

Academic achievement, creativity, multiple intelligences, and motivation in Iranian medical students

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ABSTRACT: Exploring the relationship between academic achievement, creativity, multiple intelligences, and motivation among Iranian medical students can provide valuable insights into their educational experiences and inform the development of effective strategies to enhance learning outcomes. This study investigated the relationship among Iranian medical students through a correlational-descriptive design. Participants included all 200 BA-level students of Islamic Azad University, Iran. The Attitude/Motivation Test Battery (AMTB) in Persian, the Torrance Creative Thinking Test (TCTT) in Persian, and Gardner's Multiple Intelligences Questionnaire in Persian were used to collect data. The university archived their grade point averages (GPAs) to determine students' academic progress. The Kolmogorov-Smirnov Goodness-of-Fit Test, descriptive statistics, Pearson product-moment correlation tests, and independent samples *t*-tests were used to examine the acquired data. The data analysis revealed a significant correlation between Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success; creative learners outperformed non-creative learners in terms of academic achievement; extrinsic learners outperformed intrinsic learners in terms of academic achievement; the highest academic achievement was associated with the interpersonal intelligence profile, while the lowest academic achievement was associated with the intrinsic intelligence profile. The findings may provide insight to stakeholders in the field, such as curriculum planners, tutors, and policymakers, regarding the relationship between creativity, multiple intelligences, motivation, and academic achievement, as well as the importance of factoring this relationship into ELT program design.

KEYWORDS: creativity; motivation; intrinsic motivation; extrinsic motivation; academic achievement

1. Introduction

Learners' individual factors play an important role in learning English as a foreign language (EFL). Researchers investigated individual differences from different perspectives in teaching and learning (Fathi and Kassem, 2021; Alshuaybat, 2021; Karatas and Yalin, 2021; etc.). Some previous studies have investigated academic achievement in relation to other social, cognitive, and personal factors. Costa and

Fleith (2019) claimed that academic achievement is multi-determined, with influence from cognitive and socio-emotional variables. Intelligence was the most frequent variable, but self-regulation, satisfaction with the learning process, self-efficacy, and learning engagement had greater predictive power. Other studies intended to identify factors, which improve the academic achievement of students (Bolandifar and Noordin, 2013). While the importance of personality factors in EFL learning has been acknowledged, such factors have not been sufficiently taken into account in the Iranian education context. In other words, it seems that learner-related factors have become missing links in Iran's education system. Teacher-centeredness is common in Iranian English classes. The psychological and individual characteristics of learners are not much taken into account. Such notions as creativity and multiple intelligences are not considered important in language learning, and all learners are expected to be successful at more or less the same level.

More particularly, although some teachers acknowledge the role of motivation in English learning and academic achievement, the relationship between motivation and learners' GPA as an indicator of academic achievement has not been investigated in the Iranian context. Besides, such factors as multiple intelligences and creativity are the missing links in the context of Iran's educational system. One reason for this scarcity may be the low volume of research works on these factors. The other reason may be because these notions have been recently taken into account in the ELT field, or it may be due to the fact that these concepts are considered interdisciplinary rather than exclusively ELT-related notions.

The effect of multiple intelligence theory (MIT) on academic achievement was also examined in the context of a multi-complementary approach (McA), while the current study examined the relationship between academic achievement, creativity, multiple intelligences, and motivation among Iranian medical students. For meta-analytical analysis, Batdı (2017) chose sixty-three studies evaluating the impact of MIT were chosen. For data analysis, Comprehensive Meta-Analysis and MetaWin programs were used. A qualitative dimension was introduced in the first stage of the meta-analysis, which included a systematic review of the data's thematic aspects. In accordance with the case study design, the data were analyzed using the QSR-Nvivo-8.0 software. In the first stage of the study, meta-analytical and thematic findings showed that MIT has positive effects on academic achievement as compared to conventional methods in terms of teaching grade, subject area, teaching time, intelligence area, and general characteristics. Furthermore, it was discovered in the preliminary findings that few studies were performed at the high school level and in the field of English relevant to MIT; as a result, the experimental design dimension was applied to the study accordingly. The experimental and thematic findings of the second stage have revealed that MIT has a positive and important impact on academic achievement. When all study findings (pre- and post-complementary results) are combined, it is possible to conclude that MIT has a positive impact on academic achievement, despite certain drawbacks that can be overcome with the right steps. As a result, this result, which was derived from four separate data sources, has high validity and a wide range of applications (Batdı, 2017).

Besides, although there have been studies on personality characteristics, including creativity, and motivation (Gajda et al., 2017, Beghetto, 2016a; Sawyer, 2012; etc.), so far, little research has been done on the role these factors play in language classrooms. Therefore, this study seeks to explore the potential relationship between medical students' academic achievement and personality characteristics, including motivation, multiple intelligences, and creativity.

This study attempts to find out the relationship between Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success, the difference between creative and non-creative learners in their academic achievement, the difference between learners with intrinsic and those with

extrinsic motivation in terms of their academic achievement, the difference between learners with different intelligence profiles in their academic achievement and the variables that significantly account for the variation in learners' academic success.

The following null hypotheses will be examined. First, there is no significant relationship between Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success. Second, there is no significant difference between creative and non-creative learners in their academic achievement. Third, there is no significant difference between learners with intrinsic and those with extrinsic motivation in their academic achievement. Finally, there is no significant difference between learners with different intelligence profiles in their academic achievement.

2. Literature review

2.1. Theoretical background

This study is partially informed by Gardner's (1983) multiple intelligences (MI) theory. According to this theory, the human brain is pre-programmed to process several distinct forms of learning styles: Logical-Mathematical, Musical-Rhythmic, Interpersonal, Intrapersonal, Verbal-Linguistic, Bodily-Kinesthetic, and Naturalist. Logical-Mathematical intelligence involves using numbers, logic, and mathematical problems to find out life patterns (patterns of thought, vision, colors, and so on). Musical rhythmic intelligence involves learning through sounds in the environment. Interpersonal intelligence involves learning through person-to-person relations. Intrapersonal intelligence means the awareness of our inner feelings, thoughts, emotions, values, and so on. Verbal-Linguistic intelligence involves linguistic learning or learning through language (reading, writing, and speaking). Bodily-kinesthetic intelligence means learning through our physical movements and physical body. Naturalist intelligence involves learning through our encounters with the natural world (including our recognition, appreciation, and understanding of the natural world). Also, given that the present study is concerned with other variables such as motivation, creativity, and academic achievement, it can be said that the theoretical background of the study is also rooted in constructivism and humanism schools of thought.

2.2. Previous studies on academic achievement

Boonk et al. (2018) examined 75 studies conducted between 2003 and 2017. These studies investigated the relationship between parental engagement and student academic achievement. The findings show that individual parental participation variables correlate with academic achievement when categorized by age. The research then moves on to a more in-depth literature review to see which factors moderate or mediate the relationship between parental engagement and academic achievement. Finally, the progress made by studies over the last decade was identified, emphasizing the construct of parental involvement. Variables of parental engagement, which have some potential in terms of their associations with academic achievement, include (a) reading at home, (b) parents that hold high expectations/aspirations for their children's academic achievement and schooling, (c) communication between parents and children regarding school, and (d) parental encouragement and support for learning.

In another study on academic achievement, Lei et al. (2018) investigated student engagement and academic achievement. Most academics believe that student participation predicts academic success, but some argue that this is not the case. The controversy was concluded by presenting data from 69 different studies (196,473 participants) by using meta-analysis. First, only direct effects were investigated in all of the studies reviewed; however, other studies have shown that involvement indirectly influences students' academic performance through multiple variables. As a result, the indirect impact of academic emotions

on academic performance. Second, since this meta-analysis was focused on cross-sectional research, no causal associations can be inferred from the findings. Although the hypothesis proposes that students' participation affected their academic performance, the findings only support correlations between two variables.

Furthermore, Madigan and Curran (2020) examined whether burnout affects academic achievement. The term burnout was coined to describe the incremental fatigue, cynicism, and lack of commitment observed in those working in academic settings. The research is the first meta-analytic proof that burnout is linked to academic success. The results indicate that complete burnout, as well as all three burnout symptoms, are associated with lower academic achievement. As a result, those employed in educational settings must consider burnout as a major impediment to academic success.

2.3. Empirical studies on creativity

Gajda et al. (2017) reported a meta-analysis of 120 studies on the relationship between creativity and academic achievement in research conducted since the 1960s. Whether creativity and academic achievement are linked has been a subject of theoretical and empirical works in educational psychology for more than six decades. Before this research, the question of whether there is a connection between creativity and academic achievement could only be answered with an ambiguous "It depends.". Previous research has, on average, demonstrated a positive (albeit modest) relationship between creativity and academic achievement, which is substantially moderated by the types of measures used to evaluate creativity and academic achievement. We can now confidently answer based on the results of this meta-analysis. This, of course, does not imply that the issue has been resolved. Instead, the findings of this study provide researchers with a referral link that they can use for comparison and further analysis in future studies.

In terms of the connection between creativity and academic achievement, their findings showed that there was a small but important positive interaction in the studies they examined. Furthermore, their findings show that publishing bias has no effect on this relationship. These results support scholars' long-held claim that imagination and learning are intertwined processes (e.g., Beghetto, 2016a; Guilford, 1967; Piaget, 1962, 1981; etc.). However, the small significance of this interaction raises concerns about why the observed correlation was so poor. Indeed, this correlation barely accounts for 5% of the variation between innovation and academic performance. With so much unaccounted-for variation, it is crucial to think about what could be driving this partnership. The findings of their moderator review shed some light on the situation. They presented the findings of their moderator review in the parts that followed and ended with a concise discussion of the benefits, shortcomings, and potential directions for this line of study (Gajda et al., 2017).

2.4. Empirical studies on motivation

Fahim and Hajimaghsood (2014) examined the relationship between motivation and critical thinking among male and female EFL learners. The instruments of the study were motivation and critical thinking questionnaires. Data analysis was done by correlation test. Results of data analysis showed a significant and positive relationship between EFL learners' motivation and critical thinking. This finding also confirms that motivation is an individual factor and does not work the same for all learners. Given that critical thinking has been considered as a higher cognitive activity; this relationship shows that motivation is also correlated with higher cognitive strategies (Hajimaghsoodi and Fahim, 2014).

2.5. Previous studies on multiple intelligence

In a study by Roohani and Rabiei (2013), The researchers found that multiple intelligences can predict language strategies use, but not English language proficiency and gender. This suggests that not all students will reach the same level of English language proficiency due to their different intelligences. Moheb and Bagheri (2013) the researchers found a significant correlation between logical, existential, kinesthetic, verbal, and visual intelligence and writing strategies in Iranian EFL learners. Again, this lack of prediction power for multiple intelligences is consistent with the findings of Razmjoo's (2008) study, wherein multiple intelligences could not predict language proficiency. While Razmjoo (2008) did not find a significant relationship between multiple intelligences and language proficiency, the current study reported a significant correlation between the study variables. The difference in the findings of the two studies may be due to factors such as field of study, age, gender, and education level of the participants. In a study by Saleh Khalaf Ibnian and Hadban (2013), the implications and uses of the multiple intelligences (MI) theory in the ELT field were discussed. More particularly, the study dealt with the main characteristics of the multi-intelligence theory and how the multi-intelligence theory can be implemented in ELT. The results of the study justified the use of multiple intelligences in ELT by suggesting that English language teachers can motivate learners through the use of different types of intelligence.

Naseri and Ansari (2013) described that correlation and regression analysis revealed a significant correlation between linguistic intelligence and L2 writing achievements, with a significant prediction power. Writing is a productive skill. In another study by Saeidi et al. (2014), EFL learners' multiple intelligences have a positive relationship with reasoning-gap writing performance. Zarei and Afshar (2014) explored whether multiple intelligences could predict EFL students' reading comprehension and vocabulary knowledge. The result of the data analysis demonstrated that musical, interpersonal, kinesthetic, and logical intelligences acted as significant predictors of reading comprehension. Furthermore, musical, verbal, visual, kinesthetic, and natural intelligence could significantly predict students' vocabulary knowledge. The predicting power of different types of intelligence in reading comprehension and vocabulary knowledge may be due to the fact that different cognitive and meta-cognitive strategies are at play in the learning of different English language skills (Karizak and Khojasteh, 2016).

Esmacili et al. (2014) found no significant relationship between multiple intelligences and writing ability, but male students were stronger in intrapersonal intelligence. This may be due to differences in English proficiency or other factors. Moafian and Ebrahimi (2015) found a significant correlation between multiple intelligences and language learning efficacy expectations in university students, with linguistic and intrapersonal intelligence best-predicting learners' efficacy beliefs. Self-efficacy was also correlated with these intelligences. To explore EFL learners' multiple intelligences and to identify different types of intelligence among EFL learners, Tawalbeh (2016) carried out a study. Participants possessed lower levels of musical and naturalistic intelligence than other types, suggesting that results should be interpreted carefully. Fayazi-Nasab and Ghafournia (2016) found a significant correlation between verbal-linguistic intelligence and motivational strategies, with a statistically significant impact on EFL learning. However, the sample may not represent the target population. Madkour and Mohamed (2016), in a quasi-experimental study, examined the effect of multiple intelligences on English language learning and motivation. The results demonstrated a statistically significant effect of multiple intelligences on participants' English language proficiency. In addition, multiple intelligences impacted learners' motivation significantly. To the best knowledge of the researcher, no study has investigated the

effect of multiple intelligences on motivation, and this study filled the gap. Furthermore, while studies mostly examined the relationship between multiple intelligences and language learning, this study investigated the effect of multiple intelligences on language proficiency. In this regard, the findings of Madkour and Mohamed (2016) confirmed those of Fayazi-Nasab and Ghafournia (2016).

Davoudi and Chavosh (2016) found a significant relationship between multiple intelligence scores and listening self-efficacy, with interpersonal intelligence being the best predictor of listening self-efficacy scores. The relationship may be due to the mediating role of general self-efficacy, which proved to be correlated with multiple intelligences in the study by Moafian and Ebrahimi (2015). Sistani and Hashemian (2016) found a significant relationship between multiple intelligences and Iranian EFL learners' vocabulary learning strategies. Intrapersonal, interpersonal, linguistic, and visual intelligence best predicted learners' vocabulary learning strategies. However, age and gender were not examined, and the relationship may be under the indirect impact of variables associated with learning strategies.

3. Methodology and methods

3.1. Research design

Because this study explored the relationships between academic achievement and personality characteristics of motivation, creativity, and multiple intelligences, a descriptive correlational design was selected.

3.2. Participants

The statistical population included all 200 BA-level students at Lar University of Medical Sciences, Iran. They were selected based on convenience sampling. The mean age of the participants was 18–23 years. Therefore, all 200 students were involved as participants to have the maximum statistical power as it is recommended to use the whole population instead of the sample population when possible. In this case, there is no uncertainty about the population proportion (Creswell, 2014). Furthermore, the participants' mother tongue was Persian.

3.3. Instruments

To gather the data, the following four tools were used. The first instrument was the Persian version of the Attitude/Motivation Test Battery (AMTB) adopted from Gardner (2004). It is a standardized questionnaire that was widely used. As a 6-point Likert scale items questionnaire, it has 44 items rated as completely agree = 6 to completely disagree = 1. This instrument was used to measure learners' motivation for learning English. The reliability of AMTB was reported as 0.79. For this study, the researcher checked the validity of the questionnaire through expert judgment. In addition, three experts were asked to check the content and face validity of the instrument. Besides, Cronbach's Alpha reliability was calculated as 0.81 through a pilot study with 30 students from the statistical population.

The second instrument was the Persian version of the Torrance Creative Thinking Test (TCTT), which was used to evaluate four aspects of creative thinking: fluency (the number of ideas produced), flexibility (the different categories of ideas produced), elaboration (embellishment and development of an idea), and originality (the unusualness or the infrequency of an idea). It was a 60-item multiple choice questionnaire in which the respondents should select from among three available options. The TCTT was developed by Torrance in 1966, and it has been re-normed four times: 1974, 1984, 1990, and 1998. The latest version was adopted for this study due to its highest standards and wide use by academicians. The reliability of the questionnaire was calculated as 0.89. In a pilot study with 30 students from the

statistical population but not included in the study sample, Cronbach's Alpha reliability of the questionnaire was obtained as 0.75. Its validity was confirmed by an expert judgment by checking the instrument's face and content validity.

The third instrument was the Persian version of Gardner's (1983) Multiple Intelligences Questionnaire comprising 5-point Likert Scale items rating from exactly like me = 5 to never like me = 1. This questionnaire was selected as it was standardized and used worldwide by researchers. The reliability of the questionnaire was reported as 0.82. Using similar procedures to the two previous questionnaires, the Cronbach's Alpha reliability of the questionnaire was calculated as 0.79 and 0.71, 0.78, 0.83, 0.87, 0.77, 0.88, 0.81 for Logical-Mathematical, Musical-Rhythmic, Interpersonal, Intrapersonal, Verbal-Linguistic, Bodily-Kinesthetic, and Naturalist as sub-scales of multiple intelligences, respectively. The validity was checked through expert judgment by checking face and content validity and confirmatory factor analysis.

3.4. Data collection procedures

The research outlined in this article has been approved by the faculty at Azad Islamic University, Iran. Also, the study outlined in this article underwent a thorough review by the Research Ethical Committee of Azad Islamic University to ensure compliance with ethical guidelines and safeguard the rights and welfare of participants. The data for this study were collected in the first semester of 2016–2017. To collect the required data, brief instruction was given to the participants on the purpose of the study and how to fill out the questionnaires. Also, at the outset of the study, they were informed that participation in this study is voluntary. In addition, the students were ensured that their identity remains anonymous. Then, they were asked to fill out the questionnaires. For convenience issues, the questionnaires were completed in three separate days within ten days. The Attitude/Motivation Test Battery (AMTB) (Gardner, 2004) was distributed among the participants in the first session. The second session was devoted to the Torrance Creative Thinking Test (TCTT). Gardner's (1983) Multiple Intelligences Questionnaire was administered in session three. Each session took about 35 minutes. As mentioned in the previous section, Persian versions of the questionnaires were used to avoid any misunderstanding. Furthermore, the students were allowed to ask questions when filling out the scales.

Their grade point average (GPA) was used to measure students' academic achievement. GPA, calculated as the students' mean score of courses they passed in the first semester of 2016–2017, was taken from the university archive. In the end, four data sets, i.e., students' GPA, scores from AMTB, TCTT, and Multiple Intelligences Questionnaire, were obtained.

3.5. Data analysis

Data analysis of the study was done at descriptive and inferential levels using SPSS. More specifically, descriptive statistics were run for data collected using the questionnaires. Besides, the Kolmogorov-Smirnov Goodness-of-Fit Test was employed to test the normality of questionnaire data. Pearson Product Moment Correlation was used to answer research question one, which deals with the relationship among Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success. Questions two (the difference between creative and non-creative learners in their academic achievement) and three (the difference between learners with intrinsic and extrinsic motivation in terms of their academic achievement) were analyzed through independent samples *t*-test. The fourth research question (the difference between learners with different intelligence profiles in academic achievement) was analyzed through ANOVA. Finally, the fifth research question (the variables that significantly

account for the variation in learners' academic success) was answered through multiple regression analysis.

4. Findings/results

In this part, the results of statistical procedures conducted for the purpose of this study are presented. More specifically, the results of the Kolmogorov-Smirnov Goodness-of-Fit test, Pearson Product Moment Correlation test, independent-samples *t*-tests, one-way ANOVA, and multiple regressions are provided in this section.

First, the author conducted a Normality test to determine if the scores were normally distributed or not. This test enabled the author to decide to choose between parametric or non-parametric tests.

Table 1. Results of Kolmogorov-Smirnov test.

		Creativity	Motivation	Intelligence
N		150	150	150
Normal parameters ^{a,b}	Mean	2.063	3.723	3.947
	Std. deviation	0.106	0.135	0.136
Most extreme differences	Absolute	0.067	0.096	0.061
	Positive	0.056	0.059	0.035
	Negative	-0.067	-0.096	-0.061
Kolmogorov-Smirnov Z		0.824	1.182	0.744
Asymp. Sig. (2-tailed)		0.506	0.123	0.637

As seen in **Table 1**, the obtained significance levels are higher than the study significance level (0.05). Thus, it can be said that the data are normal at a 95% confidence level. Therefore, parametric tests should be used for the present study.

Research question one (Is there any significant relationship between Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success?).

To investigate the relationship between Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success, the Pearson Product Moment Correlation test was run. It showed a significant positive relationship between Iranian EFL learners' creativity ($r = 0.71, p < 0.05$), motivation ($r = 0.65, p < 0.05$), and multiple intelligences ($r = 0.68, p < 0.05$) and their academic success. This finding means that higher creativity, motivation, and multiple intelligences are associated with higher academic success among the participants.

Research question two (Is there any significant difference between creative and non-creative learners in their academic achievement?).

To see whether there is any significant difference between creative and non-creative learners in terms of their academic achievement, descriptive statistics and an independent-sample *t*-test were run, which produced the following results:

Table 2 shows that the mean and SD of the non-creative group are 13.74 and 0.99, respectively. Furthermore, the mean and SD of the creative group are 15.61 and 1.02, respectively. This shows that the creative group outperformed the non-creative group. To ensure that the difference between the mean scores of the two groups is statistically significant, an independent sample *t*-test was run. The observed

difference is significant ($t = 283.10, p < 0.05$). Therefore, it can be concluded that the creative learners outperformed non-creative learners in their academic achievement. Thus, the null hypothesis, ‘there is no significant difference between creative and non-creative learners in their academic achievement,’ is rejected.

Table 2. Descriptive statistics for creative and non-creative learners in terms of their academic achievement and independent samples *t*-test for the difference between creative and non-creative learners.

Academic achievement	<i>N</i>	Mean	SD	df	<i>T</i>	Sig.
Creative	75	15.61	1.02	1	238.10	0.000
Non-creative	125	13.74	0.99	-	-	-

Research question three (Is there any significant difference between learners with intrinsic and extrinsic motivation in their academic achievement?).

To investigate whether learners with intrinsic and extrinsic motivation are significantly different in terms of their academic achievement, another descriptive statistics and independent samples *t*-test was run. The results are provided in the next tables:

Table 3. Descriptive statistics for intrinsic and extrinsic learners in terms of their academic achievement and independent samples *t*-test for the difference between learners with intrinsic and extrinsic motivation in terms of academic achievement.

Academic achievement	<i>N</i>	Mean	SD	df	<i>T</i>	Sig.
Intrinsic motivation	46	15.33	1.04	1	336.32	0.000
Extrinsic motivation	154	16.88	1.15	-	-	-

As indicated in **Table 3**, the mean and SD of the intrinsic group are 15.33 and 1.04, respectively. Besides, the mean and SD of the extrinsic group are 16.88 and 1.15, respectively. Obviously, the extrinsic group outperformed the intrinsic one. To ensure that this finding is statistically significant, an independent sample *t*-test was run. It can be seen in **Table 3** that learners with intrinsic and extrinsic motivation are significantly different in terms of their academic achievement ($t = 336.32, p < 0.05$). It is concluded that the extrinsic learners outperformed the intrinsic learners in terms of their academic achievement. This result convinces us to reject the null hypothesis ‘there is no significant difference between learners with intrinsic and extrinsic motivation in their academic achievement’.

Research Question Four (Is there any significant difference between learners with different intelligence profiles in terms of their academic achievement?)

To answer this research question, descriptive statistics and a one-way ANOVA were run to see if there is any significant difference between learners with different intelligence profiles in their academic achievement. The results of these tests are shown in **Tables 4** and **5**.

Table 4 shows the results of descriptive statistics for learners with different multiple intelligence profiles in terms of their academic achievement.

Table 4 shows the mean and SD of the groups with different multiple intelligence profiles. As depicted in the table, the highest mean is related to the group with interpersonal intelligence profile while the lowest mean belongs to the group with intrapersonal intelligence profile. To see if these differences between all groups are meaningful and significant, a one-way ANOVA was run.

Table 4. Descriptive statistics for learners with different multiple intelligence profiles in terms of their academic achievement.

Academic achievement	N	Minimum	Maximum	Mean	Std. deviation
Logical-mathematical	31	13	15.52	13.28	0.99
Musical-rhythmic	13	10	14	12.25	1.07
Interpersonal	45	12	15.91	16.80	0.95
Intrapersonal	38	10.33	14.97	12.39	1.01
Verbal-linguistic	41	11.75	16	14.05	1.11
Bodily-kinesthetic	24	13.41	16.75	15.01	0.89
Naturalist	8	10.15	16.11	13.65	1.20

Table 5. One-way ANOVA for the difference between learners with different intelligence profiles in terms of their academic achievement.

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected model	304.982 ^a	7	43.569	24.816	0.000
Intercept	4997.251	1	4997.251	2846.321	0.000
Multiple intelligence (MI)	21.374	6	10.687	6.087	0.007
Academic achievement (AA)	58.519	2	29.259	16.665	0.000
MI * AA	9.461	3	3.154	1.796	0.172
Error	47.404	27	1.756	-	-
Total	6785.250	35	-	-	-
Corrected total	352.386	34	-	-	-

As indicated in the above table, learners with different intelligence profiles are significantly different in terms of their academic achievement ($F = 6.087, p < 0.05$). According to this result, the null hypothesis ‘there is no significant difference between learners with different intelligence profiles in their academic achievement’ is rejected. It shows that intelligent profiles affect academic achievement, so they can be further investigated in prospective studies as an important factor affecting academic achievement.

Research question five (Can creativity, overall multiple intelligences, and motivation significantly account for the variation in learners’ academic success?).

Finally, to investigate whether creativity, overall multiple intelligences, and motivation can significantly account for the variation in learners’ academic success, regression analysis was run, and the following results were obtained:

Table 6. Results of regression analysis.

Academic achievement step	R	R2	F	B	Beta	T	Sig
Creativity	0.412	0.17	100	0.333	0.354	97.13	0.000
Creativity	0.489	0.333	7.49	-	-	-	-
Overall multiple intelligence	0.509	0.26	78.16	1.67	0.455	5.78	0.000
Creativity	0.97	0.354	0.333	-	-	-	-
Multiple intelligence	1.51	0.455	3.35	-	-	-	-
Motivation	0.561	0.32	61.59	1.02	0.453	3.94	0.000

Table 6 shows that in the first step, creativity with a regression coefficient of $B = 0.333$ is the best predictor and exerts the highest effect on the participants’ academic achievement. In the second step, multiple intelligence with regression coefficient $B = 0.489$ and through interaction with creativity, just

predicts 0.09 of academic achievement variance. In the third step, motivation, with regression coefficient $B = 1.02$ and through interaction with creativity and multiple intelligence, predicts 0.06 of academic achievement variance. Thus, it can be said that creativity was the best predictor of academic achievement, the second-best predictor was multiple intelligence, and the-third-best predictor was motivation. In other words, creativity could best account for the variance in learners' academic success, and motivation could at least account for the academic success variance of learners.

All in all, it was shown that all three variables, namely, creativity, multiple intelligences, and motivation, can significantly account for the variation in learners' academic success. Therefore, the null hypothesis, 'the above variables cannot significantly account for the variation in learners' academic success,' is rejected.

5. Discussion

It was found that Iranian EFL learners' creativity, multiple intelligences, motivation, and academic success were significantly correlated. This result implies that the higher the creativity, motivation, and multiple intelligences of the participants, the higher their level of academic success is. This significant correlation may partially be attributed to a higher level of meta-cognition which is closely related to creativity and motivation. This finding can also be justified by referring to Almajali (2005), who argued that creative thinking makes the examination of ideas and searching for different options possible and easier. Moreover, it helps learners become aware of their mind processing and evaluate the amount of their success in learning. Schacter et al. (2006), who studied the relationship between creativity and achievement in EFL learners, found a significant relationship between the study variables. Given that the procedures performed in the mentioned study were similar to those followed in the present study, it can support the findings of the present study. Similarly, Baghban Shemirani (2011) reported that creativity and language proficiency are significantly correlated. Although the instruments used in that study are different from those used in the current study, the variables are the same. This finding also aligns with the study of Anwar et al. (2012), which explored the significant relationship between creative thinking and academic achievements. Since the researchers have employed TTCT and students' GPAs, the study confirms the findings of the present study. Similarly, the same finding was reported by Ahmadi's (2011) study, which confirmed that motivation significantly affects learners' language learning. However, the main difference between the two studies was the incorporation of gender variables in the data analysis procedure by Ahmadi (2011).

Besides, a significant difference between creative and non-creative learners in their academic achievement shows a significant effect of creativity on the learners' academic achievement. As a justification for this finding, Starko (2017) argued that creative thinking makes everything better, more valuable, and more meaningful. Also, we can refer to Almajali's (2005) contemplation that creative thinking helps learners become aware of their mind processing and evaluate the amount of their success in learning.

In addition, a significant difference was found between learners with intrinsic and extrinsic motivation in terms of their academic achievement. The relationship between motivation and language proficiency is not new and has been repeatedly proved. A higher motivation means a higher engagement in the process of learning, and this, in turn, leads to better learning. The same finding was reached in the study by Ogundokun and Adeyemo (2010) wherein the relationship between learners' motivation and academic achievement was investigated, and a significant relationship was found between the two variables. Similar to the present study, the researchers used GPA as an indicator of academic achievement.

Furthermore, the current study found a significant difference among learners with different intelligence profiles in terms of their academic achievement. This finding is consistent with Tekiner's (2005) study in which the relationship between multiple intelligences and EFL proficiency was examined and it was found that they are correlated in a significant way. However, Tekiner (2005) did not employ GPA as the indicator of academic achievement. This finding was not unexpected because it is known that learners make meaning in their own ways and learn in their individual ways (Tomlinson, 2001; Kirby and McDonald, 2009).

Last but not least, it was found that creativity, multiple intelligences, and motivation all could significantly account for the variation in learners' academic success. This result is similar to the conclusion made by Roohani and Rabiei (2013), who reported that there is a significantly positive correlation between multiple intelligences and English language proficiency and that multiple intelligences could predict English language proficiency.

Recommendations

As the first implication, the findings may give insights to stakeholders in the field, including curriculum planners, tutors, and policymakers, about the interrelationship between creativity, multiple intelligences, motivation, and academic achievement, and the need for taking this issue into account when planning ELT programs. For example, learning and teaching activities should take into account the individual differences among learners with different intelligences. The other implication is that English language teachers should identify the dominant intelligence of their students and take possible measures to improve their creativity and motivation level as a way to enhance their potential for English language learning. In addition, EFL learners should know about their own intelligence, creativity, and motivation levels if they want to be successful language learners. Moreover, the findings of this study make English language teaching stakeholders aware of the fact that academic achievement does not occur in a vacuum and is under the influence of many individual and personal characteristics that should be taken into account for successful language learning.

6. Conclusion

While the importance of personality factors in EFL learning has been proved, they are not much taken into account in the Iranian education context. In other words, learner-related factors are not much emphasized in Iran's education system. In addition, among the numerous studies on personality characteristics, including creativity, motivation, etc., no study was found on the role of personality characteristics in language classrooms. Therefore, this study explored the potential relationship between medical sciences students' academic achievement and the personality characteristics of motivation, multiple intelligences, and creativity.

The results of this study show that there is a significant correlation between creativity, motivation, multiple intelligences, and academic achievement in Iranian EFL learners. This conclusion has a high value and useful implications for ELT stakeholders in Iran's educational system, in which teacher-centered approaches are commonly used. It is hoped that the obtained results will lead to promising signs of improvement in the ELT status quo and convert into useful measures to increase the quality of ELT programs in the Iranian context. The prospective researchers are recommended to investigate other issues of the topic. For example, they may investigate the effect of intelligence and creativity on different language skills, age, gender, language proficiencies, and even different fields of study.

Author contributions

Conceptualization, RK and FF; methodology, RK; software, RK; validation, RK, DR and FF; formal analysis, FF; investigation, RK; resources, FF and DR; data curation, RK; writing—original draft preparation, RK; writing—review and editing, DR; visualization, RK; supervision, RK; project administration, FF and RK. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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