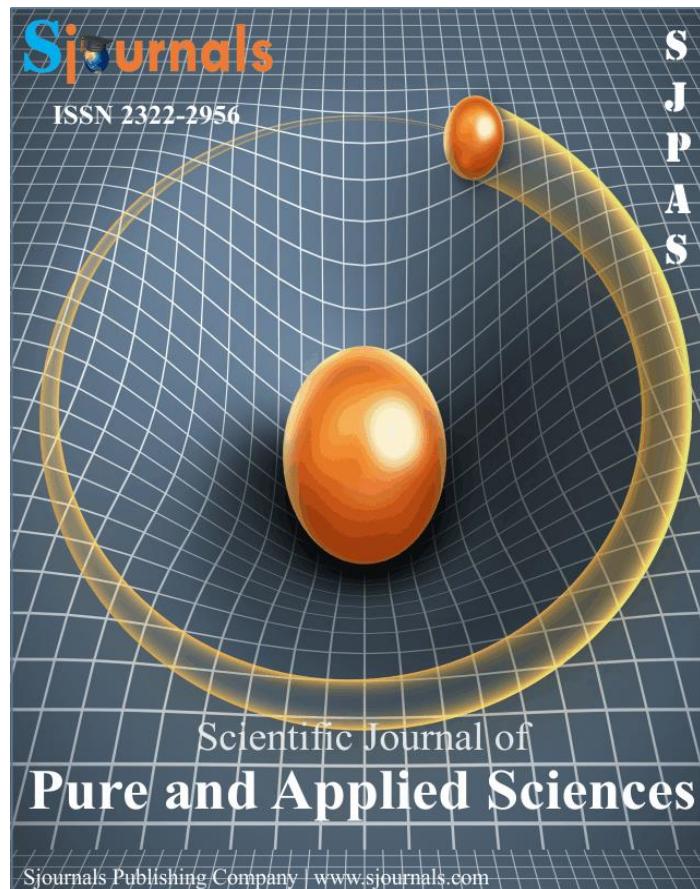


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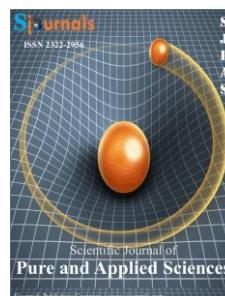
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### Review article

## Defense styles, approaches to learning and the mediating role of academic procrastination

Patra Vlachopanou<sup>a,\*</sup> and Evangelia Karagiannopoulou<sup>b</sup>

<sup>a</sup>University of Neapolis Pafos, Cyprus.

<sup>b</sup>University of Ioannina, Greece.

\*Corresponding author: pat\_vlachopanou@hotmail.com

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### ABSTRACT

The present study belongs to the research that concerns the investigation of the relationship among academic procrastination, defense styles and approaches to learning. Specifically, it aims to explore the mediating role of academic procrastination in the relationship between defense styles and approaches to learning. The sample comprises 628 Greek university undergraduates (78% women and 22% men) who attend a four-year degree program. The questionnaires Defense Style Questionnaire-88, Procrastination Assessment Scale Questionnaire, Flourishing Scale, and How ULearn are used in the study. Results reveal the mediating role of academic procrastination in the relationship between maladaptive and adaptive defense style and approaches to learning. Academic procrastination seems to have a self-handicapping/defensive role between defense styles and learning. Findings are discussed in the context of recent literature.

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### 1. Introduction

Students in tertiary education face stressful situations due to academic demands. They very often report problems related to the stress they feel because of the high demands of universities and the pressure to get good marks in exams (Pascoe et al., 2020; UNESCO, 2012). This phenomenon may result in unconscious feelings and

dysfunctions coming to the surface because of the anxiety they feel while studying (Conlon, 2002a; Pascoe et al., 2020). Some students cope with the transition to higher education, but others do not, and many counselling centers witness students' severe emotional disturbance (Conlon, 2002). So, recently, researchers have focused their studies on mental health and learning (Karagiannopoulou et al., 2018; Milienos et al., 2021; Vlachopanou and Karagiannopoulou, 2022; Vlachopanou et al., 2022). Defense styles implicated in mental health. In recent years academic procrastination and approaches to learning have been studied concerning them (Minow, 2007; Karagiannopoulou et al., 2018; Milienos et al., 2021; Vlachopanou and Karagiannopoulou, 2022; Vlachopanou et al., 2022). According to recent research, procrastination seems to play an essential role in the relationship between defense styles and approaches to learning. It is assumed that the use of maladaptive defense styles leads to procrastination to protect students from stress that further has an influence on students' learning. The role of procrastination has been explored jointly with well-being in a previous study (Vlachopanou et al., 2022) which indicated a stronger role of procrastination on learning compared to that of students' well-being on learning. To the best of our knowledge, the mediating role of academic procrastination between defense style and learning has not been explored in detail in a previous study. Therefore, this study comes to fill this gap.

## 2. Defense Styles and Procrastination

According to Sigmund Freud, defense mechanisms are used to protect the ego. Two core characteristics are that they are unconscious and keep out of awareness of effects, desires and impulses that would threaten the ego (Plutchik, 1995). Upsetting effects and anxiety trigger the development of any defense mechanism (Freud, 1915/1957; Plutchik, 1995). Furthermore, defense mechanisms protect the ego through self-deception as they inhibit, distort, screen, or cover the mental contents using reverse contents (Freud, 1915/1957). According to Solomon and Rothblum (1984), procrastination consists of cognitive, affective, and behavioral characteristics and as Minow stated (2007), procrastinators have a problem monitoring their behavior when postponing a task because they want to relieve themselves from anxiety. That is self-defeating and avoidant.

In many cases, procrastinators are not aware of their delay. Besides that, they tend to engage in self-handicapping strategies that alter self-perception by using excuses due to poor academic performance. In this line of thinking, Minow (2007) has studied the possibility of defense mechanisms to predict procrastination. Specifically, Minow (2007) found a correlation among regression, displacement, compensation, and intellectualization with procrastination. Furthermore, he found that regression predicts procrastination. In this line of research, Vlachopanou and Karagiannopoulou (2022) and Vlachopanou et al. (2022) have studied defense styles and academic procrastination and found that immature defense styles have a positive, statistically significant correlation with academic procrastination. In contrast, mature defense styles have a negative statistically significant correlation with procrastination. Additionally, they have found that immature defense styles have a positive direct effect on procrastination whereas mature defense styles have a negative direct effect on academic procrastination. They concluded that students use procrastination in their attempt to cope with stress.

## 3. Defense Styles and Approaches to Learning

Research into defense styles and approaches to learning began by studying the relationship between defense styles and thinking styles found on the spectrum of intellectual styles (Ihilevich and Gleser, 1993; Zhang and Sternberg, 2005; Zhang, 2015). The relationship between defense styles and learning styles was also investigated by Zhang (2015), who examined the adaptive and maladaptive value of defense styles and thinking styles. According to Zhang (2015), less adaptive thinking styles predicted less adaptive defensive styles. Karagiannopoulou et al. (2015) came to the opposite conclusion. Karagiannopoulou et al. (2015) based on previous research that studied the influence of adaptive and maladaptive cognitive functions (anxiety, failure avoidance, uncertain control), as well as behaviors as distant predictors affecting learning and the emotions associated with it (Niculescu et al., 2015; Postareff et al., 2017), examined the predictive relationship of defense styles to approaches to learning. They concluded that the deep approach to learning and strategic approach are positively related to the mature defense style, while the surface approach to learning is positively related to the immature defensive style. She also found that defense styles function as predictors of approaches to learning, mediating the relationship between defense styles and academic success (Karagiannopoulou et al., 2018). The present research also belongs to this innovative research framework.

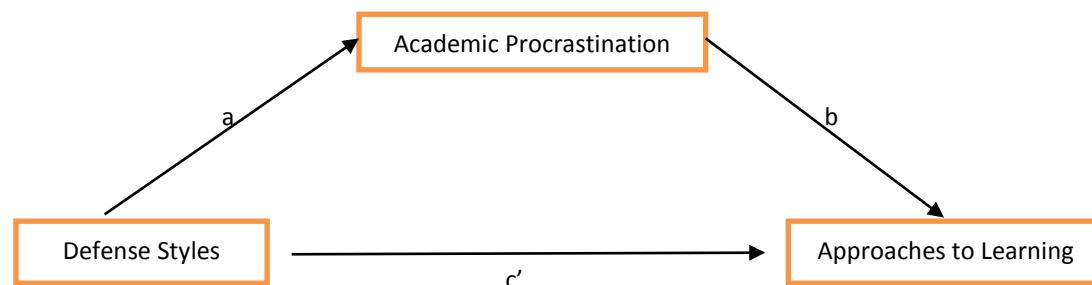
#### 4. Defense Styles, Procrastination and Approaches to Learning

In the last few years, Vlachopanou and Karagiannopoulou (2022) and Vlachopanou et al. (2022) have investigated the relationship between defense styles and approaches to learning through academic procrastination. They have found that academic procrastination correlates positively with immature defense styles and surface approach to learning and negatively with mature defense styles, deep approach to learning and organized effort. They also found that defense styles influence procrastination, and procrastination influence approaches to learning.

#### 5. The Present Study

The present study explores the mediating role of academic procrastination in the relationship between defense styles and approaches to learning. The literature review shows that academic procrastination is a multifactorial problem. It includes psychological, clinical, situational, and motivational factors that explain it (Steel, 2007a). It is prevalent among university students and results in dysfunction in academic performance (Madhan et al., 2022). Recent studies about defense styles, academic procrastination, approaches to learning, and GPA indicated that maladaptive defense styles and academic procrastination come along with surface approach to learning and low GPA (Vlachopanou and Karagiannopoulou, 2022). This led to a further study between the above variables and found that academic procrastination affects approaches to learning in the relationship between defense styles and approaches to learning and serve as a self-handicapping /defensive behavior that student use to avoid stress (Vlachopanou et al., 2022). In this context of thinking, the present study examines procrastination as a self-handicapping/ defensive behaviour that mediates the relationship between defense styles and approaches to learning (Vlachopanou and Karagiannopoulou, 2022; Vlachopanou et al., 2022).

Mediation models using PROCESS are examined based on current literature (Zahng, 2015; Karagiannopoulou, 2015; Vlachopanou et al., 2022). In these models, defense styles were the predicting variables, academic procrastination was the mediating variable and approaches to learning were the outcome variables. The research hypothesis is as follows: academic procrastination would mediate the relationship between defense styles and approaches to learning.



**Fig. 1.** The hypothesized theoretical model of the indirect effect of defense styles to approaches to learning through academic procrastination.

#### 6. Methods

##### 6.1. Participants

The sample consisted of 628 Greek university undergraduates of the Social Science department who attended a four-year degree program at the University of Ioannina. Due to the unbalance between men and women in Social Sciences (Eurostat, 2018), 490 (78%) were women, and 138 (22%) were men. The mean age for the total sample was  $M = 20.6$  years ( $SD = 3.5$ ), with 93% of the sample being under 22 years old. Regarding the year of study, 24.8% were freshmen, 25.5% were sophomores, 23.9% were third-year students, and 25.8% were fourth-year or higher students. All ethical protocols were considered. A written consent form was given to the participants before administering the questionnaires. Then, the researcher gave all the necessary information about the purpose and aims of the study, and students completed the questionnaires in their classrooms before the lecture started. The completion lasted almost 40 minutes.

## 6.2. Instruments

### 6.2.1. Demographics

A short demographic questionnaire was given to students to collect data about their age, gender, year of study, and parents' educational level.

### 6.2.2. Defense style questionnaire- 88

The Defense Style Questionnaire-88 (DSQ-88; Andrews et al., 1993, adaptation to the Greek population; Hyphantis, 2010) was administered to measure students' defense styles. The Defense Style Questionnaire is comprised of 88 items that measure four defense styles, namely, maladaptive action style (withdrawal, regression, acting out, inhibition, passive aggression, projection), adaptive action style (humour, sublimation, suppression, affiliation, anticipation), image distorting style (omnipotence, splitting, primitive idealization, denial), and self-sacrificing style (pseudo altruism, reaction formation, isolation, undoing). An example statement for maladaptive action is: «I keep getting involved in situations that frustrate me, and I cannot understand why» the image distorting style is: «People say I am like an ostrich with my head in the sand. In other words, I tend to ignore unpleasant things as if they were not there», for the self-sacrificing style is: «It gives me pleasure to help others, and I would be very sad if they deprived me of it», and, finally, for the adaptive style is: «I can laugh at myself very easily». The score was given on a 9-point Likert scale (1 = I completely disagree, 9 = I totally agree). The reliability for the four subscales were  $\alpha = 0.84$  (maladaptive action),  $\alpha = 0.74$  (image distorting),  $\alpha = 0.61$  (self-sacrificing) and  $\alpha = 0.67$  (adaptive action) respectively. The overall Cronbach's  $\alpha$  score was 0.90.

### 6.2.3. Procrastination assessment scale questionnaire

To measure procrastination Procrastination Assessment Scale Questionnaire (PASS) questionnaire (Solomon and Rothblum, 1984, adjusted in Greek by Chatzidimou, 1994), a self-reported measure that evaluated the frequency of students' procrastination was used. The Greek version of PASS assessed academic procrastination across five academic Tasks, namely, 1) writing term papers, 2) studying for the examinations, 3) academic-administrative tasks, 4) course attendance, and 5) school activities in general on 5-point Likert scales (1 = never procrastinate to 5 = always procrastinate). Example statements are: «To what extent do you put off writing a paper in a semester course? », and «To what extent do you procrastinate studying for exams? ». The reliability of the scale was  $\alpha = 0.77$ .

### 6.2.4. Flourishing scale

The Diener and Biswas-Diener's Flourishing Scale (FS) (Diener et al., 2009) was administered to measure students' psychological well-being. The Flourishing Scale comprises 8 items formulated in a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). An example statement for the Flourishing Scale is: «My life is full of purpose and meaning». The reliability of the whole scale was  $\alpha = 0.87$ .

### 6.2.5. HowULearn (Prev. Learn)

To measure approaches to learning, the Finnish questionnaire "HowULearn (Prev. Learn)" (Hailikari and Parpala, 2014; Parpala and Lindblom-Ylännne, 2012) was used. This questionnaire consisted of 12 items that measured the aspects of students learning approaches: the deep approach (Q6: I carefully looked at all the information or findings that were available before coming to my conclusions about what I was studying each time), the organised effort (Q3: Much of what I have learned seems to be nothing more than disjointed pieces of information in my head), the surface approach (Q1: I have often struggled to make sense of the information I was supposed to remember). The reliability for the three subscales were  $\alpha = 0.76$  (deep approach),  $\alpha = 0.79$  (organized approach),  $\alpha = 0.74$  (surface approach).

## 6.3. Data analysis

The analysis of the dataset was performed using SPSS 25.0. Confirmatory analyses were conducted to assess the psychometric properties of the instruments used in the study, and Cronbach's  $\alpha$  was computed as well. Pearson correlation coefficients among defense styles, academic procrastination and approaches to learning were also calculated. The hypothesis that procrastination would mediate the relationship between defense styles and approaches to learning different moderation models were tested using PROCESS v.4.1 for SPSS, developed by

Hayes (2022). In these models, defense styles were the predicting variables. Academic procrastination was the mediating variable, and approaches to learning were the criterion variables. The analyses were based on 5000 bootstrapped samples, using bias-corrected 95% confidence intervals. Bootstrap was used because it offers reliable findings (Hayes, 2013). To have a full mediation, the path  $c'$  (the prediction of the independent variable in the dependent variable with the mediator's participation) should not be statistically significant (James et al., 2006).

Since, in the social sciences, the phenomena are multifactorial and determined simultaneously by many factors, such a case is considered strict (Judd and Kenny, 1981).

For this reason, when the absolute value of  $c'$  is smaller than the absolute value of  $c$ , then it is said that we have a partial mediation. Several mediation analyses were performed to examine the relationship between defense styles and approaches to learning through academic procrastination. In these analyses, a path refers to the direct relationship between the predicting variable and the mediating variable, b path shows the association between the mediating variable and the outcome variable, c path refers to the direct relationship between the predicting variable and the outcome variable and  $c'$  path refers to the indirect effect of the predicting to the outcome variable.

## 7. Results

Results of Confirmatory Factor Analyses are shown in Table 1. All the indices are acceptable (Kline, 2016). All Cronbach's  $\alpha$  are also acceptable (Table 2). Pearson  $r$  correlation among all variables can be found in Table 3. Maladaptive action was positively correlated with image distorting ( $r = 0.47^{**}$ ,  $p = 0.001$ ), self-sacrificing ( $r = 0.43^{**}$ ,  $p = 0.001$ ), adaptive action ( $r = 0.086^*$ ,  $p = 0.031$ ), academic procrastination ( $r = 0.271^{**}$ ,  $p = 0.001$ ), surface approach ( $r = 0.224^{**}$ ,  $p = 0.001$ ) and negatively correlated with deep approach ( $r = -0.080^*$ ,  $p = 0.045$ ) and organized effort ( $r = -0.139^{**}$ ,  $p = 0.001$ ). Image distorting was positively correlated with self-sacrificing ( $r = 0.344^{**}$ ,  $p = 0.001$ ), adaptive style ( $r = 0.229^{**}$ ,  $p = 0.001$ ), academic procrastination ( $r = 0.150^{**}$ ,  $p = 0.001$ ), deep approach ( $r = 0.074^*$ ,  $p = 0.035$ ) and surface approach ( $r = 0.070^*$ ,  $p = 0.045$ ) and negatively correlated with organized effort ( $r = -0.070^*$ ,  $p = 0.040$ ). Self-sacrificing was positively correlated with adaptive action ( $r = 0.305^{**}$ ,  $p = 0.001$ ), deep approach ( $r = 0.194^{**}$ ,  $p = 0.001$ ), organized effort ( $r = 0.080^*$ ,  $p = 0.041$ ) and surface approach ( $r = 0.109^{**}$ ,  $p = 0.006$ ) and negatively correlated with academic procrastination ( $r = -0.081^*$ ,  $p = 0.044$ ). Finally, adaptive style was positively correlated with deep approach ( $r = 0.473^{**}$ ,  $p = 0.001$ ), organized effort ( $r = 0.125^{**}$ ,  $p = 0.002$ ) and negatively correlated with academic procrastination ( $r = -0.177^{**}$ ,  $p = 0.001$ ) and surface approach ( $r = -0.243^{**}$ ,  $p = 0.001$ ). Table 1.

**Table 1**

Correlation among defence styles, academic procrastination and approaches to learning.

|                    | Maladaptive Action | Image Distorting | Self Sacrificing | Adaptive Action | Procrastination | Deep Approach | Organized Effort | Surface Approach |
|--------------------|--------------------|------------------|------------------|-----------------|-----------------|---------------|------------------|------------------|
| Maladaptive Action | 1                  | 0.47**           | 0.43**           | 0.09*           | 0.27**          | -0.08*        | -0.14**          | 0.22**           |
| Image Distorting   |                    | 1                | 0.34**           | 0.23**          | 0.15**          | 0.07*         | -0.07*           | 0.07*            |
| Self Sacrificing   |                    |                  | 1                | 0.30*           | -0.08*          | 0.19**        | 0.08*            | 0.08*            |
| Adaptive Action    |                    |                  |                  | 1               | -0.18**         | 0.47**        | 0.12**           | -0.24**          |
| Procrastination    |                    |                  |                  |                 | 1               | -0.32**       | -0.39**          | 0.22**           |
| Deep Approach      |                    |                  |                  |                 |                 | 1             | 0.26**           | -0.38**          |
| Organized Effort   |                    |                  |                  |                 |                 |               | 1                | -0.17**          |
| Surface Approach   |                    |                  |                  |                 |                 |               |                  | 1                |

Note: p-value tests the statistical significance of the correlation between the indexes (\*\*p< .001, \*\*p< .05, \*p< .10).

To explore the mediating effect of academic procrastination between defense mechanisms and approaches to learning, several mediation analyses were carried out with PROCESS v.4.1 (Hayes, 2022). Separate analyses were conducted. Defense styles (maladaptive, image distorting, self-sacrificing and adaptive) were the independent variables, academic procrastination was the mediating variable and approaches to learning (deep, organized effort and surface) were the dependent variables. The mediations between maladaptive style, adaptive style and approaches to learning were statistically significant whilst mediations between image distorting, self-sacrificing and approaches to learning were not statistically significant. So, academic procrastination did not mediate the relationship between image distorting/ self-sacrificing style and approaches to learning.

### **7.1. The mediating role of academic procrastination between maladaptive defense style and a deep approach to learning**

Mediation analysis showed that academic procrastination fully mediated the relationship between maladaptive defense style and deep approach to learning. Specifically, in the path (a), there was a statistically significant positive prediction of maladaptive style to procrastination ( $b = 0.1409$ ,  $t = 7.0329$ ,  $p = 0.001$ ), so the higher the maladaptive style, the more students tended to procrastinate. Accordingly, at path (b), academic procrastination negatively predicted a deep approach to learning ( $b = -0.5876$ ,  $t = -8.2542$ ,  $p = 0.001$ ), namely, the more the students procrastinate, the less they use the deep approach to learning. In path (c') there is not a statistically significant prediction of the maladaptive defense style to a deep approach to learning through academic procrastination ( $b = 0.0075$ ,  $t = 0.2021$ ,  $p = 0.8399$ ). The  $R^2$  mediation effect for this model is 0.64%. Finally, in the path (c), there is a statistically significant negative prediction of the maladaptive defense style to a deep approach to learning without including the mediating variable (academic procrastination), ( $b = -0.0753$ ,  $t = -2.0054$ ,  $p = 0.0453$ ). This means that students who use a maladaptive defense style do not engage in a deep approach to learning. The  $R^2$  mediation effect for this model is 3.76% (Hayes, 2022). When path c' is not statistically significant, and path c is statistically significant, a full mediation has occurred (Zhao et al., 2010).

### **7.2. The mediating role of academic procrastination between maladaptive defense style and organized effort**

Mediation analysis showed that academic procrastination partially mediated the relationship between maladaptive defense style and organized effort. Specifically, in the path (a), there was a statistically significant positive prediction of maladaptive style to procrastination ( $b = 0.1409$ ,  $t = 7.0329$ ,  $p = 0.001$ ), so the higher the maladaptive style, the more students tended to procrastinate. Accordingly, at path (b), academic procrastination negatively predicted organized effort ( $b = -0.6908$ ,  $t = -9.9891$ ,  $p = 0.001$ ), namely, the more the students procrastinate, the less they use the organized effort. In path (c') there is not a statistically significant prediction of the maladaptive defense style to organized effort through academic procrastination ( $b = 0.0339$ ,  $t = 0.9411$ ,  $p = 0.3470$ ). The  $R^2$  mediation effect for this model is 15.44%. Finally, in the path (c), there is a statistically significant negative prediction of the maladaptive defense style to organized effort without including the mediating variable (academic procrastination) ( $b = -0.1313$ ,  $t = -3.5180$ ,  $p = 0.005$ ). Students who use maladaptive defense style do not engage in an organized effort. The  $R^2$  mediation effect for this model is 1.94% (Hayes, 2022). When path c' is not statistically significant, and path c is statistically significant, a full mediation has occurred (Zhao et al., 2010).

### **7.3. The mediating role of academic procrastination between maladaptive defense style and surface approach**

Mediation analysis showed that academic procrastination partially mediated the relationship between maladaptive defense style and surface approach. Specifically, in the path (a), there was a statistically significant positive prediction of maladaptive style to procrastination ( $b = 0.1409$ ,  $t = 7.0329$ ,  $p = 0.001$ ), so the higher the maladaptive style, the more students tended to procrastinate. Accordingly, at path (b), academic procrastination positively predicted the surface approach ( $b = 0.3144$ ,  $t = 4.3539$ ,  $p = 0.001$ ), namely, the more the students procrastinate, the more they use the surface approach. In path (c') there is a statistically significant prediction of the maladaptive defense style to surface approach through academic procrastination ( $b = 0.1673$ ,  $t = 4.4482$ ,  $p = 0.001$ ). The  $R^2$  mediation effect for this model is 7.83%. Finally, in the path (c), there is a statistically significant negative prediction of the maladaptive defense style to surface approach without including the mediating variable (academic procrastination) ( $b = 0.2116$ ,  $t = 5.7624$ ,  $p = 0.001$ ). Students who use a maladaptive defense style engage in a surface approach. The  $R^2$  mediation effect for this model is 5.04%. According to the results, the (c')

absolute value  $|0.1673|$  is smaller than the (c) absolute value  $|0.2116|$ . This means there is a partial mediation of academic procrastination on the relationship between maladaptive defense style and surface approach. The confidence intervals also support this since 0 value is not included between them (BootLLCI = 0.0222, BootULCI = 0.0710). The Sobel test is statistically significant ( $z = 3.78723, p = 0.001$ ), which means that the independent variable affects the dependent variable at a statistically significant level through the mediating variable, so there is a mediating effect (Hayes, 2022; Judd and Kenny, 1981).

#### **7.4. The mediating role of academic procrastination between the adaptive defense style and deep approach to learning**

Mediation analysis showed that academic procrastination partially mediated the relationship between adaptive defense style and a deep approach to learning. Specifically, in path (a), there was a statistically significant negative prediction of adaptive style to procrastination ( $b = -0.0976, t = -4.4898, p = 0.001$ ), so the higher the adaptive style, the fewer students tended to procrastinate. Accordingly, at path (b), academic procrastination negatively predicted a deep approach to learning ( $b = -0.4464, t = -7.1653, p = 0.001$ ), namely, the more the students procrastinate, the less they use the deep approach to learning. In path (c') there is a statistically significant prediction of the adaptive defense style to deep approach to learning through academic procrastination ( $b = 0.4295, t = 12.4791, p = 0.001$ ). The  $R^2$  mediation effect for this model is 28.27%. Finally, in path (c), there is a statistically significant positive predictor of the adaptive defense style to a deep approach to learning without including the mediating variable (academic procrastination) ( $b = 0.4731, t = 13.4345, p = 0.001$ ). This means students who use the adaptive defense style engage in a deep approach to learning. The  $R^2$  mediation effect for this model is 22.38%. The (c') absolute value  $|0.4295|$  is smaller than the (c) absolute value  $|0.4731|$ . This means there is a partial mediation of academic procrastination on the relationship between adaptive defense style and deep approach to learning. The confidence intervals also support this since 0 value is not included between them (BootLLCI = 0.0232, BootULCI = 0.0679). The Sobel test is statistically significant ( $z = 3.40805, p = 0.001$ ), which means that the independent variable affects the dependent variable at a statistically significant level through the mediating variable, so there is a mediating effect (Hayes, 2022; Judd and Kenny, 1981).

#### **7.5. The mediating role of academic procrastination between the adaptive defense style and organized effort**

Mediation analysis showed that academic procrastination partially mediated the relationship between adaptive defense style and organized effort. Specifically, in the path (a), there was a statistically significant negative prediction of adaptive style to procrastination ( $b = -0.0976, t = -4.4898, p = 0.001$ ), so the higher the adaptive style, the more students tended to procrastinate. Accordingly, at path (b), academic procrastination negatively predicted organized effort ( $b = -0.6899, t = -10.2115, p = 0.001$ ), namely, the more the students procrastinate, the less they use the organized effort. In path (c') there is not a statistically significant prediction of the adaptive defense style to organized effort through academic procrastination ( $b = 0.0581, t = 1.5563, p = 0.1202$ ). The  $R^2$  mediation effect for this model is 15.65%. Finally, in the path (c), there is a statistically significant positive predictor of the adaptive defense style to organized effort without including the mediating variable (academic procrastination), ( $b = 0.1254, t = 3.1626, p = 0.0016$ ). Students who use the adaptive defense style do not engage in an organized effort. The  $R^2$  mediation effect for this model is 1.57% (Hayes, 2022). When path c' is not statistically significant, and path c is statistically significant, a full mediation has occurred (Zhao et al., 2010).

#### **7.6. The mediating role of academic procrastination between the adaptive defense style and surface approach**

Mediation analysis showed that academic procrastination partially mediated the relationship between adaptive defense style and surface approach. Specifically, in the path (a), there was a statistically significant negative prediction of adaptive style to procrastination ( $b = -0.0976, t = 4.4898, p = 0.001$ ), so the higher the adaptive style, the fewer students tended to procrastinate. Accordingly, at path (b), academic procrastination positively predicted the surface approach ( $b = 0.3339, t = 4.7639, p = 0.001$ ), namely, the more the students procrastinate, the more they use the surface approach. In path (c') there is a statistically significant prediction of the adaptive defense style to surface approach through academic procrastination ( $b = -0.2108, t = -5.4443, p = 0.001$ ). The  $R^2$  mediation effect for this model is 9.22%. Finally, in the path (c), there is a statistically significant negative prediction of the adaptive defense style to surface approach without including the mediating variable

(academic procrastination), ( $b = -0.2434$ ,  $t = -6.2782$ ,  $p = 0.001$ ). Students who use the adaptive defense style do not engage in the surface approach. The  $R^2$  mediation effect for this model is 5.92%. According to the results, the ( $c'$ ) absolute value  $|0.2108|$  is smaller than the ( $c$ ) absolute value  $|0.2434|$ . This means there is a partial mediation of academic procrastination on the relationship between adaptive defense style and surface approach. The confidence intervals also support this since 0 value is not included between them (BootLLCI =  $-0.0546$ , BootULCI =  $-0.0144$ ). The Sobel test is statistically significant ( $z = 3.13834$ ,  $p = 0.001$ ), which means that the independent variable affects the dependent variable at a statistically significant level through the mediating variable, so there is a mediating effect (Hayes, 2022; Judd and Kenny, 1981).

## 8. Discussion

The present study indicates the role of academic procrastination as a mediator in the relationship between defense styles and approaches to learning in a university undergraduates' sample. The findings indicate that the relationship between defense styles and approaches to learning is mediated by academic procrastination. It is suggested that the effect of defense styles on approaches to learning can best be explained using academic procrastination as a mediation variable. The role of procrastination was explored because in a previous study when procrastination was examined jointly with well-being (Vlachopanou and Karagiannopoulou, 2022) was found that procrastination had a stronger bond with surface approach to learning and organized effort than well-being had with learning. The study, also, succeeded in showing that academic procrastination umpires the relationship between maladaptive and adaptive defense styles and approaches to learning but failed to indicate the mediating role of academic procrastination in the relationship between image distorting, self-sacrificing and approaches to learning. The failure depicts the weak correlations between those defense styles and academic procrastination.

There was a full mediation of academic procrastination in the relationship between maladaptive defense styles and a deep approach to learning. Specifically, academic procrastination negatively influences a deep approach to learning. This means that the more the students procrastinate, the less they use the deep approach to learning. This result is in line with recent research, which shows that procrastination negatively correlates with a deep approach to learning and influence (Vlachopanou et al., 2022). The full mediation of academic procrastination in the relationship between maladaptive defense style and deep approach to learning demonstrates that procrastination does not promote deep understanding and engagement with the subject of study. Instead, it is used as a self-handicapping/defensive strategy that individuals use to protect their self-esteem, unfortunately resulting in poor quality of learning. It appears to negatively affect learning by disorganizing students who engage in a surface approach to learning (Sæle et al., 2017).

There was a full mediation of academic procrastination in the relationship between maladaptive defense style and organized effort. Academic procrastination negatively influences organized effort. This means that the more the students procrastinate, the less organized effort they use. This result also aligns with recent research, which shows that procrastination negatively correlates with organized effort and influence (Vlachopanou et al., 2022). The full mediation of academic procrastination in the relationship between maladaptive defense style and organized effort maybe indicates that procrastination is considered a failure in self-regulation, low achievement motivation and disorganization and results in non-self-regulated learning (Howell and Watson, 2007). Thus, it is plausible that it negatively predicts organized effort.

There was a partial mediation of academic procrastination in the relationship between maladaptive defense style and surface approach. Maladaptive defense style influences surface approach to learning through academic procrastination. This result is in line with previous research (Vlachopanou et al., 2022). This means that students who use immature defenses are more likely to procrastinate. When they come across new knowledge, the frustration created by knowledge mobilizes defenses that refer to a regressed self (Karagiannopoulou, 2003). Regression is a defense that predicts procrastination (Minow, 2007). Therefore, students procrastinate because they cannot bear the frustration created by the state of "I do not know" and the execution of other academic obligations, such as writing papers and studying for the exam period. They seem to avoid the stressors of learning, which create an internal conflict for them through procrastination (Peterson & Seligman, 1984), behaving in a way that will provide them with an excuse for possible failure (Jones and Berglas, 1978). Therefore, procrastination seems to function as a defensive, self-undermining strategy that students use to protect their vulnerable self-esteem, which is why it is observed to be positively related to the surface approach that results in a low GPA (Grade Point Average) (Svardal et al., 2020; Vlachopanou and Karagiannopoulou, 2022).

There was a partial mediation of academic procrastination in the relationship between adaptive defense style and deep approach. The adaptive defense style influences a deep approach through academic procrastination. This result is in line with previous research (Vlachopanou et al., 2022). Students who use mature defenses are less likely to procrastinate and more likely to use a deep approach to learning. This finding probably demonstrates that the emotionally stable and adapted to the environment students have self-confidence and self-esteem and do not procrastinate in their academic tasks (Karagiannopoulou et al., 2018).

There was a full mediation of academic procrastination in the relationship between adaptive defense style and organized effort. Once again, it is perceived that procrastination, not the defenses, affects organized effort.

The disorganization causes to the students seems total and immersive. Procrastination leads to less self-regulated learning (Chao Hong et al., 2021; Ng, 2018). Students who use procrastination cannot monitor their learning. This is in line with the work of Freud, who refers that procrastination is a non-conscious attempt to protect the ego through avoidance of tasks which may cause a threat to the ego (Freud, 1953).

There was a partial mediation of academic procrastination between the adaptive defense style and surface approach. Adaptive defense style tends to play an important role affecting surface approach to learning. It seems to preserve the individual's self-esteem against stress (Cramer, 2015) leading them to surface approach. When the academic demands are high, students may use any defense and learning approach to reduce stress and learn (Vlachopanou and Karagiannopoulou, 2022).

## 9. Conclusion

To summarize, the study aimed to examine the mediating role of academic procrastination in the relationship between defense styles and approaches to learning. A key conclusion of the research is that there are partial and total mediations of academic procrastination in the relationship between defense styles and approaches to learning. The total mediation shows that academic procrastination may operate unconsciously like defense mechanisms and functions as a self-handicapping/defensive strategy predicting approaches to learning.

## Limitations

Although the study is informative for the scientific community, there are some limitations. Firstly, the usage of self-report measures to assess defense styles is questionable (Davidson and MacGregor, 1998). Although defense mechanisms are mainly unconscious, students can be aware of their defenses when they face stress and anxiety (Bond et al., 1983; Thygesen et al., 2008). Furthermore, recent research uses self-report measures to evaluate defense mechanisms (Vlachopanou et al., 2022; Laczkovics et al., 2018). Moreover, although it is known that in the first year of study students procrastinate more, in the ANOVA conducted, no difference was found between the years, so the sample was treated as a single year. Finally, the results cannot be generalized as the data were collected from one academic department.

## Future Research

As found no mediations between the defense style of image distorting and self-sacrificing, it would be helpful to repeat the research in a larger sample that includes more academic departments. Furthermore, it is essential in the future to assess academic procrastination at the behavioral level through the design of interventions. The specific programs are essential to strengthen the skills of studying and writing scientific papers and changing contextual factors to create attractive academic goals and teaching and learning environments (Schouwenburg, 2005).

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