Research Paper
Comparing Hope, Executive Function, and Procrastination in University Students: Implications for a Post-COVID-19 World

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ABSTRACT

Objective: The global pandemic has impacted variously on students' experiences of education globally. At this time, we must continue to isolate the key components contributing to supporting students' academic performance so that education systems can begin to reduce the impact of this pandemic on children's lives.

Methods: We used the ex post facto research to compare hope, executive functions, and procrastination between students with high and low academic performances. The authors hope to contribute positively to rebuilding our education system as we move to a post-pandemic phase. The statistical population consisted of students with high and low academic performances at the University of Bojnurd, Bojnurd City, Iran, from 2019 to 2020. A total of 85 students were selected as samples using the available sampling method. The research data were collected using the behavior rating inventory of executive function for adults, the procrastination assessment scale for students, and the domain-specific hope scale.

Results: The results showed a statistically significant difference between the two groups of students regarding the mean scores of executive functions and academic procrastination. In this regard, the scores of executive functions were reduced, but the academic procrastination in students with low performance was significantly higher than the high-performance students. The group factor predicted a significant amount of variance in the examined components. Nevertheless, there was no significant difference between the two groups in the hope variable except for the academic hope subscale.

Conclusion: The results have implications for understanding students' academic performances and the use of interventions that can improve students' outcomes in the future.

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Highlights

● Two groups of students (with high and low functions) had significant differences in executive functions and academic procrastination.

● The data related to hope showed that there is no significant difference between the two groups except in the academic hope factor.

Plain Language Summary

Academic performance in university is an important factor that can predict students' future success, such as occupational success and mental health. Different factors can affect academic achievement, the most important of these factors are hope, executive functions, and procrastination. The results show that students with high performance obtain better scores in executive functions, but there is no significant difference with the low-performance group in hope.

1. Introduction

Achievement in the academic environment has positive and permanent consequences for students, such as occupational success, a positive effect on their self-efficacy, self-concept, and hope (Tomás, et al., 2020). Academic failure has severe consequences for society as well as universities, students, and families (Becirevic, Smojver-Azic & Martinac, 2017). Said (2013) defined the academic achievement of students as a whole concept that is demonstrated by the Grade Point Average (GPA) of students. The university GPA is one of the methods to evaluate academic performance. Also, "grade" indicates an individual's learning motivation and mental ability (Becirevic, et al., 2017; Said, 2013). In this study, GPA is a numerical score, ranging from "low=0.00" to "high=20". Students with low academic performance have a cumulative GPA below 12 out of 20. Students with high academic performance are those who display academic achievement and gain a cumulative GPA of 17 or higher out of 20.

As entry to higher education systems increases, recognizing the relevant factors to improve academic achievement has become essential (Winne & Nesbit, 2010). Policymakers, educators, and researchers continue to build empirical evidence in relation to the factors affecting students' academic performances. In introducing these factors, various variables have been identified, like high school GPA (Cyrenne & Chan, 2012). Academic achievement has also been associated with personality and intelligence (Becirevic, et al., 2017). Research on personality indicated a positive correlation between personality traits and academic achievement. Among the big 5 personality factors of extraversion, agreeableness, openness, conscientiousness, and neuroticism, conscientiousness predicts academic performance (Furnham, Zhang & Chamorro-Premuzic, 2005; Hendy & Biderman, 2019). Research on the impact of academic performance on excessive engagement in social media has been increasing. In a recent study, Feng et al. (2019) examined the relationship between Internet usage and Facebook and academic distraction. The results showed that using the Internet or Facebook for entertainment distracts students from academic tasks and negatively affects their academic performance.

According to recent studies, the factors associated with academic performance include cognition (Zhao, Wang & Rozelle, 2019), romantic involvement (Li, Huang & Shen, 2019), economic and social status (O'Connell, 2019), leisure time (Gonzalez-Sicilia, Brière & Pagani, 2019), academic self-concept (Van der Aar, Van der Cruijsen & Crone, 2019), and the environment (Li, Chiang, et al., 2019). Research on factors affecting academic achievement focus on areas such as personality traits (Hendy & Biderman, 2019), learning strategies (Muwonge, et al., 2019), Internet addiction (Odaci, 2011), and academic procrastination (Kim, Fernandez & Terrier, 2017). Snyder et al. conceptualized hope as being derived from positive psychology (Valle, Huebner & Suldo, 2006; Tomás, et al., 2020). Hope is defined as the possibility to gain particular favorite goals, motivate persons to track them, and determine how to achieve them (Snyder, et al., 2002). Individuals with a high level of hope manifest more positive thoughts; they gain their goals more than those with a low level of hope. People with a high level of hope are more likely to overcome obstacles to success (Gal-

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lagher, Marques & Lopez, 2017). Contrary to common beliefs, ability and intelligence are not the only indicators of school achievement (Snyder, et al., 2002). Some studies show that hope is positively related to academic achievement (Snyder, et al., 2002; Day, et al., 2010; Buckelew, et al., 2008; Gallagher, et al., 2017; Tomás, et al., 2020).

Regarding what students worldwide are currently experiencing, the COVID-19 pandemic has changed the living conditions of many people. This pandemic has had the most significant impact on the education system in history, with almost 1.6 billion learners across 190 countries worldwide (De Giusti, 2020). Successive lockdowns have catapulted schools from face-to-face delivery to online platforms (Sá & Serpa, 2020). Sá and Serpa (2020) emphasize improving the supportable digital development in higher education, which includes serious challenges that higher education institutions must overcome and face if they want to be at the forefront of achievement in the international education market. In this situation, students experience different conditions due to changes in teaching methods that are held virtually. In these difficult circumstances, hope can be crucial in many aspects of their lives (Lazarus, 1999). Day, et at., (2010) found that hope played a much more vital role than students' intelligence, personality, and previous academic performance in predicting their academic achievement.

A fundamental relationship between executive functions and academic, cognitive, developmental, and behavioral consequences exists in the literature. Executive functions also relate to health, literacy, wealth, achievement, and criminality (Ahmed, et al., 2019). Executive functions are high-level and self-regulated cognitive processes that help manage and control thoughts and actions (Lin, et al., 2014). These functions include emotion regulation (or monitoring of emotional responses), impulse control (or inhibition), problem-solving skills, planning, organization, progress monitoring, and set-shifting (Bailey, et al., 2018). Evidence shows a significant positive relationship between executive functions and academic achievement (Said, 2013). Van der Sluis, de Jong, and van der Leij (2007) found that working memory, as a component of executive function, is a good predictor of success in reading, writing, and mathematical skills. Bull and Scerif (2001) found that mathematical ability is significantly associated with all components of executive functions, such as attention shifting, inhibition, and working memory. In a comparative study, successful learners had significantly better performance in all

components of executive functions, such as inhibition, orientation, working memory, initiation, self-control, emotional control, planning/organizing, material organizing, and monitoring, than the unsuccessful learners (Chang, 2008). Contrary to the above findings, the results of Bailey, et al., (2018) showed that academic achievement is not related to problems of executive performance or academic self-concept.

Procrastination is also prevalent among college students (Rabin, Fogel & Nutter-Upham, 2011). Assessments showed that 80% to 95% of students were involved with procrastination (Steel, 2007). Limone, Sinatra, Ceglie, and Monacis (2020) defined academic procrastination as a tendency to postpone academic tasks, and it refers to postponing assignments that must be done at a determined schedule and time (Steel, 2007). Procrastination occurs voluntarily and nonvoluntarily (to avoid exposure to negative emotions or for no particular reason) (Steel, 2007). Various factors related to academic procrastination are unreasonable expectations, parenting styles, classroom environment, and perfectionism (Malatincová, 2015). Academic procrastination has different effects on students, such as stress and depression, low competition, and dropping out of education (Deemer, et al., 2014). Drysdale and McBeath (2014) found no significant differences between cooperative and noncooperative students considering their hope, self-efficacy, and procrastination.

Given the multidimensionality and complexity of academic performance variables and inconsistent findings in the research evidence, the present study attempts to find differences between the two groups of high and low-performing students. The findings of this study could be helpful to university counseling centers in supporting students with academic failure. The purpose of this study was to compare hope, executive functions, and procrastination in high and low-performing students to use these results in the post-COVID-19 pandemic period.

2. Participants and Methods

The research was ex post facto. The statistical population consisted of all students with high academic performance (Grade Point Average [GAP]=17) and low academic performance (GPA=12) who had studied at the University of Bojnurd, Bojnurd City, Iran, in the 2019-2020 academic year. The grade point average is calculated based on a continuum from 0 to 20. Students with a GPA of 17 or higher are considered to have high performance, and students with a GPA

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of 12 or lower have low academic performance. The sample consisted of 85 students (43 students with low performance and 42 students with high performance) selected as the sample by the available sampling method. All interested and eligible students were invited to participate in this research. All students completed the consent form to participate in the study. The age range of the low level (first group) was between 19 and 27 years, and their mean age was 21 years. The age range of the high level (second group) was between 19 and 28 years, and their mean age was 21. Based on gender, 16 women and 27 men were in the first group, and 16 women and 26 men were in the second group. The GAP in the low-performance group ranged from 8 to 11.99 (M=10.65), and in the high-performance group, the GAP ranged from 17 to 19.80 (M=17.84). In both groups, the participants of the Faculty of Humanities ($M_{low\ level\ group}$=17, $M_{high\ level\ group}$=19) and the Faculty of Engineering ($M_{low\ level\ Group}$=23, $M_{high\ level\ group}$=18) had the highest numbers. The educational degree of both groups was a bachelor's degree.

A psychologist collected data for this study at the University Counseling Center. The behavior rating inventory of executive function for adults (Roth & Gioia, & Isquith, 2005), the procrastination assessment scale for students (Solomon & Rothblum, 1984), and the domain-specific hope scale (Sympson, 1999) were used for collecting data.

Study measures

Behavior rating inventory of executive function for adults is a scale developed by Roth et al., (2005) to measure daily executive dysfunction. The executive function scale has 75 items with 9 subscales: inhibition (with 8 questions), shift (with 6 questions), emotional control (with 10 questions), self-monitoring (with 6 questions) in the behavioral regulation index, and initiation (with 6 questions), working memory (with 10 questions), planning/organizing (with 6 questions), material organization (with 6 questions), and task monitoring (with 8 questions) in the metacognition index. The questions are scored on a 3-point Likert scale: "never=1", "sometimes=2", and "often=3". The validity and reliability were reported well (Roth et al., 2005). Regarding the reliability and validity of this scale, Mani et al. (2018) reported the Cronbach alpha of 0.70 for inhibition, shifting, 0.84 for emotional control, 0.70 for self-monitoring, 0.72 for initiation, 0.77 for working memory, 0.79 for planning/organizing, 0.65 for task monitoring, and 0.78 for the material organization.

Solomon and Rothblum (1984) developed the procrastination assessment scale for students. This scale has 27 items. It consists of 3 components: preparing for exams, preparing for assignments, and preparing for the final papers. Questions are scored on a 5-point Likert scale, from "never=1" to "ever=5". On this scale, items 2, 3, 5, 9, 13, 15, 16, 21, and 25 are reversely scored (Solomon & Rothblum, 1984). In Persian, the reliability of this test was obtained by calculating the Cronbach alpha (α=0.79). Previous studies reported the scale's validity at an acceptable level (Motie, Hedary & Sadeghi, 2013).

Sympson (1999) developed the domain-specific hope scale for adults to assess hope in adult populations in six domains: social (Questions 1-8), family (9-16), educational (17-24), romantic relationships (25-32), occupation (33-40), and leisure activities (41-48). The alpha coefficient was 0.93 for the whole test and was 0.86 to 0.93 for the subscales (Sympson, 1999). In the research of Ahmadi et al. (2011), first, the foreign sample of the scale was translated into Persian, then it was standardized on a thousand students aged 18 to 34 years. Several experts evaluated the content validity the scale and the reliability of the questionnaire was calculated as 0.94.

3. Results

Table 1 presents Mean±SD scores for executive functions, hope, and academic procrastination. We used multivariate analysis of variance to investigate the differences between the two groups in executive functions, hope, and academic procrastination.

Table 2 showed that by controlling the effect of descriptive variables (age, gender, the field of study, and native/non-native students) in the low and high academic groups, a significant difference between these two groups (F=3.22; P≤0.05) was observed. This means that a significant difference between the low and high academic groups exists at least in one of the studied variables. Furthermore, at a significant level of 5% of all subjects, multivariate analysis of covariance can be used.

According to Table 3, there is a significant difference between the two groups in the component of executive function, and its subscales (F=9.97, P<0.05). Low-level academic students scored significantly higher than high-level academic students, and the group variable explains 11% of the variance in executive function. Also, the two groups significantly differ between the component of academic procrastination and its sub-

Table 1. Descriptive indicators of variables of executive functions, hope, and academic procrastination

Variables		Mean±SD	
		Low	High
Executive functions	Total	57.42±10.67	51.83±10.01
	Emotion regulation	57.42±10.67	51.83±12.71
	Metacognition	75.11±13.95	65.19±12.71
Hope	Total	269.61±50.65	275.23±61.59
	Social arena	44.14±11.22	45.40±11.17
	Field of education	39.21±9.82	47.74±11.18
	Romantic relationships	41.34±11.67	42.81±11.88
	Family life	44.95±11.36	45.73±12.24
	Workplace	45.44±11.35	47.21±11.38
	Leisure	45.51±10.66	46.33±12.19
Academic procrastination	Total	88.88±16.01	79.02±13.42
	Exams	28.30±5.08	24.12±4.61
	Homework	34.65±7.20	31.54±6.22
	Article	25.93±5.79	23.36±5.34

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scales (F=9.44; P<0.05). In this way, the academic procrastination score of low-performing students is significantly higher than that of high-performing students. The group variable explains 10% of the variance of academic procrastination.

The results show no significant difference between the two groups in the component of hope and its subscales except for the subscale of hope in the field of education (F=1.43; P≥0.05). Therefore, the hope score of low-performing students is equal to that of the high-performing students. However, in the subscale of hope in education, a significant difference exists (F=13.99; P≤0.05). This means that the scores of hope in the high-level academic students are higher than the low-level academic students, and the group variable explains 14% of the variance of hope in education.

4. Discussion

This study aimed to compare hope, executive functions, and academic procrastination between students

Table 2. Results of MANCOVA to test the research hypothesis

Groups	Values	F	df	P	Eta Coefficient
Pillai's trace	0.35	3.22	12	0.001	0.35
Wilks' lambda	0.65	3.22	12	0.001	0.35
Hoteling's trace	0.54	3.22	12	0.001	0.35
Roy's largest root	0.54	3.22	12	0.001	0.35

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Table 3. The results of analyses of covariance in comparing the means of research variables between groups

Variables		Sum of Squares	df	F	P	Eta Coefficient
Executive functions	Total	5490.57	1	9.97	0.01	0.11
	Emotion regulation	662.81	1	6.18	0.01	0.07
	Metacognition	2093.29	1	11.74	0.01	0.13
Hope	Total	4549.79	1	1.43	0.23	0.02
	Social arena	34.01	1	0.27	0.60	0.01
	Field of education	1545.42	1	13.99	0.01	0.14
	Romantic relationships	45.33	1	13.99	0.57	0.01
	Family life	13.08	1	0.09	0.76	0.01
	Workplace	66.75	1	0.505	0.48	0.01
	Leisure	14.35	1	0.110	0.74	0.01
Procrastination	Total	2065	1	9.44	0.001	0.10
	Exams	372.82	1	15.78	0.01	0.16
	Homework	204.65	1	4.51	0.04	0.05
	Article	140.67	1	4.52	0.03	0.05

with a low and high level of performance as measured by self-report scales of executive functions, academic procrastination, and domain-specific hope.

The results indicated a significant difference between the students of the two groups in the executive functions and academic procrastination, so the scores of students with low-level performance were significantly higher in the executive functions and the components of academic procrastination.

Research shows that executive function is essential for academic achievement (Ahmed, et al., 2019; Bull & Scerif, 2001; Lee et al., 2012). Using meta-analysis, Cortés Pascual, et al., (2019) indicated that executive functions and the intelligence quotient have an equal position of predictive capacity about school performance and highlighted the significance of executive functions in the early years of education. The result of this research, in line with previous studies, indicates that cognitive flexibility significantly correlates with academic performance (Lee et al., 2012). Executive function skills are beneficial in a learning setting where students are permanently expected to pay attention, follow the rules, and focus on different cognitive

and behavioral tasks (Ahmed, et al., 2019). Applying these skills helps an individual to engage in a well-planned, flexible, and future-oriented behavior (Alvarez & Emory, 2006).

Executive functions are among the most critical cognitive functions that affect a person's success. If these cognitive functions are not executed well, executive dysfunction occurs. Executive dysfunction affects an individual's social, educational, occupational outcomes, quality of life, and independence (Cramm, et al., 2013). Executive functions consist of two subscales: self-regulation and metacognition. Findings also show that students with low performance differ significantly from another group in the two subscales of executive functions. Overall, the group factor predicts a significant percentage of the variance of these two subscales.

People with high metacognition are aware of how they are learning. If they do not achieve the desired results and academic success, they will seek to change their status and other related factors. They are eager to find something that improves their academic performance. The COVID-19 pandemic has changed the

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educational methods used in higher education institutions and affected the interaction between teachers and students. Accordingly, universities were forced to do their educational activities virtually. While in advanced societies, online learning is not new, in developing societies such as Iran, online learning is less common. It seems that students with high executive functions can easily adapt to this condition, but it is difficult for students with low executive functions.

The results of this study in the field of academic procrastination are consistent with the results of Goroshit and Hen (2019), Balkis, M., Duru and Bulus (2013), Goroshit, M (2018), Kim and Seo (2015) and Drysdale and McBeath, (2014). The study results by Goroshit and Hen (2019) indicated a negative effect of academic procrastination on GPA. Also, Goroshit (2018) demonstrated that procrastination was negatively correlated with final exam grades and with three online course participation measures. Academic procrastination is associated with perceived task difficulty in college students; it is such that task time increases with difficulty (Hebing, 2016). In a meta-analysis study, Kim and Seo (2015) showed a negative effect commonly connected to GPA, quiz scores, course grades, and assignment grades of students.

There are several possible explanations for academic procrastination that differ between high and low academic performances. Procrastinating students tend to postpone starting or completing academic tasks (Balkıs, 2011). The absence of motivation and interest are two main symptoms of academic procrastination; the participants are not interested in doing the academic tasks even if they are enjoyable and attractive (Ocak & Boyraz, 2016). Procrastination is conceptualized as a self-handicapping strategy. The behavioral delay permits people to confront self-esteem threats that result from poor performance (Deemer, et al., 2014).

The pandemic of COVID-19 has accelerated a move to online learning, which will have consequences for students' outcomes in the future. The use of an E-learning platform creates some obstacles to students' procedure of learning, such as reduction in motivation, postponing feedback, or delay assistance. In this situation, teachers are not present when students may need help to learn, so students feel isolated due to the lack of physical presence of classmates (Coman, et al., 2020). Regarding this situation, students will experience more problems experiencing challenges academically and dealing with problems in procrastination.

Results showed no significant difference in hope except in the academic domain between students with low and high academic performances. These results are inconsistent with those of Snyder, et al., (2002); Day, et al., (2010); Buckelew, er al., (2008); Gallagher, Marques and Lopez (2017); and Tomás, et al., (2020). Day et al. (2010) found that hope uniquely predicts academic achievement more than intelligence, personality, and previous academic achievement. Hope was the most robust predictor of academic achievement in college after controlling educational history (Gallagher, et al., 2017). Hope has mediated the correlation between academic achievement and socioeconomic status (Dixson, et al., 2018).

A considerable body of literature shows that socioeconomic factors are related to academic achievement (Li, Xu & Xia, 2020; Dixson, et al., 2018; Doerschuk et al., 2016). In the last three years, the socioeconomic status of Iranian people has significantly decreased. This situation has also affected the students' lives. It could be an explanation for these results. Hope in the educational domain differs between two groups of students; it can be considered that high-achieving students are somehow successful in their education, gaining more opportunities for work or deciding to immigrate to developed countries.

5. Conclusion

This study aimed to compare hope, executive functions, and procrastination in high and low-performing students to use these findings in the post-COVID-19 pandemic. Due to the COVID-19 pandemic conditions and online education issues, as well as the results of this study that indicate differences in executive functions and procrastination between students with high and low performances, the higher education system should consider the needs of students in different groups concerning virtual education. Students who are experiencing challenges with learning in higher education institutions must be identified and supported so that they can achieve their potential and develop strategies to support their learning.

In this research, the role of social, economic, and cultural factors has not been investigated, so investigating the role of social, economic, and cultural factors is suggested in future research. This study was implemented on a small sample, so caution should be taken in generalizing these results to other communities. Although much follow-up, some students were reluctant to collaborate and participate in this study. Also,

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executive functions, academic procrastination, and life expectancy in fresh-year students are recommended. Perhaps, at the end of the first academic year, students who may have an academic failure become more careful in avoiding further academic failure.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article. The participants were informed of the purpose of the research and its implementation stages. They were also assured about the confidentiality of their information and were free to leave the study whenever they wished, and if desired, the research results would be available to them. A written consent has been obtained from the subjects. Principles of the Helsinki Convention was also observed.

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