COPING WITH

MATHEMATICS ANXIETY:

GUIDELINES

FOR

COLLEGE STUDENTS

AND

FACULTY

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PURPOSE

Students

Analysis of the relationship between coping strategies and:

- level of math anxiety
  (high vs. low)

- course enrollment
  (remedial algebra vs.
  nonremedial precalculus)

- gender
  (male vs. female)

PURPOSE

Faculty

Comparison of student ratings of coping strategies' helpfulness with ratings by:

- mathematics instructors
- counselors

METHODS

Students (n ≈300)

- completed Composite Math Anxiety Scale -20 items
  10-15 min/class
- rated ten Likert type coping strategies regarding:
  - ⇨ frequency of use
  - ⇨ helpfulness

- MANOVA performed on data:
  - ⇨ 2 x 2 x 2 design
  - ⇨ independent variables:
    anxiety, gender, course level
  - ⇨ dependent variables:
    frequency of use & helpfulness of each coping strategy

COPING STRATEGIES SURVEY FOR STUDENTS

MATH COURSE (CIRCLE ONE): ALGEBRA PRECALCULUS
SEX (CIRCLE ONE): MALE FEMALE

Directions: The following is a list of strategies that students may use in order to learn mathematics effectively and do well in their mathematics courses. Please respond to both questions listed below each of the following behaviors by circling **any** number from 1 to 5 where:
1 = not at all 3 = somewhat 5 = very much.

Once again, all responses will be kept confidential and used for research purposes only.

1. Using the school's tutoring center or a private tutor.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

2. Practicing systematic relaxation, physical activities, or exercise.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

3. Discussing experiences or difficulties related to your mathematics course with other students in your class.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

4. Discussing experiences or difficulties related to your mathematics course with your school counselor.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

5. Using additional textbooks or review books other than the required text.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

6. Asking your instructor mathematics questions in class.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

7. Completing homework assignments on time so that you don't fall behind.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

8. Reminding yourself that you are a good student if you start to feel incompetent.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

9. Setting aside extra study time for review before class exams.

   a. How often have you tried this? **1 2 3 4 5**

   b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

10. Letting your instructor know if you don't understand the course material.

    a. How often have you tried this? **1 2 3 4 5**

    b. How helpful has it been OR how helpful do you think it would be if you tried it? **1 2 3 4 5**

METHODS

Faculty

n = 50

- rated ten Likert type coping strategies regarding helpfulness to students
- rank ordering of mean scores
- comparison of ratings among:
  - ⇨ students
  - ⇨ mathematics instructors
  - ⇨ counselors

COPING STRATEGIES SURVEY FOR FACULTY

DEPARTMENT (CIRCLE ONE): MATHEMATICS STUDENT DEVELOPMENT

Directions: The following is a list of strategies that students may use in order to learn mathematics effectively and do well in their mathematics courses. Please rate each of the following behaviors in terms of how helpful you feel it would be for your students. Circle any number from 1 to 5 where:

1 = not at all 3 = somewhat 5 = very much.

1. Using the school's tutoring center or a private tutor.

1 2 3 4 5

2. Practicing systematic relaxation, physical activities, or exercise.

1 2 3 4 5

3. Discussing experiences or difficulties related to your mathematics course with other students in your class.

1 2 3 4 5

4. Discussing experiences or difficulties related to your mathematics course with your school counselor.

1 2 3 4 5

5. Using additional textbooks or review books other than the required text.

1 2 3 4 5

6. Asking your instructor mathematics questions in class.

1 2 3 4 5

7. Completing homework assignments on time so that you don't fall behind.

1 2 3 4 5

8. Reminding yourself that you are a good student if you start to feel incompetent.

1 2 3 4 5

9. Setting aside extra study time for review before class exams.

1 2 3 4 5

10. Letting your instructor know if you don't understand the course material.

1 2 3 4 5

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COPING STRATEGIES EXERCISE

Directions: The following key words represent the coping strategies presented in the accompanying handout. Please rank them from highest to lowest in terms of your opinion of their helpfulness to mathematics students. The most helpful strategy should be listed as 1 and the least helpful as 10.

TUTOR

RELAXATION

DISCUSS STUDENTS

DISCUSS COUNSELOR

EXTRA BOOKS

ASK QUESTIONS

HOMEWORK

REMIND YOU'RE GOOD

EXTRA STUDY TIME

INSTRUCTOR KNOW

---

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

COPING STRATEGY CATEGORIES

APPROACH

- homework
- extra study time
- ask questions
- instructor know
- extra books
- tutor

AVOIDANCE

- remind you're good
- relaxation

SOCIAL SUPPORT

- discuss students
- discuss counselor
- tutor

RESULTS

- Low mathematics anxiety students tend to utilize and value the majority of coping strategies more than high math anxiety students.
- Female students show a tendency to utilize more coping strategies than males.
- Algebra students show a tendency to utilize more coping strategies than precalculus students.
- Students, mathematics instructors and counselors fundamentally agree in their ratings of the coping strategies.
- Approach strategies are regarded as the most helpful category of coping behaviors by all 3 groups.

THE RELATIONSHIP BETWEEN GENDER, MATHEMATICS ANXIETY, AND COPING STRATEGIES IN COLLEGE STUDENTS

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A number of strategies designed to alleviate mathematics anxiety have been proposed (Hembree, 1990; Higbee, 1989; Robertson, 1991; Tobias, 1987). A partial list includes attending a mathematics tutoring clinic, keeping a "math autobiography," engaging in relaxation training, assertiveness training, stress inoculation, or systematic desensitization, learning to improve time management skills and study habits, and even adopting a "Math Anxiety Bill of Rights" (Bitner, 1994; Davidson & Levitov, 1993; Hackworth, 1982; Schneider, 1989; Schneider & Nevid, 1993; Tobias, 1991).

It has been suggested that just as mathematical problem solving has both a cognitive as well as an affective component (Bessant, 1995; Fennema, 1989; McLeod, 1988), so do intervention strategies designed to alleviate anxiety (Robertson, 1991; Williams, 1988). Cognitive (or math-dominated) interventions focus on the learning of mathematics content, assuming that the more mathematics students understand, the less anxious they will be, while affective interventions focus on psychological techniques such as peer support groups, counseling, and relaxation training that help students reduce their anxiety level.

The above list of coping strategies designed to help students alleviate mathematics anxiety has been presented in many formats such as self-help manuals, diagnostic clinics, videotapes, pamphlets, handbooks, and seminars (Arem, 1993; Davidson & Levitov, 1993; Hackworth, 1982; Kogelman & Warren, 1978; Radmacher, 1986; Robertson, 1991; Sembrera & Hovis, 1993; Zaslavsky, 1994). Nonetheless, there is a lack of empirical research on student and faculty assessment of their comparative effectiveness. The present study examined this issue.

The primary purpose of this study was to evaluate the relationship between college students' level of mathematics anxiety and the strategies they employ to cope with it. Additionally, the study considered the effects of course enrollment, in either a remedial algebra course or a nonremedial precalculus course, and gender upon students' assessment of coping strategies. A secondary goal of the study was to examine both counseling and mathematics faculty's ratings of the same coping strategies that the student subjects evaluated. Aside from analyzing each group of faculty assessments individually, the study also compared these groups to the student ratings of the coping strategies.

Two-hundred seventy-nine community college students, enrolled in either a remedial algebra or a nonremedial precalculus course, completed the Composite Math Anxiety Scale (Tobias, 1993). This psychometric instrument, composed of twenty Likert type items, was adapted from the Fennema-Sherman Mathematics Attitude Scales (Fennema & Sherman, 1986) in order to provide an overall mathematics anxiety score. Afterwards, the students were asked to rate ten Likert type mathematics anxiety coping strategies, designed by the investigator, with regard to frequency of use and helpfulness. This set of coping strategies is presented in the Appendix. In addition to the student subjects, a total of fifty faculty members from the Mathematics and Student Development (Counseling) Departments at the same community college rated the set of coping strategies, but only in terms of faculty perception of helpfulness to students.

A multivariate analysis of variance (MANOVA) was performed on the student data. The three independent variables were Mathematics Anxiety level (high or low), Gender (male or female), and Course Enrollment (remedial or nonremedial). The dependent variables were the ten coping strategies, each of which was rated for frequency of use and helpfulness. In addition, the mean scores of the coping strategies (in terms of the helpfulness factor) were rank ordered and compared among the student, mathematics faculty, and counseling faculty groups. This data is presented in the Appendix.

A major finding of the study was that students with low mathematics anxiety both utilize and value a wider variety of coping strategies than their high anxiety counterparts. In fact, seven of the strategies (RELAXATION, DISCUSS STUDENTS, ASK QUESTIONS, HOMEWORK, REMIND YOU'RE GOOD, EXTRA STUDY TIME, and INSTRUCTOR KNOW), were preferred more by students with low mathematics anxiety than by those with high mathematics anxiety. Perhaps, because anxiety itself has a disabling effect on students, a low anxiety level may place students in an enhanced coping mode, thus empowering them to participate in the majority of coping strategies considered in the study.

It is also important to consider the types of coping strategies in which low vs. high mathematics anxiety students engaged. Namely, high mathematics anxiety students used tutoring services (TUTOR) and had discussions with their counselors (DISCUSS COUNSELOR) significantly more than low anxiety students. Both of these behaviors, which were the only two engaged in more frequently by high mathematics anxiety students, were considered among the least helpful by all of the students.

There were significant gender differences for three of the coping strategies. Practicing systematic relaxation, physical activities, or exercise (RELAXATION), an "avoidance" strategy which males utilized more than females, was considered one of the

least helpful coping strategies by all students as well as both groups of faculty. Alternatively, completing homework assignments on time so that you don't fall behind (HOMEWORK) and letting your instructor know if you don't understand the course material (INSTRUCTOR KNOW), two "approach" strategies which females found more helpful than did males, were both regarded as among the very most helpful coping strategies by all students as well as both groups of faculty. A few significant differences were also found for course enrollment. Algebra students utilized certain strategies more than did precalculus students.

The three groups of subjects that participated in the study (mathematics students, mathematics faculty, and counseling faculty) essentially agreed on the helpfulness of the coping strategies, placing HOMEWORK, EXTRA STUDY TIME, ASK QUESTIONS, and INSTRUCTOR KNOW, all of which are "approach strategies" (since the individual directly confronts the stressor), in the top half of the list. This ranking is consistent with the work of Holahan & Moos (1987) who found such strategies to generally be the most successful category of coping behaviors.

Although the three groups of subjects fundamentally concurred in their ratings, some differences are noteworthy. First of all, both the counselors and mathematics instructors rated using a tutor (TUTOR) as more helpful but rated practicing systematic relaxation, physical activities, or exercise (RELAXATION) as far less helpful than did the students. The first difference possibly may be due to the fact that both groups of faculty can only perceive the tutoring experience from an outsider's point of view. The students themselves, who actually partake in the tutoring process, may not regard it as being valuable since they are more aware of both its advantages as well as its shortcomings. One possible example, although not specifically assessed in this study, may be that some tutors use different methods to explain course material than those used in class by the mathematics instructors. This dichotomous approach can be potentially disadvantageous.

In sum, as previous research suggests (Holahan & Moos, 1987), this study has demonstrated that approach strategies are regarded as the most helpful group of coping behaviors and that low mathematics anxiety students tend to utilize and value coping strategies more than do high mathematics anxiety students. A smaller number of coping strategies yielded significant differences with respect to gender and course enrollment with females showing a tendency to utilize more coping strategies than males and algebra students more than precalculus students. In addition, mathematics students, mathematics faculty, and counseling faculty all essentially agreed when rating the coping strategies in terms of their helpfulness. All three groups regarded approach strategies as the most helpful. In particular, asking your instructor questions in class, completing homework assignments on time so that you don't fall behind, setting aside

extra study time for review before class exams, and letting your instructor know if you don't understand the course material were valued the highest.

A number of pedagogic recommendations can be made based upon these findings. These include having mathematics faculty partake in training workshops that specifically focus on the approach strategies of the present study as well as having peer tutors work together with instructors in the classroom so that students will ideally regard both of them as a "coordinated team." The later recommendation has already been implemented on a limited basis at the college where this study was conducted.

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Table 4

Rank Orderings of Means for Helpfulness

of Coping Strategies By Subject Group

Students	Counseling Faculty	Mathematics Faculty
1. Homework 4.283	1. Instructor Know 4.840	1. Homework 4.880
2. Extra Study Time 4.215	2. Homework 4.800	2. Instructor Know 4.760
3. Ask Questions 4.050	3. Extra Study Time 4.720	3. Ask Questions 4.720
4. Instructor Know 3.978	3. Tutor 4.720	4. Extra Study Time 4.640
5. Remind You're Good 3.731	4. Ask Questions 4.360	5. Tutor 4.280
6. Relaxation 3.667	5. Discuss Counselor 3.840	6. Extra Books 3.480
7. Tutor 3.642	6. Remind You're Good 3.800	6. Remind You're Good 3.480
8. Extra Books 3.459	7. Discuss Students 3.760	7. Discuss Students 3.440
9. Discuss Students 3.430	8. Extra Books 3.600	8. Discuss Counselor 2.960
10. Discuss Counselor 2.900	9. Relaxation 3.520	9. Relaxation 2.360

GUIDELINES FOR STUDYING MATHEMATICS

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INTRODUCTION:

The strategy needed for studying math is different than that needed to study other subjects. Most study skills workshops in colleges are given by guidance counselors or learning specialists. They tend to focus on subjects that emphasize reading, note-taking, and memorization. For the most part, they do not focus on technical areas (such as mathematics or physics) which emphasize problem solving. The purpose of these guidelines is to provide you with a study approach that can be specifically applied to mathematics. This work is part of a chapter in a text that I am currently in the process of writing.

GUIDELINES:

1. In class, focus on the method that is being explained. Most professors write the "rules" needed to solve problems on the blackboard. Copying these rules and any related examples is sufficient. It is not necessary to write down every word your professor says. Do not "take dictation." Unlike in humanities or social science courses, you will not be asked to write a lot of detailed information in an essay format. Rather, you will be asked to utilize concepts and techniques to solve problems. Your approach to note-taking should be based on this objective.

2. Unless your professor specifically states that he or she does not want to be interrupted during class, you should raise your hand to ask a question if confused. Most of the time in mathematics, if you do not understand the first concept, you will not understand most (or all) of what follows. In general, learning mathematics is cumulative. Each new technique builds on, and therefore obviously assumes you understood the techniques that preceeded it. This is not necessarily true in most social sciences and humanities courses, with the possible exception of foreign languages.

I always tell my students that "if you don't understand a certain concept, chances are many of your classmates don't either." Therefore, by raising your question, you are helping your colleagues as well as yourself. Nonetheless, some students (and faculty) feel that if too many questions are asked, the continuity of the lesson will be interrupted. If you sense that your third or fourth question will impede the lesson, then it probably would be best if you waited until after class to ask it. Often, instructors will recommend this, especially if the question pertains to a topic that was already covered in a previous lesson or will not be covered until a future lesson.

3. Be sure to stay up to date with your homework assignments. You must practice math to become proficient in it. Unlike most humanities courses, mathematics does not require a lot of reading or a lot of memorization. It is a skill that emphasizes reasoning and problem solving. Learning math is like learning to play a sport or a musical instrument. For example, if you were taking piano lessons and you always watched your teacher play but never touched the keyboard yourself, do you think you could give even a simple recital? The same is true for math. Just "watching" your instructor solve problems in class does not at all mean that you will be able to do so. You must practice solving problems on your own at home. You will learn a lot more if you first struggle with a problem and then see your instructor work it out (at the next class or lab meeting) as opposed to never looking at it until someone else puts it on the blackboard.

4. Before you attempt a homework assignment, you should review your classnotes. Go over the examples that were done in class and make sure you understand them before you start the homework problems. You might even want to keep your classnotes in front of you as a reference when you are first starting your homework. Try to relate the homework problems to the examples that were previously done in class.

5. Stay up to date. I am not suggesting that you "cram" any subject but again, unlike certain other areas, math is virtually impossible to cram because there is such a strong emphasis on sequential understanding. So, do your homework after every class meeting so that your understanding (not your confusion) will grow. In fact, most of my students who keep up to date find that they only need to study minimally before an exam. A quick review of their already completed homework assignments usually suffices to refresh their memory.

6. Do not feel embarrassed or frustrated if you get stuck. Ask your professor, lab instructor, or tutor for help. Many students are afraid to visit their instructors during office hours. Most professors will gladly help students during office hours as long as they feel the student first tried the assignment (even if he was not successful) on his own. In other words, you should regard your professor as a supplement to, not a replacement for your own studying.

7. Many students struggle with mathematics. If you are one of them, you should realize you are not alone. Now more than ever, countless numbers of students are returning to school after being away for many years. Many have forgotten the math they learned years ago. Others may never have learned the material that they now need to master. Although you may feel frustrated at times, do not give up. Stay up to date, ask for help if you need it, and have confidence in yourself. Be an active learner. By the end of the semester, you may even conclude that when approached properly, studying math can be a rewarding experience.