

Emotional Intelligence, Math Anxiety and Math Performance in Malaysia

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ABSTRACT

This study aims to investigate how Trait Emotional Intelligence (TEI) and mathematics anxiety could impact on math performance in a public university in Malaysia. A quantitative study with a specific cohort of Cognitive Science students comprising the 2nd and 3rd year students were carried out. More than 90% of the samples in the cohort were sampled. The questionnaire contained a component on demographic component, and sections on math anxiety (MARS-SV) and Trait emotional intelligence questionnaires (TEIQue). The performance of the students in this study was measured by the mean score of math subjects. The result of the study showed that math performance was adversely related to math anxiety. However, Trait EI did not appear to influence math performance and neither did it have an impact on math anxiety. This finding is important as it suggests that more works need to be done to determine the leading predictor of math anxiety in the Malaysian context for subsequent effective intervention.

Key words: Math anxiety, Math performance, Trait EI

INTRODUCTION

Math anxiety is a prevalent problem in the population (Dowker et al., 2016). According to one estimate, one in every five person is affected by it (Eden et al., 2013; see also Ashcraft & Kirk, 2001). It is a mental affliction related to mathematical tasks involving numerical manipulation of numbers mathematical reasoning and problem solving. Characterized in various ways in the literature, it is identified with psychological apprehensions ranging from tension and stress to severe states resulting in helplessness, fear, terror and depression (Richardson & Suinn, 1972; Tobias, 1993, Ashcraft & Faust, 1994; and Bessant, 1995).

It is not the same with the learning difficulties faced by students in other subject matter but it is a form of mathematics phobia which affects learning (Gough, 1954; Suarez-Pelliconi 2016). In other words, math anxiety is more of a psychological affliction that indirectly disrupt learning and not itself a learning disorder (Reynolds, 2003). Math anxiety lowers self-confidence, obstructs clear thinking and interfere with the normal functioning of cognitive skills crucial for math success (Rotella & Learner, 1993; Tobias, 1993). Understanding math anxiety is thus important as it adversely affects the acquisition of mathematical skills and results in disruptive psychological problems.

Poor achievement in mathematics is a constant concern through the years (Dowker et al., 2016). Undoubtedly, IQ is the leading predictor of mathematics success (Fetescu, 2017) but the influence of Emotional Intelligence (EI) in predicting mathematics achievements should not be underestimated (Beilock & Maloney, 2015).

Understanding our own and others emotions and using that knowledge to guide behaviors is known as EI (Salovey & Mayer, 1990). In other words, it refers to the ability to evaluate, regulate and utilize of emotions and was found to be linked with academic self-efficacy including academic performance (Hen & Goroshit, 2014). McLeod (1992, 1994) underlined the importance of emotional management in math grades, especially in facilitating math problem solving. In fact, Espinosa (2016), advocated embodying EI in students' curriculum to improve math results.

REVIEW OF PAST LITERATURE

The relationship between TEI and academic achievements.

Trait EI has produced mixed result in predicting academic performance in different settings such as school, college and university in other countries. On the one hand, Parker et al. (2004a) and Petrides et al. (2004b) found that TEI had an impact on the relationship between cognitive abilities and academic achievement. Di Fabio and Palazzeschi (2009) similarly demonstrated that TEI could influence GPA scores. However, few studies suggested otherwise. For instance, Newsome et al. (2000) and Parker et al. (2004) had found no relationship between TEI and academic achievements.

In a more comprehensive work, Perera (2016) through his rather extensive meta-analysis study concluded that "TEI may confer a small, yet important, advantage in academic learning and testing concepts". This appeared to be the orthodox view. Some more recent reviews and many other individual studies testify to that (Petrides et al., 2004, Mavroveli et al., 2009, Mavroveli & Maria Jose Sanchez-Ruiz, 2011, Rodeiro et al., 2011; Fernandez et al., 2012; Sanchez-Ruiz et al., 2013; Perera & DiGiacomo, 2013, and Siegling et al., 2015, amongst others).

All the same, studies performed in the Malaysian context (Talib et al., 2011; Mohzan et al., 2013; Che Ani, 2013; Ebinagbome & Nizam, 2016;) also showed that EI had positive relationship with academic performance in schools, colleges and universities. These studies were performed using the Ability EI paradigm

The relationship between math anxiety and academic achievements.

Mathematics is indispensable to many areas of studies. Studies had shown that mathematics anxiety is commonplace and affected the whole spectrum of students regardless of study levels (Sherry, 2008; Maloney & Beilock 2012, Rodarte-Luna & Sherry, 2008; Gunderson et al., 2018). As Math Anxiety is a prevalent problem, understanding how it influences mathematics achievements is thus important as it interferes with effective learning (Fulkerson et al., 1984).

Over the years, despite some isolated finding reporting insignificant relations between math anxiety and math performance (e.g., Erturan & Jansen, 2015), the majority of the literature appeared to report otherwise. The association between math anxiety and math performance had been rather robust and was consistently demonstrated in a large number of studies including major large scale review works (Hembree, 1990; Ma, 1999; Miller & Bishsel, 2004; Pourmoslemi et al., 2013; Dowker et al., 2016; Zhang et al., 2019; Namkung et al., 2019).

Carey et al. (2019) in a large scale study on the primary and secondary school children in UK affirmed the same. Similar results were reported in the Malaysian context (Zakaria & Nordin, 2008; Zakaria et al., 2012); and Puteh and Khalin, (2016).

Meanwhile, scanty evidence existed on studies that investigated directly the relations between TEI and math anxiety. Diverse results were obtained. Agnolia et al. (2012) showed that high TEI could help students cope with mathematics anxiety in relation to mathematical tasks. However, Kamron and Fatima (2013) failed to discover any relationship between the two variables.

OBJECTIVES OF STUDY

Besides indispensable for the Sciences, Mathematics is also an indivisible part of our daily life. However, low achievements in mathematics and the prevalence of math anxiety and its related problem had been consistently shown to affect many students (Hembree, 1990; Ashcraft, 2002; Dowker et al., 2016). This is exacerbated by the increasingly competitive and demanding learning environment which requires the university students to have higher self-reliance, determination and better self-regulation. Such learning environments tend to result in stressful experiences for the students.

Stressful academic life is likely to lead to inefficient learning and poor academic performance. Hence, emotional self-efficacy could be an important link to academic achievement of an individual. For instance, Galla and Wood (2012) argued that emotional self-efficacy or trait emotional intelligence appeared to reduce math anxiety and its impact – particularly on mathematic achievements

Most studies related to this appeared to demonstrate a significant relationship between the two variables (Mavroveli et al., 2009, Mavroveli & Sanchez-Ruiz, 2011; Brouzos et al., 2014; Costa & Faria, 2015; Sieling et al., 2015). As literature that explores the link between TEI and math performances is still at its infancy, it would be interesting to explore this further, especially in the context of Malaysia where studies on this are non-existence.

In fact, even though more than 2000 studies had been carried out using TEIQue (Trait Emotional Intelligence Questionnaire) (O'Connor et al., 2019), there is a dearth of literature exploring math anxiety and its achievements in relation to emotional self-efficacy using TEIQue. The present study aims to bridge the gap. In particular, it aims to investigate the following research objectives in the context of Malaysia.

- a) To study the relationship between Trait EI and Math achievements
- b) To study the relationship between Math Anxiety and Math achievements
- c) To find the relationship between Math Anxiety and Trait EI

METHODOLOGY

This study employed a survey research design to investigate Cognitive Science undergraduates' Trait EI, math anxiety and math academic achievement in a public university in Malaysia. Trait EI is a collection of questions evaluated through self-report of emotional perceptions using scale-rating questionnaires (Petrides & Furnham, 2001).

There exist at least 30 various type of instruments for measuring emotional intelligence, grouped largely into Ability EI and Trait EI. Ability EI measures intelligences the way IQ is typically measured. It relies on the assumption that respondents are able to measure their actual abilities in emotional competencies in terms of maximal performance. However, as these are tests on actual abilities and performances, they may not be entirely well-suited for studies aimed more on the understanding of behavioral dispositions and self-efficacy of respondents. Trait based EI is more well-suited in such context (see O'Connor et al., 2017; Connor et al., 2019).

This research study assessed the student's TEI by using the Trait Emotional Intelligence Questionnaire Short-Form (TEIQue-SF). TEIQue-SF comprises of 30 items made up of 4 factors (emotionality, well-being, self-control and sociability) and 15 facets (Petrides, 2011). The reliability and validity of the instrument are widely reported (Petrides, 2009; Andrei et al., 2016).

Amongst the earliest mathematics anxiety scale developed was Fennema and Sherman (1976) (MAS) which was extended by Betz (1978). However, it was Richardson and Suinn's 98-item mathematical anxiety rating scale (MARS, 1972) that had become the test of choice among researchers (Ashcraft & Moore, 2009). Most of the research tools that come later are extensions and adaptations of this work, e.g., Plake and Parkers' (1982) MARS-Revised reduced the MARS items to 24 items, MARS-A (Suinn & Edwards, 1982) for adolescents and MARS-E (Suinn et al., 1988) for elementary school pupils, Alexander and Martray (1989)

version of MARS (AMARS), MASC (Chiu & Henry, 1990). MARS-SV (Suinn & Winston, 2003) which is an improved and much shortened version of the original MARS would be used for the present research owing to its viable questionnaire length, its appropriateness for the age group of study and the general robustness of the MARS series as a research tool in mathematics anxiety research. The validity and reliability of MARS-SV were reported in Suinn and Winston (2003).

Sample

The subjects of this study were 249 undergraduates with mean age 21.6 years, and standard deviations 1.2 years from a particular cohort of a Cognitive Science program in a public university in Sarawak, Malaysia. The population of the cohort totaled 310 students. Almost all students from the cohort were selected for the study (counting those involved in pilot study). The demographic characteristics of the subjects are shown in Table 1. The cohort chosen for the study comprised of the Second and Third year students of the Cognitive Science program who had completed the Calculus and Discrete Mathematics courses in Year 1 of their study.

Research instruments

Questionnaires were used to collect data for this study. The questionnaire was divided into three sections. The first section collected the demographic characteristics of respondents. The second part of the questionnaire was the Trait Emotional Intelligence Questionnaire Short version (TEIQue-SF) used to assess the subjects' EI. The TEIQue-SF consisted of 30 items self-report inventory. The subjects responded on a seven-point Likert type scale (1=completely disagree, 2=strongly disagree, 3=disagree, 4=undecided, 5=agree, 6=strongly agree and 7=completely agree). The third part of the questionnaire was the Mathematics Anxiety Rating Scale: Short Version (MARS-SV) to assess the subjects' level of mathematics anxiety. The MARS-SV consisted of 30 items. The subjects responded on a five-point Likert type scale (1 =not at all, 2=a little, 3=a fair amount, 4=much and 5=very much) (Suinn & Winston 2003). Meanwhile, Math grades or Math achievements were calculated from the mean average of the scores obtained from the Calculus and Discrete Math subjects taken.

Table 1: Distribution and Percentage of Respondents according to Age,

Gender, Math Grade KMK1103 and Math Grade KMK1123 (n=249)

Respondents Profile		Frequency	Percentage (%)
Age	19 – 21	131	53
	22 – 24	113	45
	25 – 26	5	2
Gender	Male	59	24
	Female	190	76
Math Grade for KMK1103 (Discrete Structure)	A	67	27
	B	100	40
	C	75	30
	D	4	2
	F	3	1
Math Grade for KMK1123 (Calculus and Linear)	A	89	36
	B	78	32
	C	78	31
	D	4	2
Total		249	100.0

*Math grade used for analysis is the average of KMK1103 and KMK1123

Data collection and analysis

Pilot test consisted of 50 samples for preliminary screening of the questionnaires for reliability. The Cronbach

alpha for TEIQue-SF and Math anxiety questionnaires were 0.905 and 0.939 respectively. Data analyses were carried out with the Statistical Packages for Social Sciences.

RESULTS AND DISCUSSIONS

H₀₁: There is no relationship between math performance and Trait EI.

Table 2: Correlation between Trait EI and math achievement

	Math Performance			
	N	r		Sig. (2-tailed)
Trait EI	249	0.067		0.289

Normality test indicated that both variables did not conform to a normal distribution. As such, a non-parametric test was performed. Based on Table 2, a Spearman rank-order correlation was run to test the hypothesis and the test was statistically insignificant $r_s(248)=0.067$, $p=0.289$. Hence, H₀₁ was not rejected.

H₀₂: There is no relationship between math anxiety and grade

Table 3: Correlation between math anxiety and grade

	Math Performance			
	N	R		Sig. (2-tailed)
Math Anxiety	249	-.318		0.000

Normality test indicated that both groups did not conform to a normal distribution. As such, a non-parametric test was performed. Based on Table 3, a Spearman rank-order correlation was run to test the hypothesis and the test was statistically insignificant $r_s(248)=-0.318$, $p<.001$. Hence, H₀₂ was rejected. Math anxiety and math grade were correlated and they appeared to be a weak negative relationship between the two variables.

H₀₃: There is no relationship between math anxiety and Trait EI

Table 4: Correlation between math anxiety and Trait EI

	Math Anxiety			
	N	R		Sig. (2-tailed)
Trait EI	249	-.097		.127

Normality test indicated that both groups did not conform to a normal distribution. As such, a non-parametric test was performed. Based on Table 4, a Spearman rank-order correlation was run to test the hypothesis and the test was statistically insignificant $r_s(248)=-.0097$, $p=0.127$. Hence, H₀₃ was not rejected.

DISCUSSIONS

The significant relationship found between math anxiety and math results is consistent with the literature generally which indicated a robust but modest inverse relation between the both variables. Specifically, a

recent meta-analysis of 131 studies (Nam Kung et al., 2019) reported a significant relationship between the two variables, in which $r = -.34$ (see also Hembree, 1990; Ma, 1999; Jing et al., 2019).

However, contrary to expectation, no significant relationship was found between TEI and math performance. Indeed, studies that investigated the relationship between EI and academic performance had suggested a modest but significant relationship. This is also largely true in studies investigating Trait EI and math performance though this area of study is still yet to be thoroughly investigated (e.g., Mavroveli & Sanchez-Ruiz, 2011; Agnoli et al., 2012).

It followed then that self-efficacy in emotion management (or Trait EI) did not appear to influence math results. Based on these findings, a likely explanation was that math anxiety could be exerting a moderating influence on TEI and Math results. The present study demonstrated that math results were directly related to math anxiety and it was also shown that TEI had no influence on math anxiety, hence it was unsurprising that TEI was likewise ineffectual in influencing math results. The uniformity of these results suggest that these phenomenon were likely credible and merit investigations.

Data in the present study, however, did not conform to the more stringent requirement of a parametric statistical analysis and hence did not allow the performance of a more robust partial regression and other moderating analysis which would be more compelling in showing the role of EI and math anxiety in moderating math results.

Investigating this further is important because if Trait EI could be shown to have no direct nor moderating influence on math anxiety than ascertaining the leading predictor of math anxiety in the Malaysian scenario is vital as successful intervention would depend on a sound understanding of the factors affecting math anxiety. This is because math difficulties arising from emotional disturbances were dissimilar with difficulties associated with other cognitive related problems (e.g., working memory) (Carey et al., 2019) hence requiring different intervention strategies.

CONCLUSIONS

Mathematics plays important role in modern communities (Festus & Seraphina, 2015). It also appears that career opportunities are related to mathematical abilities. And the emotional efficacy of an individual appears important in the acquisition of mathematical abilities (Kanhai, 2014). Like in many other countries, math anxiety is still a disturbing concern to many students in higher learning institution in Malaysia (Sharifah et al., 2014).

The findings above is important and merit further investigations to explore more the interrelations between EI/ math anxiety and math performances especially in the Malaysian context. Apart from a handful of studies (e.g., Justicia-Galiano et al., 2016), the literature is typically silent on the question of math anxiety and TEI relations. The analysis could be made more robust and compelling by coupling it with some other germane moderators as found in the literature. TEIQue should be the tool of choice for investigating these questions, given the relative sparseness of studies in Malaysia using TEIQue and its rising prominence in the field in characterizing the behavioral disposition of samples on perceived emotional efficacies.

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