) indicated that AB has an effective impact on improving mental health in addition to improving psychological well-being and is positively related to students' academic self-concept and academic performance. The higher the level of AB, the higher the ability to face academic challenges and difficulties and thus improve the level of academic performance which is positively reflected in the academic self-concept and personality traits as indicated by the results of Colmar, Liem, Conner, and Martin (2019).

Yun, Hiver, and Al-Hoorie (2018) pointed out that students who have a high level of AB can deal with academic difficulties with higher achievement compared to students with a low level of AB. Furthermore, Fong and Kim (2021) pointed out that students with a strong sense of academic buoyancy tend to display several positive traits. These contain heightened self-confidence, improved academic integration and the ability to build positive relationships with their teachers.

Every student experiences academic stresses and confronts them as part of their educational drive. One effective way to tackle these issues is through AB, which plays a crucial role in lessening the effects of these challenges and responsibilities (Rohinsa, Cahyadi, Djunaidi, & Iskandar, 2019).

AB is positively and statistically related to many variables connected to the educational practice, such as academic motivation and academic achievement and also its relationship with the coping strategies used by students during their studies (Putwain, Daumiller, Hussain, & Pekrun, 2024) and the existence of a relationship between AB and perception of the learning environment (Sadri Damirchi, Karimaianpoor, & Jalilan, 2017). According to Rameli, Hassan, and Idris (2025), self-regulated learning is positively and significantly related with AB. There is a relationship between all three stages of self-regulated learning, namely forethought, performance, and reflection, and AB.

There is a relationship between AB and student participation in the classroom (Rodrigues & Magre, 2018). In addition to the existence of a correlation between intrinsic and extrinsic motivation and AB (Dahal, Prasad, Maag, Alsadoon, & Hoe, 2018). AB and mental motivation are predictors of academic achievement (Smith, 2016). The results of the study by Wurf and Croft-Piggin (2015) indicated the importance of mental motivation and academic integration as dimensions of AB as they have an impact on the educational process. AB is also negatively associated with variables that negatively affect the student's academic side. Therefore, there is a negative relationship between AB and anxiety. AB is also negatively related to variables that negatively affect the student's academic side. Kul, Aksu, and Satıcı (2024) found that there is an indirect relationship between AB and math anxiety which refers to the negative thoughts that students suffer from when dealing with numbers. Chen, Zhang,

and Wong (2024) demonstrated that AB is closely related to cognitive-behavioral adjustment and emotional adjustment.

## 2. LITERATURE REVIEW

Jason, Tamzin, and Roland (2019) defined AB as the ability of students to overcome daily challenges related to study and successfully adapt to the academic lifestyle. Dang and Middlemiss (2025) consider AB states to be a student's adaptive response for dealing with academic-interrelated hindrances and challenges that are characteristic in the normal course of school life.

AB is interpreted as a positive concept within the framework of the broadening and building theory of positive emotions in positive psychology which was developed by Hart, Atkins, Fegley, Robins, and Tracy (2003). This science views positive emotions as an important means of improving personal well-being and expanding the student's circle of thinking, and thus it focuses on the student's response to daily challenges (Miller, Connolly, & Maguire, 2013).

Many factors greatly influence a significant impact on students' perception of academic difficulties and challenges, namely psychological factors which include self-efficacy, control, motivation, awareness of goals, and school factors, which include classroom participation, enjoyment of studying, desire to learn, and facing difficult subjects, and family factors, which include family support, good relationships with friends, good care from parents, and good communication with the community (Marsh & Marsh, 2008).

Recent studies have shown that a student's ability to face challenges and difficulties is an important element in determining his academic progress, which is referred to as the concept of AB which acts as a protective and stimulating element for psychological calm. Students who have high vitality have a great ability to overcome daily academic challenges (Olendo, Koinange, & Mugambi, 2019).

Beyond adaptation, AB appears to be an important predictor of academic success. This notion is supported by Barnett (2012) research, which found a relationship between excellent academic achievement and high levels of AB. It is now evident that improving AB can significantly affect student achievements, demonstrating its significance as a central idea in the process of educational planning.

Piosang (2016) indicates that modern measures of AB have provided five basic elements: Self-efficacy, which means students' ability to understand and comprehend academic tasks well and do their best to face challenges and difficulties and perform tasks. Uncertain control which means students' uncertainty about how to perform tasks well. Anxiety is a feeling of psychological stress related to achievement and academic tasks. Academic engagement is the extent of the student's involvement in the educational environment. The correlation between the teacher and the student is based on mutual respect between them.

Comerford, Batteson, and Tormey (2015) emphasize that dealing with AB is done through three basic components: Motivation components, which include self-efficacy and the ability to plan work and control work and its course. Value components, which are the student's ability to persevere and continue working to achieve the goal he seeks. Emotional components, which are the presence of a state of low anxiety that makes the student able to endure and overcome difficulties.

There are differences between AB and academic resilience. AB deals with daily or temporary challenges periods of poor performance or engagement, academic resilience is associated with more serious such as chronic underperformance, or school refusal (Kritikou & Giovazolias, 2022).

AB is applicable to a large percentage of students while resilience is only applicable to a small percentage of students and under certain circumstances. Resilience is associated with chronic underperformance, resentment, anger, and absenteeism (Reisy, Dehghani, Javanmard, Shojaei, & Naeimian, 2014).

### 2.1. Study Problem

Due to the importance of AB for students, many studies have been conducted on it. The first AB scale was developed by [Marsh and Marsh \(2008\)](#). It is a one-dimensional scale consisting of four domains applied to a sample of school students aged 8-10 years. [Verrier, Johnson, and Reidy \(2018\)](#) expanded the concept of AB by adapting the scale to assess the AB of teachers and its impact on students and school staff. [Panjwani and Aqil \(2020\)](#) contributed to developing a scale for AB for high school students in India which showed results of the presence of seven factors for the scale. However, despite these significant contributions, there is still a gap in the literature related to detecting AB in the Jordanian environment. Most of the studies conducted on this topic were applied to primary and secondary school students and teachers. This scale was not applied to university students. This gap represents a logical reason for conducting this study with the aim of contributing to understanding how university students in Jordan perceive academic challenges and difficulties and how to deal with them.

### 2.2. Research Questions

1. What is the factor structure of the AB scale among university students in Jordan?
2. What are the implications of the validity and reliability of the AB scale among university students in Jordan?

### 2.3. Objective of the Study

This study aims to investigate the factor structure of the AB scale prepared by [Piosang \(2016\)](#) and evaluate these factors among Jordanian university students.

### 2.4. Study Significance

The importance of the study appears in its direction to investigate the factor structure of the AB scale, which the researchers did not find any Arab study that addressed. Moreover, existing international studies that have examined this scale, such as the study by [Panjwani and Aqil \(2020\)](#) have not reached a clear consensus regarding its five-factor structure. Several studies, including those by [Aldhowey, Abdullah, and Khaled \(2021\)](#) and [Piosang \(2016\)](#) have recommended further examination and verification of the scale's factorial structure before employing it in research contexts. One of the key contributions of this study is the development of an Arabic version of the Academic Buoyancy Scale supported by sufficient evidence of its validity and reliability, thereby enriching the Arabic research literature in this field.

### 2.5. Previous Studies

[Oner and Erden \(2024\)](#) conducted a study that aimed to develop a scale for AB and verify its validity indicators. The scale was applied to a sample of 974 students. In the context of analyzing the results, five variables were identified that were able to explain 60.2% of the total variance, confirming the validity of the indicators and the sufficiency of the values obtained to verify the integrity of the modeling process. Reliability coefficients appeared within the range of 0.71-0.90.

A recent study conducted by [Waer, Hamouda, and Ahmad \(2024\)](#) aimed to explore the psychometric properties of the AB scales among high school students. The results revealed the six dimensions. Of the AB scale explained 62.9% of the variance with Cronbach's alpha values for these dimensions from 0.86 to 0.94.

A study by [Maw and Saw \(2022\)](#) investigate the AB scale's factor structure. The model's consistency with the structure of the five components that comprise the buoyancy scale was demonstrated by the results. The value of the coefficient for the dimensions was 0.73 to 0.59; its value for the total scale was 0.85.

[Fong and Kim \(2021\)](#) carried out a study to investigate the predictive power of AB in academic accomplishment. The study sample consisted of 678 university students. The study findings demonstrated that academic success can be predicted using AB.

Al-Dawi, Hussain, and Al-Sayed (2021) conducted a study aimed at investigating the psychometric characteristic (AB). The outcomes showed that the five components of the AB scale explained 38.10% of the variance that was explained. For the dimensions, the Cronbach's alpha reliability coefficient was 0.84 , 0.82, 0.83, 0.71, and 0.55; for the split-half, it was 0.88 .

A study by Panjwani and Aqil (2020) aimed at discovering the latent variables of the AB scale. The study sample consisted of 300 high school students in Lucknow. The study findings revealed that seven factors were found. The Cronbach alpha ranged from 0.89 to 0.70 for each factor. The scale's construct validity was confirmed by calculating the correlation coefficients between the extracted factors. All of them were statistically significant.

### 2.6. Comment on Previous Studies

It is clear from reviewing previous studies that there are many efforts made in this field. Some studies, such as the study by Panjwani and Aqil (2020) used the buoyancy scale prepared by Piosang (2016) while the study by Oner and Erden (2024) developed a special scale for AB. In addition, the study and Jahedizadeh, Ghonsooly, and Ghanizadeh (2019) identified the level of AB among university students and revealed differences in the level of AB according to a number of variables. The current study which can be considered the first to be conducted in the Jordanian environment to determine the factor structure of the AB scale (ABS) among Jordanian university students.

## 3. METHODOLOGY

### 3.1. Research Design

The study employed the analytical descriptive approach for its suitability for this study purposes.

### 3.2. Sample and Data Collection

The sample consisted of 533 students from Jordanian universities (Amman Arab University and Yarmouk University). 408 were female (76.7%), and 125 were male (23.3%). The participants were enrolled in two academic programs: undergraduate (361, 67.4%) and graduate (172, 32.6%). They were also distributed across two university types: government (130, 23.8%) and private (403, 76.2%).

### 3.3. Instruments

The researchers used the AB scale prepared by Piosang (2016) the scale consisted of 50 items distributed over five dimensions which are self-efficacy, uncertain control, anxiety, faculty-student relationship and academic integration. Items with numbers from 1 to 10 belong to the self-efficacy domain, items with numbers 20 to 11 belong to the uncertain control domain, items with numbers 21 to 30 belong to the anxiety domain, paragraphs with numbers 31 to 40 belong to the faculty-student relationship domain, and items with numbers 41 to 50 belong to the academic integration domain.

### 3.4. Analyzing of Data

After administering the study tools to the participants, responses and demographic data were entered into IBM-SPSS 28 to estimate Cronbach's alpha reliability coefficients for the scale's dimensions and correlations between the scale's dimensions. Additionally, responses were input into IBM-AMOS 27 to verify the scale factor structure. The weighted least squares means and variance adjusted (WLSMV) approach was employed, demonstrating strong performance in samples with more than 200 participants (Li, 2016).

### 3.5. Limitations

This study was conducted in light of several limits, its human limits were represented by the students of the Amman Arab University and Yarmouk University, and its spatial limit was limited to the Amman Arab University and Yarmouk University. It was conducted in the first semester of the year 2024/2025. The results of the study are determined by the scale used in this study, which is the Arabic version of the AB scale prepared by Piosang (2016) and the factors emerging from its factor analysis and the psychometric properties achieved for it in addition to the extent of the validity of the study sample's response to the scale used.

## 4. RESULTS

The findings of the first study question state, what is the factor structure of the AB scale among university students in Jordan?

By examining the model fit results for the AB scale (ABS) PID-5-BF scale data shown in Table 1, we find that all fit indices were within the accepted range ( $\chi^2/df = 2.83$ , RMSEA = 0.06, GFI = 0.89, CFI = 0.91 and TLI = 0.92). About the loadings of the items on the scale's dimensions as detailed in Table 2, all were statistically significant and had high values (cut-off value  $\geq 0.50$ ), except for item Q1 (0.49) and item Q4 (0.44) from the self-efficacy dimension and item Q44 (0.41) from the academic engagement dimension. Item Q1 was close to the cut-off point value of 0.50, so it was kept. Items Q4 and Q44 were significantly below the cut-off point, so they were deleted.

**Table 1.** AB scale model fit statistics

Fit index	$\chi^2$	df	$\chi^2/df$	RMSEA	GFI	CFI	TLI
Analysis value	3296.95	1165	2.83	0.06	0.89	0.91	0.92

**Table 2.** ABS factor loadings

Factor and items	Loading	Factor and items	Loading	Factor and items	Loading
<b>Self-efficacy</b>		<b>Anxiety</b>		<b>Academic engagement</b>	
Q1	0.49	Q21	0.72	Q41	0.58
Q2	0.52	Q22	0.55	Q42	0.55
Q3	0.55	Q23	0.53	Q43	0.62
Q5	0.73	Q24	0.85	Q45	0.64
Q6	0.72	Q25	0.62	Q46	0.63
Q7	0.59	Q26	0.81	Q47	0.72
Q8	0.67	Q27	0.91	Q48	0.67
Q9	0.58	Q28	0.90	Q49	0.70
Q10	0.62	Q29	0.52	Q50	0.74
		Q30	0.50		
<b>Uncertain control</b>		<b>Teacher and student</b>			
Q11	0.65	Q31	0.63		
Q12	0.74	Q32	0.72		
Q13	0.77	Q33	0.69		
Q14	0.80	Q34	0.61		
Q15	0.75	Q35	0.72		
Q16	0.74	Q36	0.69		
Q17	0.73	Q37	0.72		
Q18	0.77	Q38	0.73		
Q19	0.81	Q39	0.51		
Q20	0.78	Q40	0.72		

Figure 1 shows the results of the confirmatory factor analysis of the items.



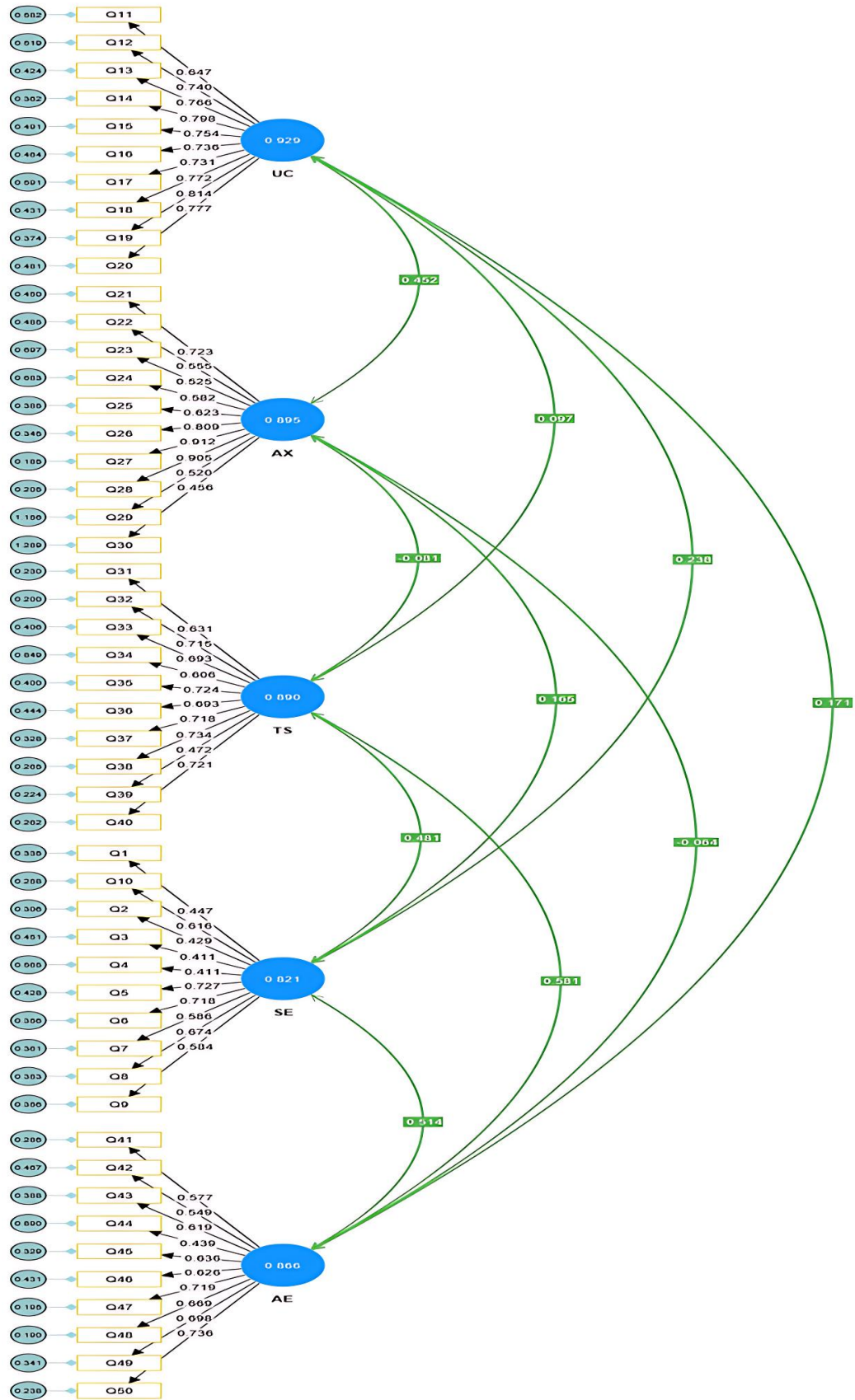


Figure 1. The data study model

The correlation values between the dimensions (subscales) of the measure shown in Table 3 indicate good correlations between most of the subscales. High correlations were observed between academic engagement and self-efficacy and teacher-student relationships with values of 0.51 and 0.58, respectively. Additionally, the correlation coefficient was 0.48 between self-efficacy and the teacher-student relationship on one side and between uncertain control and anxiety on another side. Similarly, the table shows a negative correlation between anxiety and self-efficacy and between uncertain control and both subscale self-efficacy and academic engagement. Finally, the correlation between subscales and the total scale ranged from 0.49 to 0.68 with a significant level of 0.01.

**Table 3.** Correlations between ABS dimensions

Dimensions	1	2	3	4	5	6
1. Self-efficacy	1.00	-0.29**	-0.21**	0.48**	0.51**	0.49**
2. Uncertain control		1.00	0.48**	-0.14**	-0.17**	0.60**
3. Anxiety			1.00	0.07	0.05	0.68**
4. Teacher and student				1.00	0.58**	0.64**
5. Academic engagement					1.00	0.59**
6. Scale						1.00

**Note:** \*\*Statistically significant at the significance level (0.01).

The findings of the second study question state, what are the implications of the validity and reliability of the AB scale among university students in Jordan?

The findings presented in Table 4 suggest that the internal consistency reliability coefficients as measured by Cronbach's alpha ranged from 0.82 to 0.93 for the ABS dimensions which are considered adequate (Li, 2016). Composite reliability coefficients varied from 0.83 to 0.93 which is considered good as they exceeded 0.70 (Lowry & Gaskin, 2014). Convergent validity values by Average Variance Extracted (AVE) ranged between 0.50 and 0.62 which are acceptable validity coefficients as they exceeded 0.50 (Lowry & Gaskin, 2014). As for discriminant validity, its values ranged between 0.12 and 0.64 which is all acceptable.

**Table 4.** ABS construct reliability and validity

Dimension	M	SD	$\alpha$	CR	AVE	Discriminant validity			
						2	3	4	5
1. Self-efficacy	4.10	0.48	0.82	0.83	0.50	0.25	0.22	0.51	0.60
2. Uncertain control	2.58	0.82	0.93	0.93	0.62		0.51	0.12	0.17
3. Anxiety	3.78	0.73	0.90	0.89	0.56			0.13	0.15
4. Teacher and student	4.13	0.58	0.89	0.89	0.55				0.64
5. Academic engagement	4.26	0.51	0.87	0.86	0.52				

## 5. DISCUSSION

AB is a modern concept that has received increasing attention in the field of educational and psychological research. This concept reflects the ability to deal with the daily challenges that students face in the academic environment, such as pressures resulting from exams, the intensity of schoolwork, and high expectations from teachers or parents. AB may not be the solution to deep crises as the concept of academic resilience. However, it has a clear impact on students' daily lives and therefore deserves some attention.

Previous studies have shown that AB directly enhances students' academic performance and psychological well-being. Students with a high level of AB are better able to adjust to difficulties, which helps them achieve their learning goals. Furthermore, AB is associated with lower levels of anxiety and stress, which improves their academic performance. Therefore, to help researchers and teachers understand the characteristics of AB in students and raise its levels, it is necessary to develop accurate measurement tools for this concept.

To understand this concept and develop pedagogical and instructional solutions grounded in empirical data, developing an AB scale is more than just a technical procedure. To ensure its effectiveness, it needs to be defined by



objectivity, validity, and dependability. Objectivity is the attribute that ensures accurate and unbiased results by preventing the scale's results from being impacted by the assessor's subjective variables or the outside world. The validity of the scale reflects its ability to measure what it is designed to evaluate. This calls for ensuring that the items appropriately capture the elements of AB, such as flexibility, stress management, and academic optimism.

Reliability is the ability of the scale to produce consistent results over time and in different situations, which boosts trust in the scale's conclusions. Several methodological steps are required to construct an (AB) scale. The first step in the process is to identify the theoretical dimensions of the concept by thoroughly examining previous research. These attributes might include the ability to quickly recover from classroom setbacks, the ability to persevere through challenges, and the ability to maintain motivation. Products that clearly and concisely communicate these dimensions are then produced. The best method to ensure face validity is to present the items to a group of subject-matter experts who will assess their clarity and idea relevance.

Once the items have been developed, a pilot study is conducted to evaluate the scale's psychometric properties. This entails investigating the construct validity through exploratory and confirmatory factor analysis. This analysis determines the extent to which the items represent the theoretical elements of the concept. Factor analysis can also be used if needed to reduce the number of elements while maintaining the consistency and comprehensiveness of the tool.

The Cronbach's alpha coefficient and other internal consistency coefficients are calculated to assess reliability and further ensure the stability of the findings. By providing a measure of AB, a number of psychological and educational traits can be enhanced. By using these criteria, it is possible to identify which students need more help overcoming academic challenges. Additionally, it can help develop training programs that enhance students' AB skills, which benefits both their academic performance and mental well-being. The scale provides a standardized measurement tool that makes it easier to conduct comparison studies between different student groups or cultures from a research perspective.

### 5.1. Ethics Statement

Participants were informed that their answers would be treated confidentially. No identity was asked.

## 6. CONCLUSION

Developing AB scale represents a vital step towards understanding this concept and applying it in different educational contexts. The importance of this scale lies in its ability to provide accurate and objective data that helps improve students' academic experience. Researchers and teachers can provide scientifically based interventions that contribute to enhancing students' academic success and psychological well-being by developing a valid and reliable scale.

### 6.1. Recommendations

Conduct further future studies to determine the factorial structure of the scale AB on other samples of university students.

Employing the Arabic version of the AB scale in the educational field.

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**Institutional Review Board Statement:** The Ethical Committee of the Deans' Council of Amman Arab University, Jordan has granted approval for this on 1 October 2018 (Ref. No. 05/2018-2019).

**Transparency:** The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

**Competing Interests:** The authors declare that they have no competing interests.

**Authors' Contributions:** All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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