Work in Progress – Investigating the Concurrent Validity of an Academic Resilience Scale

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Investigating the concurrent validity of an academic resilience scale – A Work in Progress

Abstract

Resilience reflects the ability to bounce back from adversity and unfavorable conditions. Previous studies have shown the importance of resilience to succeed in the workplace, as well as academic career. Being resilient is particularly significant in engineering programs; encouraging students to develop resilience may be a key catalyst for academic improvement and subsequent career success.
While the literature pertaining to academic resilience is well-developed, there are not many instruments that measure the construct. With a focus on engineering students. The current study examines the structure validity of the Academic Resilience Scale (ARS -30). Participants included 113 engineering students enrolled in an engineering class who completed an online survey of the concurrent resilience scales. An exploratory factor analysis was performed to examine the latent factors that underlie items on the instrument. The analysis demonstrated adequate reliability among the examined factors. Directions for future study are discussed.

Introduction

Resilience is an important psychological trait that generally describes an individuals' ability to positively respond to adversity. Resilience is the ability to cope effectively in the face of adversity in the bid to overcome a risk or stress factor. It is a desirable attribute that determines whether an individual weathers an undesirable situation and goes on to succeed, or whether they fail to persevere [1]. The Medical Research Council identify resilience as an important factor for well-being and life-long health [2].

Martin & Marsh [3] posited that students experience academic challenges and setbacks in school contexts. While such challenges may not have major life altering consequences, they nonetheless affect student learning, motivation, engagement and, ultimately, academic achievement. While researchers have copiously explored the subject of resilience broadly, there has been relatively less research focusing on academic resilience (i.e. resilience in an academic context). Unlike the broad concept of resilience, academic resilience is less studied particularly among college students [4]. Academically resilient students are able to focus more on learning, engage with learning tasks, and use strategies that promote positive outcomes [5]. On the other hand, less resilient students who experience academic adversities may become demotivated and disillusioned with academic life.

During their academic careers, engineering students experience varying degrees of academic setbacks that they must overcome in order to succeed. At times, students can feel academic pressure induced by individual student factors, such as, poor performance, heavy workload, inadequate preparation, or as a result of other social and institutional factors [3]. Some students facing challenging academic situations may become cognitively and emotionally disengaged and inclined to withdraw from the engineering program. Hence, the need for resilience is particularly relevant in engineering where student attrition is high [6]. Further, this is no different than many of the situation's students will experience later in their professional and career lives. Resilient

students can navigate challenging academic circumstances and recover from academic setbacks, and school could be an important training ground to learn the important skill of resilience.

Students who dropout of engineering might not necessarily be lacking the cognitive ability they require to success in engineering academic workloads. Alternatively, in the face of academic adversities, less resilient students may doubt their own academic ability, which could affect their learning strategies and metacognitive approach to learning. Despite its importance, research around academic resilience among engineering students remains under-explored.

Measuring Academic Resilience

The relevance of resilience to the academic well-being and academic achievement of students creates a need for an instrument to adequately measure the construct. Additionally, establishing the psychometric properties of scales for measuring academic resilience is important for documenting their reliability and validity for research purpose. Some scales have been developed to measure resilience, e.g., the Connor-Davidson Resilience scale [7] and the Child and Youth Resilience Measure [8]. While the Connor-Davidson resilience scale has been cited as a valid and reliable resilience scale, its items focus broadly on resilience, and do not capture the constructs that are particular to resilience in academic contexts [9]. In response to this gap, Cassidy [9] reported an initial effort in developing the Academic Resilience Scale (ARS-30), which is specifically designed to measure academic resilience. The author also conducted exploratory factor analysis to determine the factorial structure of the ARS-30.

In order to extend resilience research to exploring the effect of academic resilience on student engagement, school performance, and retention in engineering programs, it is essential to identify a valid instrument that reliably measures academic resilience in this setting. In this exploratory study, we examined the factorial structure of the ARS-30 with a sample of engineering students. We also examined the correlation between the subscales on the ARS-30 and the factors of resilience that the established Connor-Davidson scale is claimed to measure. The first purpose of this study is to examine the factorial validity of the ARS-30 instrument that is supposed to measure academic resilience with a different population (undergraduate engineering students). The second purpose is to explore how comparable the ARS-30 it is to the Connor-Davidson resilience scale (a less context specific measure of resilience).

Methods

Participants

Following IRB subject approval, the survey was administered via Qualtrics to 113 undergraduate students and taken by 95 (73 males and 22 females) enrolled in an engineering class at a major southeastern public university in the Spring 2018. Twenty-six percent of the students identified as transfer students from other institutions. Most of the study respondents self-identified as Caucasians (59%). A list of student names was compiled and the students who completed the online survey received extra class credit.

Measures

The Academic Resilience Scale- ARS 30: The ARS-30 is a three-factor resilience measure comprising of 30 items that measure student ability to bounce back from academic setbacks, and to deal with academic adversity [9]. Items were measured on a 5-point Likert scale ranging from 1 (being "Not true at all") to 5 (being "True nearly all the time"). Cassidy [9] reported finding three factors on the ARS-30: Perseverance (14 items), Reflecting and Adaptive Help-Seeking (9 items), and Negative Affect and Emotional Response (7 items).

The Connor-Davidson Resilience Scale- CD-RISC: The Connor-Davidson Resilience Scale developed by Connor and Davidson [10] comprises 25 items that measure the ability to cope with adversity. A higher score on the instrument is considered to indicate greater resilience. Items were measured on a 5- point Likert scale ranging from "Never true of me" to "Always true of me". The instrument has demonstrated good test-retest reliability [10].

Data Analysis and Results

Participant responses were analyzed, and we conducted in two phases of data analysis: Using IBM SPSS, we: (i.) conducted an Exploratory Factor Analysis (EFA) to explore the factorial structure of the ARS-30; (ii.) conducted a reliability analysis and explored correlations between the factors on both instruments.

Exploratory Factor Analysis (EFA): We conducted an exploratory factor analysis (EFA) using IBM SPSS to determine the number of latent factors that describe the 30 items making up the ARS). We examined whether the 30 items on the scale would load on three factors in the same way as Cassidy [9] proposed. The data was first checked for normality. We extracted factors using Principal Axis Factoring and rotated extracted factors using the Direct Oblimin procedure to identify the number of latent factors underlying the scales. Kaiser-Meyer sphericity measure (KMO) was 0.81, suggesting that our data were suitable for the EFA. The Bartlett's test of sphericity was $\chi 2\ (435) = 1251.36$, $p < 0.001$, which indicated that there were patterned relationships between items. Items with a factor loading lower than 0.3 were suppressed to minimize the number of irrelevant cross loadings. Based on a minimum Eigenvalue of 1.0, three factors emerged from the EFA analysis, consistent with Cassidy [9]. The three factors explained about 41% of the cumulative variance in participant responses on the survey. Factor loading is shown in Table 1 below.

Table 1…: Three-factor loadings for the ARS-30

		Factor 1 (Perseverance)	Factor 2 (Negative affect)	Factor 3 (Adaptive Reflection)
ARS 4	... see the situation as temporary	0.73		
ARS 22	... use the situation to motivate myself	0.68		
ARS 26	... see the situation as a challenge	0.65		
ARS 25	... use my past successes to help motivate myself	0.59		
ARS 2	... stop myself from panicking	0.55	-0.36	

		Factor 1 (Perseverance)	Factor 2 (Negative affect)	Factor 3 (Adaptive Reflection)
ARS 24	... look forward to showing that I can improve my grades	0.51		
ARS 3	... do not change my long-term goals and ambitions	0.51		
ARS 23	... set my own goals to achieve	0.47		
ARS 15	... work harder	0.45		
ARS 18	... keep trying	0.44		
ARS 1	... give myself encouragement	0.44		
ARS 14	... start to monitor and evaluate my achievements and effort	0.44		
ARS 28	... just give up	-0.41		
ARS 21	... do my best to stop thinking negative thoughts	0.38		
ARS 30	... change my career plans			
ARS 13	... become very disappointed		0.74	
ARS 9	... tend to get depressed		0.72	
ARS 5	... feel like everything is ruined and going wrong	-0.32	0.65	
ARS 8	... begin to think my chances of success in college are poor	-0.31	0.61	
ARS 7	... begin to think my chances of getting the job I want are poor		0.49	
ARS 9	… tend to get annoyed		0.39	
ARS 27	... start to self-impose rewards and punishments depending on my performance			
ARS 12	... seek help from my instructor			-0.51
ARS 29	... try to think of new solutions	0.35		-0.45
ARS 10	... blame the instructor			0.44
ARS 11	... seek help from my fellow peers and tutors			-0.42
ARS 17	... try to think more about my strengths and weaknesses to help me work better	0.35		-0.41
ARS 16	... try different ways to study			-0.39
ARS 20	... use the feedback I receive to improve my work			-0.37
ARS 6	... do not accept the instructors' feedback			

	Factor 1 (Perseverance)	Factor 2 (Negative affect)	Factor 3 (Adaptive Reflection)
Cronbach's α	.83	.79	.72
Eigenvalues	7.47	2.85	1.88
% of variance	24.89	9.51	6.27

Reliability Analysis and Concurrent Validity: We conducted reliability analysis to determine the internal reliability coefficient of each subscale (the three-factor model derived from the EFA) on the ARS-30. Scales are considered reliable when the Cronbach's α of internal reliability of the scale is greater than or equal to 0.70 [11]. Cronbach's α of the global scale was 0.72 indicating that ARS-30 has good reliability overall. The three factors exceeded the threshold reliability value, Cronbach's α was 0.83, 0.79 and 0.72 for Factor 1, Factor 2, and Factor 3, respectively.

We examine correlations between the three factors of the ARS-30 and three factors on the CD-RISC scale. The factor analysis for the CD-RISC yielded three resilience factors based on the resilience literature (in measure of Self- efficacy, Faith and Tenacity). The results showed that the all three factors from the ARS-30 were significantly correlated (r = 0.24 ~0.69) to the factors derived from the CD-RISC measure (see Table 2).

Table 2…. Correlations between factors extracted from ARS-30 and CD-RISC

			1	2	3	4	5	6
ARS-30	1.	Perseverance	1	-.38**	.55**	.66**	.39**	.61**
	2.	Negative Affect		1	-.26**	-.59**	-.24**	-.33**
	3.	Adaptive Reflect			1	.33**	.24*	.47**
CD-RISC	4.	Self-Efficacy				1	.36**	.69**
	5.	Faith				.	1	.36**
	6.	Tenacity						1

*p < .05, ** p< .01

Discussion

Academic resilience is an important factor in school and in the workplace. Research efforts to explore the effects of resilience on the professional formation of students in engineering could be enabled by the availability of reliable and valid instruments for measuring academic resilience. In this study, we examined the factorial validity of the ARS-30. Exploratory factor analysis using the responses of college engineering students supports the three-factor model proposed in earlier studies. Items that loaded on the factors that emerged from our analysis were fairly similar to those on the Perseverance, Negative Affect, and Adaptive Help Seeking scales, as the author's earlier study indicated Cassidy [9]. Coefficients of internal reliability for the sub-scales were

acceptable. We found moderate, but significant, correlations between factors on the ARS-30 and those identified on the CD-RISC. We observed strong correlations between Perseverance and student self-efficacy and their ability to be reflective. Similarly, whether students were tenacious was strongly correlated with Self-Efficacy and Perseverance. This relationship may have important implications for how students facing adverse academic conditions engage with learning.

Future Directions

In summary, the current study is an important step in examining and validating the ARS-30 scale, and to confirm its psychometric properties. The current study was intended to test the generalizability of the ARS-30 to a different population than the sample on which the instrument was first piloted. In the future, we intend to use confirmatory factor analysis techniques to confirm the factor loading of the items on each of the factors. We will examine the multi-dimensionality of the academic resilience construct by testing the three-factor model against a four or five factor model. Future studies will explore diversity of participants, examine gender differences among different samples and explore other demographics. Lastly, we intend to use the validated instrument as a tool to examine causal relationships between academic resilience, students' school engagement, and other motivational factors that influence academic achievement, especially for students who are most vulnerable to high academic stress.

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