



Faculty of Cognitive Sciences and Human Development

**ACHIEVEMENT GOAL ORIENTATION AND MATH ANXIETY
AMONG UNIMAS UNDERGRADUATE STUDENTS**

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**ACHIEVEMENT GOAL ORIENTATION AND MATH ANXIETY
AMONG UNIMAS UNDERGRADUATE STUDENTS**

MICHELE LOW YEN WEN

This project is submitted
in partial fulfilment of the requirements for a
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The project entitled 'ACHIEVEMENT GOAL ORIENTATION AND MATH ANXIETY AMONG UNIMAS UNDERGRADUATE STUDENTS ' was prepared by Michele Low Yen Wen and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Science with Honours (Cognitive Science).

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ABSTRACT

The purpose of present study was to investigate the relationship between achievement goal orientation and math anxiety. Different types of achievement goals (mastery goal, performance approach goal and performance avoidance goal) were explored in this study. Besides, the difference in math anxiety between gender was also explored. Questionnaire was chosen as our instrument to collect data and the sample of present study involved a total number of 400 UNIMAS undergraduate students. The questionnaire used in this study included Achievement Goal Questionnaire Revised (ACQ-R) and Math Anxiety Rating Scale (MARS). Quantitative and cross-sectional design was used in this study. Independent t-test was used to compare the difference in math anxiety between male and female and the Pearson's correlation was used to determine the relationship between the achievement goal orientation and math anxiety. Present finding showed that there was no significant difference in math anxiety between gender. Moreover, present finding proved that mastery goal had positive relationship with math anxiety and performance approach goal had negative relationship with math anxiety. Moreover, it also found that performance avoidance goal was not correlated with math anxiety.

Keywords: achievement goal orientation, math anxiety, UNIMAS undergraduate students

ABSTRAK

Kajian ini bertujuan untuk mengkaji hubungan antara orientasi matlamat pencapaian dan kebimbangan matematik. Pelbagai jenis tujuan pencapaian (tujuan penguasaan, matlamat pendekatan prestasi dan matlamat penghindaran prestasi) telah diterokai dalam kajian ini. Selain itu, perbezaan kebimbangan matematik antara jantina juga diterokai. Soal selidik dipilih sebagai instrumen kami untuk mengumpulkan dan sampel kajian ini melibatkan sejumlah 400 pelajar sarjana UNIMAS. Reka bentuk kuantitatif dan keratan rentas digunakan dalam kajian ini. Ujian-t bebas digunakan untuk membandingkan perbezaan kebimbangan matematik antara lelaki dan perempuan dan korelasi Pearson digunakan untuk menentukan hubungan antara orientasi matlamat pencapaian dan kebimbangan matematik. Hasil kajian menunjukkan bahawa tidak ada perbezaan yang signifikan dalam kebimbangan matematik antara jantina. Selain itu, kajian ini membuktikan bahawa tujuan penguasaan mempunyai hubungan positif dengan kebimbangan matematik dan tujuan pendekatan prestasi mempunyai hubungan negatif dengan kebimbangan matematik. Selain itu, kajian ini juga mendapati bahawa tujuan penghindaran prestasi tidak berkaitan dengan kebimbangan matematik.

Kata kunci: orientasi matlamat pencapaian, kebimbangan matematik, pelajar sarjana UNIMAS

CHAPTER ONE

INTRODUCTION

Background of Study

Mathematical comprehension is usually seen as essential to career success and effective day-to-day personal management (Jain & Dowson, 2009). Mathematics is therefore seen as a core discipline in education across primary to higher education (Baloglu & Kocak, 2006). Additionally, achievement in mathematics is an important element in decisions affecting the placement, selection and admission of students across most education systems (Nasser & Birenbaum, 2005). A growing, economically competitive world demanded change in math education. The need to understand mathematics is important with the increasing use of computer technology.

However, math anxiety is one of the main issues for several students. It is a key issue that can influence on learning and performance in mathematics and thus may adversely affect students' education, career and overall future (Jain & Dowson, 2009). As mentioned by Richardson and Suinn (1972), "mathematical anxiety includes the feelings of stress and anxious which implies with numerical manipulation and mathematical problem solving in general and academic contexts." Math anxiety can be described as a situation where students experience discomfort when they have mathematical task to perform (Jain & Dowson, 2009).

Nowadays, mathematics become a significant challenge for youngsters as they have negative attitude toward the mathematics. This situation is known as math anxiety (Geist, 2010). Moreover, he emphasised that an anti-anxiety curriculum is necessary as this can help students to build their confidence while performing mathematical task, particularly as more students are encouraged to go to fields of science, technology, engineering and mathematics (STEM). Thus, it is crucial to help students recognise and resolve their problem so that they

can deal and overcome these anxieties that would otherwise adversely affect their potential decision-making in education and career.

According to achievement goal theory, there are several purposes for students to participate and showing low participation in education (Patrick, Kaplan, & Ryan, 2011). In the trichotomous model of achievement theory, three subgroups of goal orientation have been studied: mastery orientation, performance-approach orientation, and performance-avoidance orientation (Skaalvik, 2018). Students espousing mastery goal are emphasising to gain new knowledge and improve their capability and skill. Students espousing performance- approach orientation are concerning whether they could surpass others and demonstrate competence whereas students with performance avoidance goal focusing on covering their incompetence to other people so that they can prevent negative perception from others toward them (Skaalvik, 2018). Previous studies repeatedly indicate that these goal orientations have effect on the achievement, emotion and behaviour of the student (Meece, Anderman & Anderman 2006). Therefore, investigating the relationship between achievement goal orientation and math anxiety among UNIMAS undergraduate student is the purpose of present study. The association of the achievement goal orientation (mastery goal, performance - approach goal and performance - avoidance goal) with math anxiety will be explored. These findings will help to enhance the understanding of mathematics learning with respect to math anxiety.

Problem Statement:

The need for specialists in science, technology, engineering and mathematics (STEM) is increasing globally. To accommodate this demand adequately, many governments and private companies have updated STEM education and facilitated training to enhance math and science skills among students and employees (Foley, Herts, Borgonovi, Guerriero, Levine, & Beilock, 2017). Learning and training programs usually concentrate on increasing the understanding of mathematics and science among individuals.

Mathematics proficiency is a major advantage for industrialized nations. Evidence from laboratory studies and major international assessments show that fear or apprehension of mathematics, mathematical anxiety, should also be taken into account when attempting to improve mathematical achievement and STEM career performance (Foley et al., 2017). However, many people choose to avoid math and math-related occupations as they become anxious while doing math tasks (Maloney & Retanal, 2020). Consequently, people with mathematical anxiety have the restriction on choosing their earning opportunity and potential work prospect (Maloney & Retanal, 2020). The lack of skill people to participate in the fields of STEM, will cause negative effects to the country as society are becoming more technologically based (Beilock & Maloney, 2015). Globally, increased mathematical anxiety is associated with reduced mathematical efficiency and this is not limited to academic circumstances (Foley et al., 2017). For example, math-anxiety nurse who have math anxiety will have poor dosage calculations, women with math-anxiety have the tendency to participate in poor financial management, and people with math-anxiety are poor in analysing health statistic.

Considering that math-anxiety has significant negative effects to people's everyday lives, it is important to understand math anxiety and solve this problem. However, most of the

past studies about math anxiety are only emphasised on the relationship of math anxiety with the achievement of student in mathematics (Maloney & Retanal, 2020). Achievement goal orientation is one of the motivational structures that plays a significant role in assessing student success in learning. The application of a certain goal instruction contributes to multiple learning outcomes (Rameli & Kosnin, 2002). However, there are only less research about the relationship of math anxiety with the different achievement goal orientation (Skaalvik, 2018). Moreover, inconsistent results were found in the relationship of performance - approach goal and math anxiety (Skaalvik, 2018). Thus, conducting the research to explore the relationship of different achievement goal orientation (mastery goal, performance - approach goal and performance - avoidance goal) with math anxiety is beneficial and crucial.

General Objective:

The main purpose of present study is to investigate the relationship between achievement goal orientation with math anxiety among UNIMAS undergraduates in University Malaysia Sarawak.

Research Objective:

1. To investigate the relationship between mastery goal and math anxiety
2. To investigate the relationship between performance approach goal and math anxiety
3. To investigate the relationship between performance avoidance goal and math anxiety
4. To investigate the difference in math anxiety between male and female

Hypothesis:

H1: There is significant relationship between mastery goal with math anxiety

H2: There is significant relationship between performance - approach goal with math anxiety

H2. There is significant relationship between performance - avoidance goal with math anxiety

H3. There is significant difference in math anxiety between male and female

Conceptual Framework:

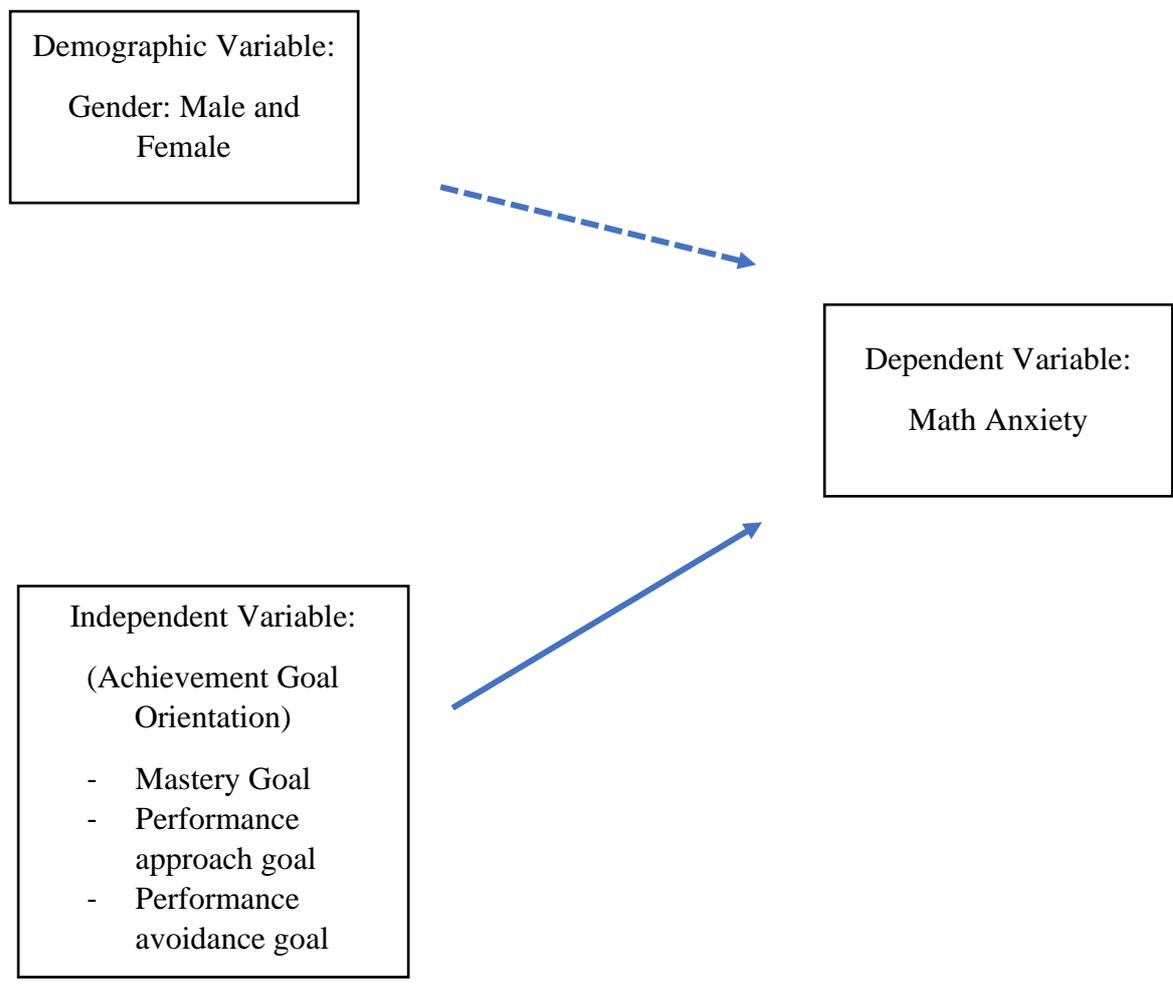


Figure 1. Conceptual Framework

-  Represent Difference
-  Represent Correlation

Table 1

Definition of Term

Term	Conceptual Definition	Operational Definition
Math anxiety	The discomfort feeling that experienced by students when they are performing mathematical calculations is characterised as math anxiety. (Cemen, 1987). Moreover, the students will experience stress and apprehension. This situation will disrupt the numerical manipulation as well as mathematical resolutions (Richardson and Suinn, 1972).	Math Anxiety Rating Scale (MARS) was used to evaluate math anxiety. This MARS was built by Richardson and Suinn (1972). Higher mean scores indicate higher math anxiety level.
Mastery goal	Students with mastery goal concentrate solely on the mission rather than any extrinsic incentives and their goal is to learn, understand and solves problems (Nicholls, 2017)	Mastery goal in this study was measured by using Achievement Goal Questionnaire-Revised (ACQ-R) developed by Ratsameemonthon (2015).
Performance-approach goal	Students with performance-approach goal concentrate on showing their capability and they want to achieve better than others (Skaalvik, 2018).	Achievement Goal Questionnaire-Revised (ACQ-R) developed by Ratsameemonthon (2015)

		was used to measure performance-approach goal.
Performance-avoidance goal	Students with performance-avoidance goal concentrate on covering their incompetence to other people so that they can prevent negative perception from others toward them (Skaalvik, 2018).	Achievement Goal Questionnaire-Revised (ACQ-R) developed by Ratsameemonthon (2015) was used to measure performance-avoidance goal.

Significance of Study

This study is beneficial for the students who have the problem with math anxiety. With the finding, this serves as a recommendation for the students to cope with their math anxiety. Moreover, this study can also serve as a guideline for the educators on how to deal with students with math anxiety. This study can be served as a reference for the future study in concern to the relationship between achievement goal orientation with math anxiety. Apart from that, this study also can make contribution to STEM education as it can serve as a guideline to solve math anxiety among students so that more students will take part in STEM related field. Moreover, this research informs other educators to identify that achievement goal orientation is important in education.

CHAPTER TWO

LITERATURE REVIEW

Math Anxiety

Math anxiety typically refers to tension or fear of mathematic, which inhibits a student from understanding mathematic related topic (Gurefe & Bakalim, 2018). Math anxiety is described as feeling of discomfort, apprehension or fear that faced by most of the people when they engage in mathematics (Ashcraft, 2002). Bessant (1995) describes math anxiety as a negative mindset towards mathematic learning, fear of failure and loss of self-confidence. Math anxiety is not just about fear of mathematic, but it will cause disappointment, pressure, fear, mental disturbance, helplessness, frustration and anxiousness (Ma & Xu, 2004). Most people describe math as the punishment or major stressor (Gurefe & Bakalim, 2018). Furner and Gonzalez-DeHass (2011) stated that they seem to be nervous when are going for a math test (math test anxiety), they even feel panic when faced with some sort of computational exercise (number anxiety). Some students also feel fear when taking math classes and this can occur at primary, secondary or university levels (math course anxiety). It is stated that the learning output decreases to its lowest level when the anxiety reaches its highest level (Furner & Gonzalez-DeHass, 2011). Thus, it can be said that math anxiety causes severe effect on learning.

Math anxiety does not have particular cause, it was due to the several different causes, including truancy, low self-image, poor management skills and focus on learning mathematics without understanding its context. Zakaria and Nordin (2008) also claimed that teaching methodologies were the key cause of mathematical anxiety. This is because math classes did not foster comprehension and reasoning. The issues with mathematical anxieties will not be solved until lecturers applied problem-solving process to the teaching of

arithmetic and mathematics (Zakaria & Nordin, 2008). Butterworth (1999) stated that lack of understanding is the factor of anxiety and avoidance, and he suggested that understanding based learning is more efficient than drill and practice. Stuart (2000) stated that lack of confidence when work with mathematical situations is the cause of anxiety in mathematics. Student with higher math anxiety are less fluent in computing and mathematics, and they are less likely to discover particular approaches and relationships within the field of mathematics (Zakaria & Nordin, 2008). Thus, lecturer is encouraged to build a healthy, tension-free learning environment and make sure it is free from embarrassment or humiliation so that the mathematic anxiety can be reduced (Zakaria & Nordin, 2008).

Math Avoidance Model's Cycle

According to the math avoidance model's cycle, Pries and Biggs (2001) stated that the individual will response toward the math circumstances negatively in the first stage. These may arise from previous bad mathematics experiences. This direct to the second stage that causes the individual to avoid mathematics circumstances. Thus, it causes poor preparation of mathematics in stage three, which leads them to perform poorly in mathematics in stage four. It causes more negative mathematics experiences, and it takes them back to the first stage. The loop can be repeated frequently and never broken that the individual with math anxiety is persuaded that he cannot do mathematics. Biological studies of math anxiety have shown that individual with math anxiety have insufficient inhibition mechanism at which their working memory are occupied and distracted by unrelated tasks. Students who do not perform well in assessments and examinations claim to be confused, cannot concentrate on their task. This is because they keep worrying about their poor performance in mathematics (Mutodi & Ngirande, 2014). Math anxiety causes interference on the working memory, affects its productivity as well as the accuracy.

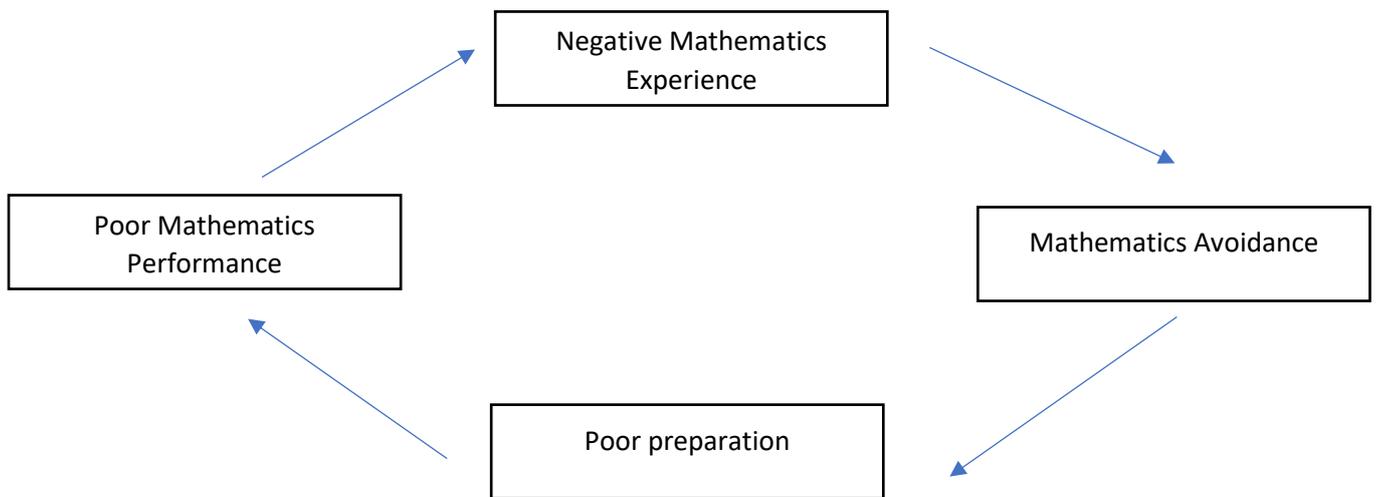


Figure 2. Math Avoidance Model's Cycle

Gender and Math Anxiety

Most of the studies have found that women have higher rates of math anxiety as compared to men (Ramirez, Shaw & Maloney, 2018). Nonetheless, there are also some studies that have not found gender difference in math anxiety (Ramirez, Shaw & Maloney, 2018). However, it does appear that there are gender gaps when analyzing math anxiety on a wide scale. Stoet, Bailey, Moore and Geary (2016) have conducted a research to assess the high school students about their math anxiety. This involved 761,655 participants across 68 PISA participating countries. They found that women participants experienced more mathematical anxiety than men, and mathematical anxieties and gender gap were broadened as the country increased in economic growth. Similarly, researchers also noted that in the 2003 PISA Gender Equality and Mathematics Anxiety data, girls in more gender equal countries had comparatively higher rates of math anxiety compared with boys in more gender-equal countries (Else-Quest Hyde & Linn, 2010). This is because higher gender equity and lower power distance would encourage girls to compare themselves with boys

more than in circumstances of lower gender equality and greater power distance. The increased between sex-comparisons will cause the increasing of math anxiety among girls in gender-equal countries and this contribute to greater gender differences.

To now, the issue about women have higher rates of math anxiety as compared to men has not been addressed decisively. However, study have shown that the differences in math anxiety among between male and female are due to the differences of spatial processing capability among gender (Stoet, Bailey, Moore & Geary, 2016). Spatial processing is important in mathematics (Cheng & Mix, 2014). However, the spatial processing of female is poor as compared to male. Thus, they are more worried about math as compared to male. Ashcraft (2002) hypothesized that there might be a gender gap in math anxiety as women report anxiety more comfortably compared to men. The social stereotype of female cannot achieve better than male in math has caused the gender gap in math anxiety (Beilock, Rydell, & McConnell, 2007). Goetz, Bieg, Lüdtke, Pekrun and Hall (2013) have conducted a study to examine the differences in trait level of the students among gender by using questionnaires. The result found supported this social stereotype as well. They stated that female have higher math anxiety as compared to male. However, when the math anxiety test was conducted before and during the examination, female student did not show more symptoms of math anxiety than male student. This showed that the disparity between trait and state math anxiety is greater among student with weak mathematical conception and those who endorsed traditional gender stereotypes that mathematics is dominated by men (Bieg, Goetz, Wolter, & Hall, 2015).