Factors Affecting the Executive Function in Undergraduate Students

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Abstract

This research aimed to 1) study the level of self-efficacy, self-awareness, social skills, and executive function of undergraduate students, 2) study the relationship among self-efficacy, self-awareness, social skills, and executive function of undergraduate students, and 3) investigate the effect of self-efficacy, self-awareness, and social skills on executive function in undergraduate students. The sample used in the study was 400 undergraduate students from Mahasarakham University in the academic year 2021, selected by multi-stage random sampling. The research instruments included four questionnaires including self-efficacy, self-awareness, social skills, and executive function questionnaire. The statistics used in the data analysis were percentage, mean (M), standard deviation (S.D.), and multiple regression analysis. The results revealed that 1) students' self-efficacy, self-awareness, social skills, and executive function, in general, were at a very high level. 2) There were statistically significant at the .01 level correlations between students' self-efficacy, self-awareness, social skills, and executive function. 3) Students' self-efficacy (SELE), self-awareness (SELA), and social skills (SOCS) affected executive function, with a prediction of 70.20%.

Keywords: executive function, self-efficacy, self-awareness, social skills

1. Introduction

1.1 Background

In the twenty-first century, education focused on developing the potential and character of learners to have learning skills required for living in a globalized society. Learning is the primary tool for expanding a person's knowledge base. Competence is also a process of societal prosperity on human resource development. The brain is directly related to the development of relevant and consistent learning skills. As a result, executive function such as working memory, inhibition ability, and emotional control must be strengthened (Haenjohn, 2019).

The executive function (EF) was caused by the functioning of the prefrontal cortex (PFC), which developed and worked with other brains' interconnected neural circuits (Huizinga et al., 2018; Haenjohn, Sirithadakunlaphat, & Supwirapakorn, 2018; Watanabe, 2021). It was divided into three dimensions: 1) metacognition (initiation, working memory, plan and organize, and materials organization), 2) behavior (inhibition and self-monitoring), and 3) emotion (shift and emotional control) (Cooper-Kahn & Dietzel, 2008; Saengsawang, Langka, Utairatanakit, & Semheng, 2016; Chutabhakdikul, Thanasetkorn, & Lertawasadatrakul, 2017; Pahirun, 2018; Ahrens, Lee, Zwibruck, Tumanan, & Larkin, 2019; Chankhachon, 2019). The prefrontal cortex (PFC), which was developed and worked in line with other parts of the brain through interconnected neural circuits, was responsible for executive function (Chutabhakdikul et al., 2017). This happened particularly during adolescence (Chularut, Aeamtussana, & Kambhu, 2019). As a result, adolescence is a critical phase for the development of the frontal brain since it is the age of transition (transitional period) when people change physically, cognitively, emotionally, and socially, also known as the transition from childhood to maturity.

In their studies, Pongsopha (2012) and Chularut et al. (2017) claimed that adolescence required autonomy, enjoyment, challenge, and sensitivity. They were impulsive, with poor emotional and behavioral control; as a result, if this area of the brain grows properly, they may be able to self-regulate, be sensible, and achieve in both academic and personal life. According to Chutabhakdikul et al. (2017), 36.5 percent of Thai teenagers had difficulty with executive function, which included demonstration, cognitive flexibility, working memory, and attention. Cognitive control was the most troublesome characteristic, accounting for 40.5 percent of the total. At

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the same time, behavioral and emotional regulation were each given a 25% score (Grafman, 2008; Said, 2013; Zahodne, Nowinski, Gershon, & Manly, 2015; Madjar, Chubarov, Zalsman, Weiser, & Shoval, 2019). All indicated that prefrontal brain talents influenced life goals, social learning, and self-awareness.

As a result, the focus of this research was on the effects of self-efficacy, self-awareness, and social skills on undergraduate students' executive function in three areas: cognition, behavior, and emotion, which affect material organization, self-monitoring, emotional control, and goal-directed persistence. The findings could be used to generate new knowledge and serve as a foundation for educational reform. Educators and other interested parties will benefit from planning, promotion, support, and aiding the development of students' executive function, perceptions, actions, and emotions.

1.2 Purpose of the Study

This study aimed to 1) investigate the level of self-efficacy, self-awareness, social skills, and executive function of undergraduate students at Mahasarakham University (MSU); 2) study the correlations of students' self-efficacy, self-awareness, social skills, and executive function; and 3) study the effect of self-efficacy, self-awareness, and social skills on executive function in undergraduate students at MSU.

1.3 Conceptual Framework

Executive function is a process that controls multiple brain functions regarding cognition, behavior, and emotion, which leads to problem-solving skills, planning, judgment, self-direction, and personality. Therefore, executive function is a required skill and essential for academic success as well as social and personal life. The factors affecting executive function used in this research referred to self-efficacy, self-awareness, and social skills. Said (2013) defined self-efficacy as it raised from the belief in the person's ability to organize and plan actions according to the guidelines to achieve the goals set. Rike et al. (2015) claimed that self-awareness affected the components of EF, such as initial planning, self-assessment, inhibition, and modification. At the same time, Christ et al. (2017) stated that social skills referred to the ability to communicate and interact properly in society. Social skills play a role in areas such as working memory, inhibitory control, and cognitive flexibility. These concepts, therefore, were developed into a theoretical framework for this research as illustrated below.
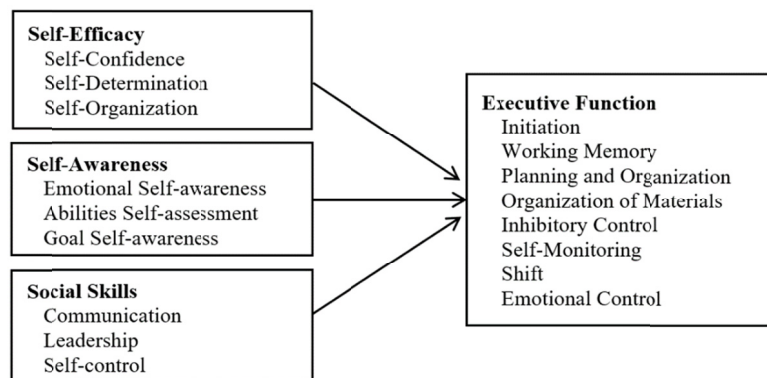

Figure 1. Conceptual framework

2. Methods

This quantitative research focused on studying factors affecting the executive function of undergraduate students at MSU.

2.1 Research Participants

The samples used in the research were 400 undergraduate students at MSU in the academic year 2021, selected by a multi-stage random sampling method. The sample size was calculated using the Krejcie and Morgan (1970) population formulas. All samples were classified into three groups, namely the Health Sciences faculty group, the Humanities and Social Sciences faculty group, and the Technology Sciences faculty group. To provide complete and comprehensive information according to the characteristics of the faculty groups, the samples were selected using a multi-stage random sampling technique to randomly select the number of faculties to be used as a sample group representing 20 percent. As a result, one faculty (Faculty of Public Health) from the Health

Sciences faculty group, two faculties (Faculty of Humanities and Social Sciences, and Faculty of Education) from the Humanities and Social Sciences faculty group, and two faculties (Faculty of Sciences, and Faculty of Informatics) from the Technology Sciences faculty group were selected.

2.2 Research Instrument

The instruments used in this research referred to four questionnaires as follows:

1) The self-efficacy questionnaire (18 items) It was a five-point Likert scale ranging from very high (5) to very low (1). Total scores can range from 18 to 90. The discrimination index was between .256− .866, and the Cronbach's alpha coefficient was .940.

2)The self-awareness questionnaire (18 items) It was a five-point Likert scale ranging from very high (5) to very low (1). Total scores can range from 18 to 90. The discrimination index was between .376− .787, and the Cronbach's alpha coefficient was .920.

3) The social skills questionnaire (18 items) This instrument was designed in a five-point Likert scale format ranging from very high (5) to very low (1). Total scores can range from 18 to 90. The discrimination index was between .250− .768, and the Cronbach's alpha coefficient was .878.

4) The executive functions questionnaire (61 items) This instrument was designed in a five-point Likert scale format ranging from very high (5) to very low (1). Total scores can range from 61 to 305. The discrimination index was between .249− .866, and the Cronbach's alpha coefficient was .967.

2.3 Data Analysis

The analyses were conducted using IBM SPSS Statistics version 26. The data was presented herein as a percentage (%), median (M), and standard deviation (S.D.). Pearson's Product Moment Correlation Coefficient was used to determine the relationship among the participants' characteristics, self-efficacy, self-awareness, social skills, and executive function. Multiple regression analysis was used to determine the predictive factors that affected the executive function of undergraduate students. P-values of less than.01 were considered statistically significant. All questionnaires were designed in a five-point Likert scale form and were clarified as follows: 4.21−5.00 indicates a very high level, 3.41−4.20 indicates a high level, 2.61−3.40 indicates a moderate level, 1.81−2.60 indicates a low level, 1.00−1.80 indicates a very low level.

2.4 Study Ethics

The present study was approval of Mahasarakham University Ethics Committee for Research Involving Human Subjects, issued on July 9, 2021 (Approval number: 218-159/2021). All information obtained from the participants was kept confidential.

3. Results

The results of this research were as follows:

3.1 Characteristics of the Participants

The participants of this research were 243 females (60.75%) and 157 males (39.25%). They were undergraduate students from the Humanities and Social Sciences faculty group (n = 247; 61.75%), Technology Sciences faculty group (n = 110; 27.50%), and Health Sciences faculty group (n = 43; 10.75%), respectively.

3.2 Analysis of the Level of Self-Efficacy, Self-Awareness, Social Skills, and Executive Function of Undergraduate Students at MSU

Table 1. Analysis of the level of self-efficacy, self-awareness, social skills, and executive function of undergraduate students at MSU

Factors Affecting	n = 400		
	M	S.D.	Meaning
1. Self-Efficacy (SELE)	4.36	0.33	Very high
2. Self-Awareness (SELA)	4.45	0.32	Very high
3. Social skills (SOCS)	4.27	0.51	Very high
4. Executive Function (EF)	4.36	0.37	Very high

Note. n = Number of samples; M = Mean; S.D. = Standard Deviation.

According to Table 1, the overall level of students' self-efficacy, self-awareness, social skills and executive function of undergraduate students at MSU was at a very high level. The results were presented as follows: self-awareness (SELA) (M = 4.45, S.D. = 0.32), executive functions (EFS) (M = 4.36, S.D. = 0.37), self-efficacy (SELE) (M = 4.36, S.D. = 0.33), and social skills (SOCS) (M = 4.27, S.D. = 0.51).

3.3 Analysis of the Correlations of Self-Efficacy, Self-Awareness, Social Skills and Executive Function in Undergraduate students at MSU

Table 2. Analysis of the correlations of self-efficacy, self-awareness, social skills and executive function in undergraduate students at MSU

Factors Affecting	SELE	SELA	SOCS	EF
Self-Efficacy (SELE)	1.000			
Self-Awareness (SELA)	.736**	1.000		
Social skills (SOCS)	.506**	.507**	1.000	
Executive Function (EF)	.651**	.645**	.771**	1.000

Note. ** *p*-value < .01.

According to Table 2, the correlations of students' self-efficacy, self-awareness, social skills, and executive function were significantly at the .01 level. The order of the correlations could be presented as 1) social skills (SOCS) (r_{xy} = .771), 2) self-efficacy (SELE) (r_{xy} = .651), and 3) self-awareness (SELA) (r_{xy} = .645), respectively.

3.4 Analysis of the Effect of Self-Efficacy, Self-Awareness, and Social Skills on Executive Functions in Undergraduate Students at MSU

Table 3. Analysis of the effect of self-efficacy, self-awareness, and social skills on executive function in undergraduate students at MSU

Model	Unstandardized Coefficients		Standardized Coefficients	t	*p*-value
	B	Std. Error	β		
Constant	.580	.146		3.959	.000
Self-Efficacy (SELE)	.249	.046	.223	5.359	.000
Self-Awareness (SELA)	.225	.047	.198	4.759	.000
Social skills (SOCS)	.398	.023	.557	17.062	.000
R = .838 R^2 = .702	R^2_{Adj} = .700	SE_{est} = .201	F_{Change} = 311.332	*p*-value = .000	

According to Table 3, all three independent variables were statistically significant (F_{Change} = 311.332; p-value = .000), accounting for approximately 70.20% of the variance of the EF in undergraduate students at MSU (R = .838; adjusted R^2 = .700). The statistical results were presented as: social skills (SOCS) (B = .398, β = .557, t = 17.062, p-value = .000), self-efficacy (SELE) (B = .249, β = .223, t = 5.359, p-value = .000), and self-awareness (SELA) (B = .225, β = .198, t = 4.759, p-value = .000). The discriminant equation was shown as follows:

Discriminant equation in the form of raw scores

Y' = .580 + .225 (SELA) + .249 (SELE) + .398 (SOCS)

Discriminant equation in the form of standard scores

Z'_y = .557 Z_{SELA} + .223 Z_{SELE} + .198 Z_{SOCS}

4. Discussion

The results were discussed based on the previous research objectives as follows:

4.1 The Level of Self-Efficacy, Self-Awareness, Social Skills and Executive Function of Undergraduate Students

The table revealed that undergraduate students' self-efficacy, self-awareness, social skills, and executive function were all at a very high level. Mahasarakham University (MSU) offers a variety of activities to help students develop skills such as intelligence, systematic thinking, leadership, and self-responsibility. As a result, physical activities have a positive affect on executive function. This corresponds to one of Harvard University's Center on the Developing Child's (2015) theories, which argues that activities during adolescence can aid developing executive function. Self-regulation, working memory, inhibition, and shift are the most significant parts of strengthening executive function, and physical and dance activities can assist teenagers in enhancing this

skill. Similarly, Chaisuwan et al. (2017) investigated the effect of physical activity on adolescent executive function and found that encouraging teenagers to engage in physical activities such as exercise, sports, and dancing can help them accumulate their executive function and affect analytical thinking, reasoning, and learning as well.

4.2 The Correlations of Self-Efficacy, Self-Awareness, Social Skills and Executive Function in Undergraduate Students at MSU

This study revealed that the correlations between self-efficacy, self-awareness, and social skills toward executive function were statistically significant at the .01 level. It showed that students' executive function developed continuously throughout the adolescence period and developed effectively to a higher level of cognitive control. These skills are tools to support self-control, and changing environments. The role of the executive function is decisive in predicting students' self-efficacy, self-awareness, and social skills. The findings agreed with Said's (2013) study, which focused on predicting academic performance based on executive function, metacognition, study strategies, and self-efficacy, revealing that executive function was statistically correlated with self-efficacy at the .05 level. The findings were also consistent with Zahodne et al. (2015) that self-efficacy promoted the relationship between executive function and higher education, and it was found that higher education had a relationship with higher self-efficacy. Further, self-efficacy was related to executive function, which indicated that the relationship between self-efficacy and executive function was very effective for people with higher education. In addition, Madjar et al. (2019) discovered that executive function substantially connected with social skills. This was because social skills were linked to social interaction, social relationships, social participation, social communication, social cognition, social awareness, and social motivation (Mariasine, Pei, Poth, Henneveld, & Rasmussen, 2014; Jahja et al., 2016; Christ et al., 2017; Yingdamnoon, Phusuwan, Trakulsoontorn, Sarutipakorn, & Hongsawat, 2017). At the same time, Grafman (2008) stated that people with executive function abnormalities exhibited lower levels of self-awareness in his study. This study, however, was only conducted with students with good executive function, and it found a link between executive function and self-awareness, which influenced their abilities in a variety of fields.

4.3 The Effect of Self-Efficacy, Self-Awareness and Social Skills on Executive Function in Undergraduate Students at MSU

According to the findings, self-efficacy, self-awareness, and social skills significantly affected executive function at the .01 level. As self-efficacy, self-awareness, and social skills factors are significant to the role of executive function in skill development, students can organize and plan the implementation according to the guidelines to achieve the set goals with them. Similarly, in their study, Zahodne et al. (2015) claimed that self-efficacy influenced the executive function (β = .142; **p** < .01). It also aligned with the findings of Madjar et al. (2019), which examined social skills, executive function, and social participation, and discovered that social skills influenced executive function (β = .66; **p** <.01).

In addition, research by Haenjohn et al. (2019) found that gender differences in academic achievement, sleep, substance abuse, meditation, and mindfulness had a statistically significant effect on executive function at the .05 level. As a result, adolescents develop skills in inhibition, working memory, shift, and planning. Steward, Tan and Gonzales (2014) pointed out that adolescents with ADHD had statistically significant executive function at the .05 level due to the decrease in the prefrontal cortex of the brain that controlled concentration and behavior revealed that consequences of this disorder affected different aspects of the functioning and normal development of the individual with this disorder, besides suffering from various behavioral problems (Heydari & Farahani, 2016; Salami, Ashayeri, Estaki, Farzad and Entezar (2017).

5. Conclusion

This study pointed out that undergraduate students at Mahasarakham University had a very high level of self-efficacy, self-awareness, social skills, and executive function. There was a substantial correlation at the .01 level. Additionally, self-efficacy, self-awareness, and social skills affected executive function, with a prediction of 70.20%. The findings showed that three factors played significant roles in executive function in undergraduate students. Therefore, universities or neurological institutes should organize activities to enhance the development of students' executive function to empower their skills for living in society.

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