EMOTIONAL INTELLIGENCE AND ACADEMIC SUCCESS

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Abstract

Emotional intelligence (EI) is considered to be one of the factors predicting academic success in Doctor of Medicine (MD) programs. However, previous literature on the topic has shown contradictory findings. While some research suggests that there is a positive association between EI and academic success in MD programs, other research reports no such association, or even a negative correlation, between these two variables. The main objective of the current study was to resolve these contradictory findings by synthesizing the research between 2005 and 2022. Data were analyzed using the multilevel modeling approach to (a) estimate the overall relationship between EI and academic success in MD programs, and (b) determine whether the mean effect size varies by country (US vs. non-US counties), age, EI test, EI task nature (ability-based vs. trait-based), EIsubscales, and academic performance criteria (GPA vs. unit exams). Results from 20 studies (k = 105; N = 4,227) indicated that, overall, there is a positive correlation between EI and academic success, $r = 0.13$, 95% CI [0.08–0.27], $p < .01$. Moderator analyses indicated that the mean effect size significantly varied by EI tests and EI subscales. Moreover, three-level multiple regression analyses showed that Level 3 (between-studies) variance explained 29.5% of variability in the mean effect size, while Level 2 (within -studies) variance explained 33.5% of variability in the mean effect. Overall, the current findings show that EI is significantly, butweakly, related to academic success in MD programs.

Abstract

Emotional intelligence (EI) is considered to be one of the factors predicting academic success in Doctor of Medicine (MD) programs. However, previous literature on the topic has shown contradictory findings. While some research suggests that there is a positive association between EI and academic success in MD programs, other research reports no such association, or even a negative correlation, between these two variables. The main objective of the current study was to resolve these contradictory findings by synthesizing the research between 2005 and 2022. Data were analyzed using the multilevel modeling approach to (a) estimate the overall relationship between EI and academic success in MD programs, and (b) determine whether the mean effect size varies by country (US vs. non-US counties), age, EI test, EI task nature (ability-based vs. trait-based), EI subscales, and academic performance criteria (GPA vs. unit exams). Results from 20 studies (k = 105; N = 4,227) indicated that, overall, there is a positive correlation between EI and academic success, $r = 0.13$, 95% CI [0.08–0.27], $p < .01$. Moderator analyses indicated that the mean effect size significantly varied by EI tests and EI subscales. Moreover, three-level multiple regression analyses showed that Level 3 (between-studies) variance explained 29.5% of variability in the mean effect size, while Level 2 (within - studies) variance explained 33.5% of variability in the mean effect. Overall, the current findings show that EI is significantly, but weakly, related to academic success in MD programs.*Keywords*: emotional intelligence, undergraduate medical students, academic success, meta- analysis

Emotional Intelligence Weakly Predicts Academic Success in Medical Programs: A

Multilevel Meta-Analysis Which factors predict academic success in undergraduate medical programs? While some students perform well in the Doctor of Medicine (MD) programs, others fail to complete their study or struggle in their MD journey. Moreover, the current competencies and expectations of undergraduate medical students are different from those in the last 20 or 30 years (Vanderbilt, Perkins, Muscaro, Papadimos, & Baugh, 2017), which highlights the significance of revising the admission criteria for such programs (Fielding et al., 2018). It is not surprising that a large amount of research, especially in medical education, has been conducted to examine which admission criteria contribute to the academic success of MD students. In the last two decades, researchers have tried to test the association between a number of factors such as metacognition awareness (Akbarilakeh & Sharifi¬Fard, 2021; Ullah et al., 2020), motivation (Altwijri et al., 2021; Wu et al., 2020; Yun et al., 2021), coping strategies (Mahmood et al., 2021; Banerjee et al., 2019), learning style (Amin et al., 2021; Hernández-Torrano et al., 2017), educational environment (Javaeed et al., 2022), critical thinking (Chang et al., 2021; Shakurnia et al., 2021), and emotional intelligence (EI; Humphrey-Murto et al., 2014; Libbrecht et al., 2014; Singh et al., 2020); the latter is the variable of interest in the current study. Although the notion of EI was first discussed by Edward Thorndike in the 1920s when he conceptualized that intelligence is a multidimensional rather than a unidimensional construct, and includes mechanical, abstract, and *social intelligence*, it was Salovey and Mayer's (1990) seminal work that contributed to the systematic and scientific study of EI. Since then, a number of theories and models of EI have been introduced such as Bar-On model (Bar-On, 2006) and Goleman's model (Goleman, 2006). EI has been extensively researched in different areas of study including sports, education, music, and medicine (Abdulla Alabbasi et al., 2021; Arribas- Galarraga et al., 2020; Austin et al., 2005; Kaschub, 2002). EI is gaining importance in medicine since success in this field is not just determined by knowledge and academic excellence but the acquisition of EI-related skills such as empathy, communication, interpersonal sensitivity, and emotion recognition (Libbrecht et al., 2014). Doctors manage different kinds of patients with varying socioeconomic statuses and different cases that range from mild to critical, which require doctors to understand their patients' emotions, show empathy and, sometimes, communicate bad news in professional ways. Interest in studying the association between EI and academic success in MD programs began in the first decade of the 21stcentury. Notably, a literature review on the predictors of academic success in medical schools show that EI is one of the most studied variables, with three systematic reviews conducted on this topic (Arora et al., 2010; Cook et al., 2016; Singh et al., 2020). One of the major findings of these systematic reviews was that primary studies reported contradictory findings. For instance, Singh et al. (2020) reported that 8 studies concluded that EI has a positive impact on academic success, 2 studies showed nonsignificant association between EI and academic success, and 11 studies showing that there is a negative relationship between EI and academic success. The same conclusion was reached in the systematic reviews by Arora et al. (2010) and Cook's et al. (2016). Although systematic reviews offer valuable source information for researchers regarding the effectiveness of an intervention, the difference between two or more groups on a specific variable, and the association between different factors, the method does not provide quantitative and reliable results. Therefore, one of the current study's objectives is to synthesize the effect stemming from primary studies using a multilevel meta- analysis approach to clarify the nature and magnitude of the relationship between EI and academic success in MD programs. The second objective is to study factors that might contribute to the contradictory findings in the primary studies (see Table 1). The next section sheds light on possible sources of inconsistency in the primary research based on reviewing the literature on the association between EI and academic success. Insert Table 1 around here

Sources of inconsistency and the need for a quantitative synthesis

Previous meta-analyses on emotional intelligence provide some explanations for the inconsistent findings in the primary studies. These include culture or country, age, gender, EI tests, EI subscale, and EI task nature (ability-based assessments vs trait-based assessments; Abdulla Alabbasi et al., 2021; Ogurlu, 2021; Sánchez-Álvarezet al. 2020). These factors can be observed in the previous studies that assessed the association between EI and academic success in MD programs (see Table 1). For example, Brannick et al. (2013) reported that there was no significant correlation between the trait-based EI scale (Wong & Lu EI Scale) and academic performance, while the ability-based EI test (i.e., Mayer–Salovey–Caruso Emotional Intelligence Test; MSCEIT) was significantly correlated with academic performance. Moreover, some studies found a significant relationship between academic performance and some of the EI subscales (e.g., optimism, awareness of emotions, and attention to feelings) while no significant correlation was observed between academic performance and other EI subscales (e.g., Libbrecht et al., 2014; Naeem et al., 2014). This study deviates from previous literature in its definition of academic success. While some studies assessed academic success using students' GPA (e.g., Brannick et al., 2013; Fallahzadeh, 2011; Leddy et al., 2011), others used unit/achievement exams (e.g., Austin et al., 2005; Chew et al., 2013; Rajasingam et al., 2014). Therefore, the difference in academic performance criteria was included as a possible moderator that could explain the variability in the mean effect. Cultures also show variances in emotional intelligence (Lim, 2016). In the current study, the included works represented 10 different countries in three different continents (North America, Europe, Asia, and Australia; see Table 1). Finally, some studies showed that there is a link between EI and age (Chen et al., 2016; Sliter et al., 2013). All of the above factors were considered in the current study to possibly explain the variability in the mean effect size.

Research Questions

Based on the above literature review, this study aims to answer the following research questions:

What is the nature and magnitude of the relationship between EI and academic success in undergraduate medical programs?

Do the moderators of age, EI test, EI subscale, and country explain the variability in reported results in previous studies on the relationship between EI and academic success in undergraduate medical programs?

Method

Study Selection and Inclusion Criteria Potential works were located through searching the following databases:*ScienceDirect*, *ProQuest Central*, *ProQuest Digital Dissertation*, *Academic Search Complete*, *ERIC*,*Access Medicine*, *Medline*, and *PsycINFO*. The following keywords were searched in the titles and abstracts: emotional intelligence AND (medical students OR medical school) AND (academic success OR performance OR GPA). Moreover, the authors reviewed the reference list of the two systematic reviews conducted on the same topic (i.e., Cook et al., 2016; Singh et al., 2020). This search resulted in locating 180 works. After removing the duplicates, we obtained 123 items (113 journal articles, 7 reports, 1 magazine, 1 conference material, and 1 dissertation). Five criteria were applied on these 123 works: First, the articles were written English. Second, they reported sufficient statistics to calculate the effect size (Pearson r). Third, they examine the association between emotional intelligence as assessed by a number of well-known EI tests and scales *and* academic success/achievement defined in terms of GPA or achievement exam(s). Fourth, the search included both published and unpublished works; however, only one dissertation was found, which was excluded because it assessed the relationship between emotional intelligence and leadership (Reyes-Dominguez, 2008). Finally, we only included studies that were conducted with undergraduate medical students pursuing their MD. All studies that were conducted on graduate medical students or nursing students were excluded (e.g., Cheshire et al., 2015; Doherty et al., 2013). Applying these criteria brought the number down to 20 studies published between January 2005 to December 2021 (see Figure 1). Insert Figure 1 around here

Data Coding and Reliability

A *coding book* was created, which included information about the study variables and the special code for each level of categorical variables (e.g., the EI test; see Table 2)[1]. The first and the second authors met twice to discuss the coding and clarify any issues before starting the independent coding in the *coding sheet*. In addition to coding the study moderators, each coder[1] Age was treated as a continuous variable independently retrieved the effect size (i.e., Pearson correlation) and the sample size associated with it. A column for notes was included for the coders to make any comments. The two-way interclass correlation coefficient was high (r = .93; McGraw & Wong, 1996). All cases with disagreement were individually revisited and resolved. Insert Table 2 around here

Effect Size Calculation and Statistical Analyses

All included studies reported the Pearson product-moment correlation coefficient (r). As the Pearson correlation is not normally distributed, each effect size was converted to Fisher's z using the following formulas (Borenstein & Hedges, 2019, pp. 220–221):z = 0.5 × 1n !!"#" (???????? 1) !$# The variance and the standard error of Fisher's z were calculated as follows:

vz = !

%$&

; SEz = [?]?, (????????? 2 ??? 3) Fisher's z is then converted back to the Pearson correlation using the following equation: (!"$! (!""! where ?) is the anti-log function. (???????? 4) As a majority of the studies reported more than one effect size (e.g., effect size per EI subscale or for each EI test), a three-level meta-analysis approach was adopted, where (a) Level 1 referred to sampling error, (b) Level 2 referred to between-studies variance, and (c) Level 3 referred to the across-studies variance. All multilevel analyses were conducted using SAS(r) Studio. The full codes for running analyses can be found in Van den Noortgate et al. (2015, p. 20). The full model can be presented as follows: ?*, = ?++ + ?+, + ?*, + ?*, (???????? 5) Where ?*, represents observed effect size, ?++ represents the overall mean effect size, ?+, represents Level 3 random effect, ?*, represents Level 2 random effect, and ?*, represents Level 1 random effect. The full model, when all moderators are included, can be presented as follows: ?*, = ?+, + ?!,?!*, + [?] + ?,,?,*, + ?*,, (???????? 6) Where ?+, and ?!, represent regression coefficients, and ?!*, and ?,*,represent moderators (Konstantopoulos, 2011).

Heterogeneity Analysis

There are several methods for estimating heterogeneity in meta-analyses including Q, I^2, and T^2 statistics. In the current study, both Q and I^2 statistics were computed. The Q-statistic follows a chi-squared distribution with degrees of freedom equal to the number of effect sizes/studies minus 1, and it is defined as "the sum of squared deviations of each observed effect from the mean effect on a standardized scale" (Borenstein, 2019, p. 457). The Q-statistic can be calculated using the following formula:

(???????? 7)

Where Wi is the study weight, Yi is the study effect size, M as the summary effect, and k is the number of effect sizes. I^2-statistic refers to the proportion of the observed variance, which can be estimated using the following formula (Borenstein et al., 2021):

(???????? 8)

Assessing Publication Bias

Three methods of assessing publication bias were used in this study: the funnel plot, the Egger's test, and the Begg and Mazumdar correlation test. The funnel plot is a visual representation, which is based on the fact that in the absence of publication bias, the mean effect size is expected to be the same in small and in large studies (Hunter & Schmidt, 2015). The Egger's test is a parametric test that assesses the funnel plot asymmetry, and is based on linear regression analysis. A significant t-test result indicates that publication bias may exist. Finally, the Begg and Mazumdar's test is a nonparametric correlation test, which assesses whether or not there is a relationship between the study size and effect size (Vevea et al., 2019).

Results

Figure (2) shows the funnel plot for precision. The Egger's regression test was not significant, b = -0.59, SE = 0.67, p = .18. In addition, the Begg and Mazumdar's correlation test was not significant, τ = -0.02, $\zeta\tau$ = 0.41, p = .34. These results show that publication bias did not affect the results. Insert Figure 2 around here The effect size values ranged between -0.21 to 0.51. To estimate the mean effect size, results from 20 studies (k = 105; N = 4,227) indicated that, overall, there is a significant positive correlation between EI and academic success, r = 0.13, 95% CI [0.08–0.27], $p < .01$. As expected, a high heterogeneity was observed, $Q(105)$ = 375.48, $p < .001$, I^2 = 72.04. Moderator analysis showed that the mean effect size significantly varied by EI test, $Q(3)$ = 42.93, $p < .001$, and EI subscale, $Q(3)$ = 18.87,p = .04, while EI task nature [$Q(1)$ = .71, p = .40], country [$Q(1)$ = 3.08, p = .08] and academic performance criterion [$Q(1)$ = .38, p = .54] did not significantly explain variability in the mean effect (see Table 3). Together, the EI test and EI subscale explained 34% of variability in the mean effect. Age was treated as a continuous variable, and the results showed that age did not significantly explain variability in the mean effect, b = 0.011, SE = 0.007, p = .17 (see Figure 2). Insert Table 3 and Figure 3 around here As Table (3) shows, the EQ-i test was highly correlated with academic success compared with other EI tests, and the perceiving emotions subscale was highly associated with academic performance compared with other EI subscales. Finally, the three-level multiple regression analyses showed that Level 3 (between-studies variance) explained 29.5% of variability in the mean effect, while Level 2 (within -studies variance) explained 33.5%. Together, Levels 2 and 3 explained 63% of variability in the mean effect.

Discussion

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Table 2.

*Description of the study moderators*Moderator Operational Definitions**Age** Mean age of participants; range 18.5–24.1 years.**Year of Publication** Ranged from 2005 to December 2021.**Country** The United States and Canada. Other (include all other countries).

Academic Performance Criterion

GPA Grade point average. Unit or final exams Achievement exams on a specific unit or module.

EI Test

EQ-i Emotional Intelligence Inventory. MSCEIT Mayer-Salovey-Caruso Emotional Intelligence Test. SSEIT Schutte Self-Report Emotional Intelligence Test. Other EI test All other EI tests.

EI Task Nature

Self-Report/Trait-Based A self-report EI assessment that is based on a mixed-model approach for assessing EI. Ability-Based Assessments that treat EI as a set of skills that combines cognition and emotions.

EI Subscale

Perceiving Emotions Refers to the ability to perceive, control, and evaluate emotions. Emotional Management Refers to the ability to be aware of and constructively handle both positive and challenging emotions. Understanding Emotions Refers to the ability to understand the nature, causes, and control/regulation of emotion. Facilitating Thinking Refers to the ability to use emotions to facilitate thinking. Other All other EI subscales such as self-expression, stress management, and self-perception. Total Score A composite EI score.

Non-Empirical (n = 18)	Insufficient Statistical Information (n = 14)	Did not study the relationship between EI and aca

Figure 2

Funnel plot of precision by Fisher's z

Figure 3

Regression of Fisher's z on age