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THE RELATIONSHIP BETWEEN STUDENTS' PERCEIVED SELF-EFFICACY

ON DESIGNATED SKILLS AND THEIR ACADEMIC ACHIEVEMENT IN A

THIRD-YEAR FAMILY MEDICINE CLERKSHIP

A Dissertation

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DOCTOR OF PHILOSOPHY

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DEBORAH S. CACY

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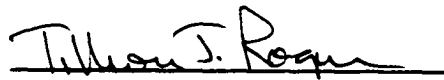
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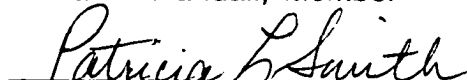
A Dissertation APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

BY

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I have been blessed to have been guided by three mentors in the pursuit of my doctorate. Without the encouragement and the strong support of my dear friend, Sonia Crandall, I am not sure that I would have seriously considered embarking on my doctoral journey at all. She has made learning about research practical as well as a great deal of fun. Thank you, Sonia.

I do not believe I have successfully conveyed to Paul Kleine how honored I felt when he agreed to be the chair of my doctoral committee. He was much in demand, and I felt at the time (and still do) that is was nothing short of a minor miracle that he took me on. I am so thankful that he did. Paul instills in his students the desire to grow intellectually far beyond their initial expectations of themselves. Thank you, Paul, for all of your guidance and support.

And my third mentor has been my husband, Jim Cacy. Jim has had the toughest job of all for he has been on call 24 hours a day since the day we married. I consider my husband, Jim, who is also an Educational Psychologist, a true renaissance man and scholar. As all three of my mentors are only too aware, I question almost everything. Jim has been the one to whom I have turned at all hours of the day and night to help me understand concepts that he mastered years ago. I am sure I have been a real trial, and I want to thank you again, Jim, for sharing not only your knowledge with me but also your life.

DEDICATION

This dissertation is dedicated to my father, Lowell Cheatwood, who emphasized to his children the importance of a good education.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

This study explored the relationship between third-year medical students' self-efficacy and their academic achievement on a third-year family medicine clerkship rotation. The sample size was 103 participants, and the mean age of the participants was 27 years (SD = 4.14). There were 68 male students and 35 female students who participated in the study. The self-efficacy questionnaire was administered prior to the rotation and again the last week of the rotation prior to performance assessments. Performance was measured by an oral examination, a written examination and a preceptor-assessed clinical evaluation.

The results revealed moderate correlations between the pre-rotation self-efficacy scores and the oral exam scores ($r = .22$, $p < .05$) and the post-rotation self-efficacy scores and the clinical scores ($r = .24$, $p < .02$). There was a negative correlation found between the self-efficacy gain scores and the written exam scores ($r = -.25$, $p < .05$). Significant differences were found between the self-efficacy scores (pre- and post-rotation) of the students who completed the family medicine clerkship rotation during the first six months (early group) and those who completed the rotation during the last six months (late group) of the academic year, but no difference was found between the performance measures of the two groups. The self-efficacy measures and the performance measures of the males and females were compared and no gender differences were found.

The results of this study did not reflect as strong a relationship between the self-efficacy measures and the academic performance measures as was anticipated, but it may well be that the predictive power of the construct of self-efficacy, with regard to academic performance, flattens out beyond certain levels of efficacy and ability. Implications for further research of medical students' self-efficacy and its relationship to their academic performance are discussed.

In addition, a principal components analysis of the self-efficacy items (pre- and post-rotation) revealed a transformation in the clerkship students' knowledge structure of patient care. The influence of the family medicine clerkship experience on the different factor loadings (pre-and post-rotation) is discussed.

The Relationship Between Students' Perceived Self-Efficacy on Designated Skills and Their Academic Achievement in a Third-Year Family Medicine Clerkship

CHAPTER 1

Introduction

Soon after the publication of Bandura's (1977) investigations of self-efficacy and coping behaviors, investigators recognized the relevance of self-efficacy theory in the educational setting, and researchers began exploring the influence of self-efficacy on students' achievement behaviors. Some of the areas of educational research relating self-efficacy to achievement behaviors that have been investigated in recent years have included learners' cognitive skills (Bandura, 1989; Brown, Lent, & Larkin, K.C., 1989; Campbell & Hackett, 1986; Corno & Mandinach, 1983; Multon, Brown, & Lent, 1991; Relich, Debus, & Walker, 1986; Schunk & Carbonari, 1984; Schunk, 1989; Zimmerman & Martinez-Pons, 1992), social skills (Ladd & Price, 1986; Lee, 1984; Perry, Perry, & Rasmusson,1986), motor skills (Barling & Abel, 1983; Lee, 1982; Weinberg, Gould, & Jackson, 1979), and career choices (Clement, 1987; Hackett, 1985; Hackett & Betz, 1992; Lent, Brown, & Larkin, 1986; Lent, Lopez, & Bieschke, 1991) as well as studies of teachers' sense of efficacy (Ashton & Webb, 1986; Vanek et al., 1996). The area of research most relevant to the present study of medical students' academic performance is the research relating self-efficacy to achievement behaviors in the area of cognitive skills.

Many of the studies in this area of self-efficacy research have focused on children and adolescents in traditional education settings (Bandura & Schunk, 1981; Brown & Inouye, 1978; Keyser & Barling, 1981; Kloosterman, 1988; Norwich, 1987; Pintrich & De Groot, 1990; Relich, et al., 1986; Schunk, 1981; Schunk & Gunn, 1986; Zimmerman & Martinez-Pons, 1990). I was able to locate studies relating self-efficacy to the academic achievement of undergraduate college students, but none that related self-efficacy to the academic achievement of graduate students or medical students. This appears to be an area of research that has been neglected. However, before describing the present study, self-efficacy theory, the theoretical framework upon which the study is based, will be reviewed.

Self-Efficacy Theory

In social cognitive theory (Bandura, 1986), motivation is goal-directed behavior initiated and sustained by individuals' expectations regarding the anticipated outcomes of their actions, self-efficacy for performing those actions, and self-evaluation of their progress towards their goals. The incentive for change is created when individuals become aware of the difference between their goals and their current levels of performance. As individuals pursue their goals, they evaluate the progress they are making towards them, and this perception of progress sustains motivation and self-efficacy. The accomplishment of a goal validates self-efficacy and outcome expectations and encourages the setting of new goals. (Schunk, 1992)

"Self-efficacy," is a major construct in Bandura's (1986) social cognitive theory, and a key factor in self-regulatory

2

mechanisms governing individuals' motivation and action. It is defined as an individual's ability to organize and perform the appropriate actions needed to accomplish specific tasks, and "perceived self-efficacy" is one's perception of that ability. In this study the terms "self-efficacy" and "perceived self-efficacy" will be used interchangeably.

It is important to differentiate self-efficacy from outcome expectation. Self-efficacy is the belief in one's ability to perform the appropriate action needed to accomplish a designated task, whereas an outcome expectation is one's belief in the consequence of that action. Although expectations of anticipated outcomes influence one's actions, one's efficacy judgements impact beliefs regarding the expected outcomes of one's actions.

Bandura (1986) described self-efficacy as a generative capability comprised of cognitive, social, and behavioral subskills which must be organized and integrated into appropriate actions. Accomplishing one's goal often involves generating different strategies and persevering even after early attempts have failed. In this way new subskills are developed and behavior patterns are formed.

Since self-efficacy influences behavior, ways of thinking and emotional reactions (Bandura, 1986), accurate assessment of one's capabilities, perceived self-efficacy, is important. Overestimation may cause unnecessary failures, and underestimation the avoidance of challenging and rewarding activities. The most useful efficacy choices are ones which slightly exceed an individual's abilities and direct the individual to realistically, challenging tasks.

Efficacy judgments influence expenditure of effort and persistence. Researchers (Andrews & Debus, 1978; Bandura, 1977; Bandura, 1986; Weiner, 1979) have demonstrated that individuals who perceive themselves as highly efficacious are more likely to blame their failures on a lack of effort and persist in trying to find solutions to challenging tasks. Those with comparable skills but lower perceived self-efficacy are more likely to blame their failures on lack of ability and give up easily.

According to Bandura (1986) the following factors can negatively affect the relationship between self-efficacy and action:

- disincentives
- performance constraints
- consequences of misjudgment
- temporal disparities
- faulty assessments of self-percepts
- faulty assessments of performance
- misweighting requisite subskills
- obscure aims
- performance ambiguity
- faulty self-knowledge   (pp. 395-398)

In addition, Bandura (1986) described three dimensions upon which self-efficacy may vary that can impact performance. First, efficacy judgments differ in level. With regard to the level of difficulty of specific tasks within a particular domain, the self-efficacy of different individuals may be limited to simpler tasks or may extend to more difficult ones. Second, perceived self-efficacy varies in strength. Stronger perceived self-efficacy is associated

not only with the selection of more challenging activities, but also with greater persistence, effort, and success in performing those activities. Third, perceived self-efficacy differs in generality or the degree to which an individual's self-precepts extend across tasks in different domains.

Bandura (1986) described four primary sources of information upon which self-knowledge of one's efficacy is based. These are listed in descending order of influence:

- (a) enactive attainment (task performance),
- (b) vicarious experience (observation of others),
- (c) verbal persuasion that one can perform the task,
- (d) physiological states (e.g., muscle tenseness).

It is important to note that information from these four sources does not influence self-efficacy directly. The impact on perceived self-efficacy is determined by the way the information is cognitively appraised by the individual.

According to Bandura (1986), the most influential source of efficacy information is enactive attainment because it is based on "hands-on" experience. In general, successful personal experiences will raise one's efficacy and failures will lower it; however, the effect of new experiences on an individual's self-efficacy is dependent upon the strength of that person's preexisting self-perceptions. Enhanced self-efficacy effects tend to generalize to other situations, but they are more likely to generalize to similar tasks.

Self-efficacy appraisals are also influenced by vicarious experiences. Although vicarious experiences are usually weaker

than enactive ones, they can produce significant, lasting changes. One's self-precepts of efficacy can be raised by observing others, who are considered by the individual to be similarly competent, succeed at a particular task. However, observing similar others putting forth effort and failing can lower precepts of efficacy and undermine the individual's efforts. Individuals are more likely to rely on vicarious information regarding specific tasks when they do not have direct knowledge of their own capabilities.

Verbal persuasion may not have the power to create lasting increases in self-efficacy; however, if a performance appraisal is perceived by an individual to be reasonable, it can encourage an individual to put forth more effort. It is important to remember that verbal persuasion can also undermine perceived self-efficacy since efficacy appraisals are easily disconfirmed if the individual should fail.

In stressful situations individuals often consider physiological states such as muscle tenseness or emotional arousal as an indication of vulnerability or impairment. Individuals are more likely to associate success with a more relaxed, less tense physiological state. According to Bandura (1986), treatments that alleviate emotional arousal increase perceptions of self-efficacy and are associated with improved performance.

Statement of the Problem

For many years of an individual's life, school is the principal setting for the development and social validation of cognitive efficacy. Bandura (1986) emphasized that it is in this setting that individuals acquire knowledge and problem solving skills and develop their cognitive competencies. For some individuals school extends well into their adult years as is the case for students enrolled in medical school. Greater perceived self-efficacy or confidence in performing a task has been associated with greater involvement in an activity as well as persistence, effort, and success in performing that activity (Bandura, 1986). Therefore, attention should be given to medical students' self-efficacy as well as to the knowledge and skills needed to perform successfully in medical school (Tresolini & Stritter, 1994).

How confident are our third-year medical students initially that they can perform the skills necessary for academic achievement on a Family Medicine Clerkship rotation? How confident are they upon completion of that rotation? Is there a relationship between their perceived self-efficacy on designated skills and students' academic achievement? Is there a difference between the self-efficacy scores of male and female students? Are there clusters of skills or knowledge that correlate more highly with the clerkship performance measures? In order to answer these questions, I propose to answer the following seven research questions.

The first research question is: What is the relationship between students' perceived self-efficacy on designated skills and

their academic achievement in a Third-Year Family Medicine Clerkship that include these designated skills? This research question has three components that will be addressed:

(1) Is there a relationship between the students' perceived self-efficacy scores on designated skills prior to the Family Medicine Third-Year Clerkship and each of the following measures of academic achievement:

- the written examination score?
- the oral examination score?
- the clinical score?

(2) Is there a relationship between the students' self-efficacy scores on designated skills upon completion of the Family Medicine Third-Year Clerkship and each of the following measures of academic achievement:

- the written examination score?
- the oral examination score?
- the clinical score?

(3) Is there a relationship between the students' self-efficacy gain scores (the score calculated by subtracting the pre-rotation self-efficacy score from the post-rotation self-efficacy score) on designated skills upon completion of the Family Medicine Third-Year Clerkship and each of the following measures of academic achievement:

- the written examination score?
- the oral examination score?
- the clinical score?

The second research question I propose to answer is whether the self-efficacy scores of students enrolled in the Family Medicine Clerkship rotation during the second half of the academic year (after having completed several other clinical rotations in other specialty areas of medicine prior to the Family Medicine Clerkship rotation) are significantly higher than the self-efficacy scores of the students completing the rotation during the first six months of the academic year (who have completed fewer clinical rotations prior to the Family Medicine Clerkship rotation).

As there is an increasingly higher proportion of females enrolled in medical schools, with the current national average of 41% (Bickel, Galbraith, & Quinnie, 1995), I am also interested in investigating whether there is a difference between the self-efficacy scores of the males and females enrolled in the Third-Year Family Medicine Clerkship. The third research question I propose to answer is whether there is a significant gender difference with regard to the:

- pre-rotation self-efficacy scores?
- post-rotation self-efficacy scores?
- self-efficacy gain scores?

The fourth research question I propose to answer: Are there significant differences between the male and female students with regard to the three performance measures?

The fifth research question I propose to answer: Are there particular clusters of items (factors) in the Family Medicine Clerkship Self-Efficacy Questionnaire that correlate significantly with the performance measures?

9

The sixth research question I propose to answer: Are there significant correlations between any of the factor scores (pre and post) and any of the performance scores?

The seventh research question I propose to answer: Are there significant differences between the factor scores of the male students and the female students?

Significance of the Study

I was unable to locate any articles that addressed the generalizability of self-efficacy theory to academic achievement in medical education. This study will contribute to the medical education literature by addressing that question of generalizability. If it can be established that there is a relationship between medical students' self-efficacy and their academic achievement in a medical school setting, then hopefully more medical educators would see its value and usefulness in the instructional design of medical school curriculum. Of particular interest to this Family Medicine educator is whether there are particular clusters of items on the Family Medicine Self-Efficacy Questionnaire which correlate significantly with the performance measures. If so, then particular attention should be paid to the instruction and practice of those particular skills during the Family Medicine Clerkship rotation.

Limitations of the Study

Correlations obtained in a relationship study cannot establish cause-and-effect relationships between the variables correlated. At best a relationship study can provide information regarding the degree of relationship between the variables in the study. Because this is a relationship study and not experimental in design, it was

difficult to control for extraneous variables that may have jeopardized the internal validity of the study.

Based on Bandura's (1986) theory of self-efficacy, the use of aggregate efficacy measures of performance rather than micro-analytic measures of individual tasks may have weakened the strength of the relation between efficacy scores and academic performance scores. However, the use of aggregate measures is also more representative of real-world academic measures of performance. Additionally, the intellectual homogeneity and age of the participants may have been limiting factors in the variability of the performance scores.

Related Literature

<u>Criteria for Inclusion</u>

I conducted computer searches of Medline, Educational Resources Informations Center (ERIC), and Psychological Abstracts data bases using the following search terms:

- self-efficacy
- personal efficacy
- self beliefs
- perceptions of personal ability
- perceived ability
- self-confidence
- perceived confidence

in order to obtain the relevant literature published during the period 1977 (the year Bandura introduced self-efficacy theory) through 1995. I then examined the reference lists of all relevant articles obtained through the computer searches for additional published articles.

Finally, I reviewed the tables of contents of every issue of <u>Teaching and Learning in Medicine</u>. This was the journal in which I found the only article published in the medical education literature in which the relationship between self-efficacy and medical students' academic activities was investigated.

I have included in my literature review two of Bandura's earliest studies on self-efficacy research and one meta-analytic study of the relation of self-efficacy beliefs to academic outcomes.

I believe these studies offer an important theoretical framework from which to review the other self-efficacy studies included in my review of the literature. I was able to locate only two studies in the medical education literature that investigated medical students' self-efficacy. Although neither of these studies related student self-efficacy to achievement, I believe it was important to establish the contexts in which the construct had been studied with regard to medical students. Except for these five studies, to be included in a review of the relevant literature, a study had to provide the following:

(a) an academic, task specific measure of self-efficacy, an aggregate measure of academic self-efficacy, or a college-level career self-efficacy measure;

(b) a measure of academic performance or achievement (e.g., course grades, grade point average); and

(c) participants who were undergraduate college students or graduate level college students.

Fourteen studies met the criteria for inclusion in the review of relevant literature. These articles will be discussed later in this chapter, but a discussion of self-efficacy research would be incomplete without a review of two of Bandura's seminal studies of self-efficacy research.

Early Studies Investigating the Theory that Psychological

Procedures Achieve Changes in Behavior by Altering the Level and

Strength of Self Efficacy

Bandura, Adams and Beyer (1977)

In early self-efficacy research, Bandura and his colleagues (1977) administered a behavioral pretest to adults who had a phobia of snakes. The pretest consisted of encounters with a snake which became increasingly more threatening (e.g., approaching the caged snake, touching the snake, holding the snake). Due to the participants' snake phobias, very few tasks were performed by the participants during the pretest. Self-efficacy was assessed by having the participants specify which of the tasks they felt they could perform and the level of certainty at which they believed they could perform each of those tasks.

Participants were assigned to one of the following treatment conditions: modeling, participant modeling or control. In the modeling group participants observed therapists who modeled the criterion tasks with a snake. In the participant modeling group, participants not only observed therapists model the criterion tasks with a snake, but they also engaged in the criterion tasks with the therapists. In the control group, the participants received assessments but no training. Following training, the self-efficacy and approach behaviors of all participants were reassessed for the criterion tasks.

There was a considerable increase in self-efficacy from pretest to posttest in the participant modeling group, a moderate

increase in the modeling group and no change in the control group. Both participant modeling and modeling treatments showed significant increases in approach behaviors (criterion tasks) with participant modeling showing the greatest increases.

The microanalytic measure of congruence between posttest self-efficacy and performance was obtained by comparing each participant's efficacy judgment for each task at the end of treatment and computing the percent of accurate correspondence between efficacy judgment and actual performance. Correspondence percentages for each of the treatment groups were 86% (modeling), 89% (participant modeling), and 90% (control).

Bandura and Adams (1977)

As a follow-up to the first study, Bandura and Adams (1977) designed two experimental studies to test self-efficacy theory of behavioral change. In the first follow-up study, adults with snake phobias were administered pretreatment efficacy and behavioral assessments prior to a systematic desensitization treatment. The participants were then trained in deep muscular relaxation techniques. While they were deeply relaxed, they were instructed by the therapist to visualize themselves performing increasingly more threatening and anxiety-provoking activities involving snakes. This procedure was continued until participants' anxiety reactions to the most threatening snake-related activities were completely eliminated.

Efficacy expectations were measured prior to and after the behavioral posttest. Bandura and Adams (1977) found that desensitization treatment did increase the participants' self-

15

efficacy. The results of the study revealed the higher the level of perceived self-efficacy at the completion of treatment, the higher the level of approach behavior ($r = .75$, $p < .01$). However, as Bandura and his colleagues pointed out, the correlations based upon aggregate measures did not fully reveal the degree of correspondence between self-efficacy and performance on the specific tasks from which the aggregate measures were obtained.

In keeping with his theory of self-efficacy, the most precise index of the relationship would be provided by a microanalysis of the congruence between self-efficacy and performance at the level of individual tasks. When measured this way, the efficacy-behavior congruence was 84%.

In the second study, Bandura and Adams (1977) investigated the process of efficacy and behavioral change during the course of treatment. Six snake phobics were administered a behavioral pretest that assessed 29 tasks that were divided into 11 hierarchical blocks. Each of these blocks of tasks required increasingly more threatening interactions with a boa constrictor. The treatment procedures were administered to the participants on an individual basis. First, the therapist modeled all 29 of the tasks while the participants observed from a distance. The participants then received the participant modeling treatment for the block of tasks they failed in the behavioral pretest.

After successful completion of each treatment block of tasks, the participants completed self-efficacy assessments of the 29 tasks. The behavioral avoidance test was then administered. The participants followed this process of treatment on the failed block

of activities, followed by self-efficacy assessment, and behavior assessment until they achieved terminal performances in treatment.

Although all of the participants achieved terminal performance levels in treatment, there was considerable posttest variability. The results of the study revealed that efficacy judgments prior to the posttest predicted participants' actual performances better than their performances in treatment. As measured at different points in treatment, self-efficacy predicted actual performance in 92% of the total assessment tasks.

Meta-Analysis of the Relation of Self-Efficacy Beliefs to Academic Outcomes

Multon, Brown and Lent (1991)

Multon, Brown and Lent (1991) completed a meta-analysis designed to test the hypotheses that self-efficacy beliefs relate positively to academic performance and persistence. They also examined possible moderators of those relationships. Of relevance to the present study is the relation between self-efficacy beliefs and academic performance.

Multon, Brown and Lent (1991) included 38 samples from 36 studies published between the years 1977 (the year Bandura introduced self-efficacy theory) and 1988 in their meta-analysis of academic performance. The 36 studies met their criteria for inclusion by providing the following: (a) a measure of self-efficacy, (b) a measure of academic performance or persistence, and (c) sufficient information to calculate appropriate effect size estimates.

17

The effect size estimate used in the meta-analysis was r_u, the unbiased correlation between self-efficacy and performance for the studies used. A total of 4,998 subjects from 38 samples (M = 131.5 subjects, Mdn = 84.0, range = 28 to 536), with an average age of 16.6 years (SD = 12.6) were included. The majority of the samples involved elementary school children (60.6%), but college students were also included (28.9%), and the samples were approximately equally divided between normal-achieving (55.3%) and low-achieving (42.1%) students.

Three conceptual categories emerged from the 19 different measures of academic performance used in the 38 studies, and the authors used these three categories to code the 19 academic performance measures. The three categories included: (a) standardized achievement tests (e.g., Iowa Test of Basic Skills) in 10% of the studies, (b) classroom-related measures (e.g., course grades) in 24% of the studies, and (c) basic skill tasks (e.g., subtraction problems) in 66% of the 38 studies. In 19 of the studies the effect sizes were computed from posttreatment data, and in the other 19 studies the effect sizes were computed from pretreatment or correlational data.

The meta-analysis revealed a positive and statistically significant relationship between self-efficacy beliefs and academic performance outcomes. The unbiased effect size estimate (r_u) .38 with a 95% confidence level suggested that across different types of student samples, study designs, and criterion measures, self-efficacy beliefs accounted for approximately 14% of the variance in students' academic performance. The meta-analysis also indicated

significant heterogeneity among effect size estimates which the authors believed suggested that the relationship of self-efficacy to performance might vary across different types of students, criterion measures and study designs.

The analyses of performance variables revealed four conditions that moderated effect sizes. The first variable was the amount of time during which self-efficacy beliefs and performance measures were assessed. The authors found stronger relationships when effect sizes were estimated from posttreatment (.58) than from pretreatment or correlational data only (.32). They contended that this effect size difference suggested that self-efficacy enhancing strategies used in the experimental studies (eg., modeling and feedback) might have been associated not only with changes in efficacy beliefs but might also have acted to enhance self-efficacy performance relationships.

They also found that the relation of self-efficacy to academic performance varied by students' achievement level. Stronger relations were found among lower-achieving students (.56) than were found among normal-achieving students (.33). The authors pointed out that one explanation for this might be that self-efficacy enhancing strategies were particularly helpful for low-achieving students. Another explanation might be that it was an artifact of the way effect size estimates were calculated for the two different academic levels of students. For the low-achieving students the effect size estimates were calculated primarily from posttreatment data and for the normal-achieving students they were calculated mostly from pretreatment or correlational data.

Participant age was the third factor they found that moderated the relation between self-efficacy beliefs and academic performance. Within the normal-achieving range, the high school (.41) and college student (.35) samples showed stronger effect sizes than did the elementary school students (.21). As the authors stated, one interpretation might be that high school and college level students have had more opportunity to develop skills of efficacy self-assessment. They pointed out that rather than viewing self-efficacy enhancing strategies as possibly being lost on younger students, that the strategies might act to accelerate more accurate self-appraisals.

Type of performance measure was the fourth moderator. Basic skills performance measures produced the strongest effect sizes (.52), followed by classroom-based performance measures (.36), and standardized achievement tests (.13). These findings support Bandura's assertion that the nature of self-efficacy beliefs is task- and domain-specific, and is best measured task-specifically (Bandura, 1986).

Studies of College Level Career Efficacy

The studies in this section were conducted by researchers who investigated career efficacy at the college level. Although the foci of these studies were more global than the present study, the author found few studies for which the primary focus of the investigators was strictly on academic self-efficacy at the college or graduate course level. The investigators of these studies did relate career self-efficacy to academic achievement in specific college courses

or to course GPA, and for that reason these studies have been included in the literature review.

Lent, Brown and Larkin (1984)

The primary purpose of this study was to examine the relationship of college students' self-efficacy beliefs to their persistence and success in the pursuit of science and engineering college majors. In addition and of particular interest to this author, these investigators examined the relation between self-efficacy and objective measures of academic achievement. That component of the study will be reviewed here.

The study included 42 participants (28 males and 14 females) who were enrolled in a 10-week career/educational course for students considering science and engineering majors and careers. Participants were mostly freshmen and sophomores, and the mean age of the participants was 20 (SD = 3.5). All of the students completed the pretest, posttest and the follow-up test. However, academic outcome data were available for only 37 of the participants so only the results of those 37 participants will be discussed.

The self-efficacy measures used in this study were constructed based on the procedures used by Betz and Hackett (1981) and Bandura, Adams, Hardy & Howells, (1980). The participants completed the self-efficacy scales during the first class session, during the final class session, and eight weeks after the final class session. Educational requirements and job duties were listed for 15 science and engineering fields, and students were asked to indicate whether or not they believed they could successfully complete them.

The number of fields that participants indicated they could complete were summed to obtain the level scores.

Strength of self-efficacy was assessed by asking participants to indicate their degree of confidence that they could complete the requirements and duties. They indicated their degree of confidence on a 10-point scale that ranged from 1 (completely unsure) to 10 (completely sure). Strength scores were calculated for each participant by summing the strength estimates and dividing by 15 which was the total number of major/career fields listed. Strength ratings were calculated only for the fields that participants indicated they could complete. The researchers were then able to examine four aspects of self-efficacy with regard to science and engineering achievement: level and strength of self-efficacy for educational requirements (ER-L and ER-S) and level and strength of self-efficacy for job duties (JD-L and JD-S).

The academic performance measures consisted of cumulative grade point average (CGPA) one year after the course, and grade point average one year later in science or technical course work (TGPA).

The following were the test-retest correlations for the self-efficacy scales from the last class session to the 8-week post follow-up (with no intervention between): .58 for level of job duties (JD-L), .84 for strength of job duties (JD-S), .76 for level of self-efficacy for educational requirements (ER-L), and .89 for strength of educational requirements (ER-S) (all at $p < .001$). The coefficient alpha values used to assess internal consistency of the scales at pretest were as follows: JD-L .80, JD-S .85, ER-L .79, and ER-S .89.

At pretest the two educational requirements scales had a correlation of .81, and the two job duties measures also had a correlation of .81.

The researchers divided the participants into high- and low-self-efficacy groups based on their ER-L and ER-S scores at follow-up. Participants scoring in the upper third of the distribution on the two scales were designated as the high-self-efficacy group and participants scoring in the lower third were designated as the low-self-efficacy group. The researchers explained the reason they chose to use the educational requirement scales was because they believed those two scales were most conceptually related and specific to the academic criteria of interest.

Multivariate analyses were computed on the means and standard deviations on the CGPA and TGPA for the high- and low-self-efficacy groups, and revealed significant mean differences between the two ER-L groups, Hotelling's $T2$ $(3, 20)$ = 11.93, $p < .05$; and also between the two ER-S groups, Hotelling's $T2$ $(3, 21)$ = 18.48, $p < .01$. Univariate t-tests produced significant differences between high- and low- self-efficacy groups in all but one instance: high- and low- ER-L groups differed on the TGPA variable at only the $p < .11$ level. The differences favored the high-self-efficacy participants in every comparison, and the results indicated that the high-self-efficacy participants generally achieved higher grades.

The authors pointed out that the results were impressive considering the global nature of the self-efficacy and academic outcome measures used in their study. The authors suggested that compared to many of the earlier studies on self-efficacy in which

23

more specific target behaviors were examined, their study examined a more highly complex set of academic behaviors and still found significant relations between self-efficacy beliefs and academic performance. The authors indicated that the results of their study suggested self-efficacy might be a relatively robust and flexible model that might help explain complex as well as relatively discrete behaviors (p. 360). This study was relevant because the performance measures consisted of a highly complex set of academic behaviors as were the performance measures in the present study.

Lent, Brown and Larkin (1986)

The primary purpose of this study was to extend the findings of the Lent et al. (1984) study by assessing the extent to which the measure of efficacy beliefs together with measures of the following variables: career indecision, self-esteem, and expressed vocational interests, and range of perceived vocational options relative to technical/scientific fields predicted academic grades, persistence and perceived career options in students considering science and engineering fields. Of relevance to the present study was the assessment in this study of how well self-efficacy beliefs predicted academic grades.

There were 105 college students (75 men and 30 women) included in this study. The students were enrolled in two sections of a 10-week career/educational planning course for undergraduates who were considering science and engineering majors and careers. The majority of the participants were freshmen and sophomores and their mean age was 20 years (SD = 2.86). Participants completed

measures of the variables listed above during the first and last class sessions of the course.

The researchers used one of the self-efficacy indices, the educational requirements scale, that had been used in the Lent et al. (1984) study. The authors developed another self-efficacy scale for this study that focused on more specific academic behaviors than did the earlier scale. The self-efficacy measures for the educational requirements scale was constructed based on the procedures used by Betz and Hackett (1981). Educational requirements and job duties were listed for 15 science and engineering fields, and students were asked to indicate whether or not they believed they could successfully complete them. The number of fields that participants indicated they could complete were summed to obtain the level scores (ER-L).

Strength of self-efficacy (ER-S) was assessed by asking participants to indicate degree of confidence that they could complete the educational requirements and job duties. They indicated their degree of confidence on a 10-point scale that ranged from 1 (completely unsure) to 10 (completely sure). Strength scores were calculated for each participant by summing the strength estimates and dividing by 15 which was the total number of major/career fields listed. Strength ratings were calculated only for the fields that participants indicated they could complete.

The researchers were able to examine two aspects of self-efficacy with regard to science and engineering achievement: level and strength of self-efficacy for educational requirements (ER-L and ER-S). Test-retest correlation for ER-S from the first class to the

25

last (8-weeks with no intervention) was .89. To estimate internal consistency reliability, they calculated an alpha coefficient which was also .89. Only the ER-S was used in this study because the researchers believed it to be more conceptually relevant to the academic criteria of interest and because they believed the information contained in the level measure was effectively subsumed in the strength measure.

To test a less global measure of self-efficacy, Lent, et al. (1986) developed another measure that they believed was more task-specific. They named this second measure, strength of self-efficacy for academic mile-stones (AM-S). Students were asked to rate their ability to perform specific accomplishments necessary for academic success in science and engineering majors (e.g., "complete the mathematic requirements for most engineering majors," p. 266). The students rated their confidence on a 10-point scale that ranged from 1 (completely unsure) to 10 (completely sure). The ratings were summed across items and then divided by the number of items (11) which gave the researchers the students' AM-S measures. The coefficient alpha for this scale was computed on the pretest data and it was .89.

The academic performance measure used in this study was the students' grade point average in science and technical course work (TGPA) one year after the study.

Self-efficacy scores were combined over gender and course sections for further analysis after they were subjected to a three-way repeated measures analysis of variance (Gender X Course

Section X Pre-Post), and the results showed no significant main or interaction effects.

As in the earlier study (Lent et al., 1984), the participants were divided into high- and low-self-efficacy groups, however, in this study the division was based on the posttest ER-S and AM-S scores. Participants scoring in the upper quartile of the distribution were designated as the high-self-efficacy group and those scoring in the lower quartile were designated as the low-self-efficacy group. The two groups were compared on the academic outcome measure (TGPA). Significant mean differences were found for the two groups on the performance measure (ER-S, $t = 1.97$, $p < .05$; AM-S, $t = 2.78$, $p < .01$) with differences consistently favoring high-self-efficacy participants who achieved higher grades.

Hierarchical regression analyses were conducted to assess what self-efficacy added to the prediction of academic performance (TGPA) beyond measures of ability, achievement, and vocational interest. Self-efficacy was entered last into the regression equation of each analysis to determine its unique contribution in the prediction of performance. The researchers conducted separate analyses for the ER-S and AM-S measures. In predicting TGPA, the self-efficacy variables each accounted for additional significant variance beyond the other predictors (AM-S, $R^2 = .08$; ER-S, $R^2 = .04$). Differences between the contributions of AM-S and ER-S did not reach significance.

The researchers pointed out that although self-efficacy did add significant unique variance beyond ability and achievement measures in the prediction of academic performance, the size of

27

self-efficacy's practical contribution could be challenged. The authors indicated this pattern of relations was generally consistent with the self-efficacy model which they stated suggests that "efficacy beliefs provide valuable, but often not sufficient, information for predicting behavior" (Lent et al., 1986, p. 268).

Hackett, Betz, Casas, and Rocha-Singh (1992)

The primary purpose of this study was to examine the relation of self-efficacy measures to academic achievement in engineering programs. The participants included 218 students enrolled in the School of Engineering at a midsized West Coast university. The surveys were distributed and collected in required engineering courses. In addition, surveys were mailed to women and students of color who were not contacted during courses to ensure adequate representation. There were no significant differences between the students who completed the survey in class or the students to whom the survey was mailed on any of the variables. The majority of the participants were freshmen and sophomores and their ages ranged between 17 and 33 years (M = 19.70 years, SD = 2.04 years).

The self-efficacy questionnaire was adapted from the Lent et al. (1986) study and measured overall occupational self-efficacy and also self-efficacy for academic milestones. The researchers made only minor changes and additions to the instruments and these changes reflected institutional differences in program requirements. A subscale with 18 specific subareas in engineering was used to assess students' confidence in their ability to successfully complete the educational requirements for different science and engineering occupations.

Another subscale with 12 academic milestones was used to measure students' confidence in their ability to successfully complete the different core requirements in the engineering program. For both self-efficacy strength measures, the participants were asked to rate their confidence on a 10-point scale which ranged from 0 (no confidence at all) to 10 (complete confidence). The mean scores for both the occupational and academic milestones self-efficacy scores was computed by totaling the responses and dividing by the number of items within each subscale. The internal consistency reliabilities (Cronbach's alpha) was .95 for both the occupational self-efficacy scale and the academic-milestones self-efficacy scale.

The researchers used cumulative college GPA and spring quarter college GPA as their academic performance measures. GPAs were measured on a 5-point scale ranging from F (0) to A (4).

Both academic milestones self-efficacy and occupational self-efficacy were significantly related with college GPA measures (college GPA-spring and academic milestones self-efficacy, $r = .36$, $p < .001$; college GPA-cumulative, and academic milestones self-efficacy, $r = .39$, $p < .001$; college GPA-spring and occupational self-efficacy, $r = .19$, $p < .01$; college GPA-cumulative and occupational self-efficacy, $r = .25$, $p < .001$). Academic milestones self-efficacy was consistently the strongest predictor of performance when the authors ran two forward-selection stepwise multiple regression analyses. Academic milestones self-efficacy was entered into both equations first. For the prediction of spring quarter GPA, R was .57 (adjusted $R^2 = .30$) and academic milestones self-efficacy was

ß = .32. For the prediction equation for cumulative college GPA, R was .73 (adjusted R^2= .51) and academic milestones self-efficacy was ß = .30.

Studies Utilizing Basic Skill Tasks-Performance Measures

Meier, McCarthy, and Schmeck (1984)

The purpose of this study was to determine to what extent efficacy expectations predicted college writing performance. The participants in the study were 121 college freshmen enrolled in a remedial writing course (54%), a required freshman writing course (33%), or an honors writing course (13%).

Each participant wrote an essay during the first weeks of a 16-week semester writing course (phase 1) and another essay during the last weeks of the course (phase 2). The students also completed a self-efficacy instrument that consisted of 19 items generated from course objectives from each of the three courses. They were ordered hierarchically by level of increasing difficulty as determined by agreement of subjects in a pilot study, a composition expert, and the researchers. The students completed the self-efficacy instrument prior to writing the first essay.

Magnitude of efficacy expectation (the total number of tasks participants believed they could perform) was measured by having students answer either "Yes" or "No" to each of the 19 writing tasks. The strength of efficacy (the level of certainty regarding ability to perform each of the tasks) was measured by having the students rate their ability for each of the 19 items on a 100-point scale, with 0 indicating complete uncertainty and 100 indicating total certainty. Strength score was a sum of the ratings for each of the items.

Test-retest reliability for a 1-week period revealed $r = .85$ for efficacy strength and $r = .84$ for efficacy magnitude.

Writing performance for phase 1 and phase 2 was evaluated by four raters trained in composition assessment. The raters based their assessment of writing performance on the 19 tasks represented in the self-efficacy instrument. Raters had no knowledge of whether the compositions they were rating were from phase 1 or phase 2. Interrater reliability was determined by calculating an alpha coefficient on a sample of data analyzed independently by each rater. The interrater reliability for writing performance was estimated to be .92.

The researchers analyzed only the strength of efficacy expectation because of a ceiling effect for magnitude. The maximum possible score on the magnitude scale was 19 and the phase 2 mean was 18.26. Stepwise regression analyses of phase 1 and phase 2 data were conducted to measure the amount of variance in writing performance accounted for by efficacy strength. In addition to the self-efficacy and writing performance variables the following variables were also included in the regression model: outcome expectations, cognitive processing, affective (anxiety) and demographic variables. At phase 1 efficacy strength was significant ($R^2 = .18$), $F(1,39) = 8.46$, $p < .006$). At phase 2, efficacy was not a significant predictor. The authors hypothesized that efficacy expectations might be more important with regard to behavior when individuals experience strong risks with aversive consequences and that possibly by phase 2, the students did not perceive the writing task as aversive.

This study was relevant to the present study primarily because the sample included college level students and because it was a field study as opposed to a study in a laboratory setting. The study would have been more relevant to the present study had the researchers separated the participants by performance level when they estimated correlations between efficacy belief scores and performance measures. In addition, the performance tasks in this study were not closely related to the performance tasks in the present study.

Shell, Murphy, and Bruning (1989)

In this study the researchers examined the relation between self-efficacy and outcome expectancy beliefs and achievement in reading and writing. Of relevance to the present study were the data regarding the relationship between self-efficacy and academic achievement.

There were 153 participants (38 males and 115 females) in this study. The participants were volunteers recruited from undergraduate educational psychology classes at a midwestern state university. The majority of the participants were White and came from middle-class families.

Two self-efficacy instruments were used in the study and each instrument had two subscales, a task subscale and a component skill subscale. The instruments were developed by the researchers based on Bandura's (1982, 1986) methods. The participants rated confidence in their ability to complete the tasks listed in the instruments on a scale from zero (no chance) to 100 (complete certainty).

Reading self-efficacy was measured by an instrument that included a reading task subscale and a reading component subscale. For the reading task subscale, participants were asked to rate confidence in their ability to read and understand 18 different reading tasks, e.g., "read a letter from a friend or family member" (Shell, Murphy & Bruning, 1989, p. 99). For the reading component skill subscale, the participants were asked to rate their confidence in their ability to perform each of nine skills, e.g., "recognize parts of speech" (Shell, Murphy & Bruning, 1989, p. 99). Cronbach's alpha was computed to assess reliability which was .92 for the task subscale and .93 for the component skill subscale. Correlations between items and subscale scores were positive and exceeded .50 for all items, except Item 1, which exceeded .30.

Writing self-efficacy was also measured by an instrument that included a task subscale and a component subscale. For the writing task subscale participants were asked to rate confidence in their ability to successfully complete 16 different writing tasks, e.g., "write a letter to a friend or family member" (Shell, Murphy & Bruning, 1989, p. 99). For the writing component skill subscale, participants were asked to rate confidence in their ability to perform each of eight skills, e.g., "correctly spell all words in a one page passage" (Shell, Murphy & Bruning, 1989, p. 99). Cronbach's alpha was computed to assess reliability which was .92 for the task subscale and .95 for the component skill subscale. Correlations between items and subscale scores were positive and exceeded .40 for all items.

Reading performance was measured using the Degrees of Reading Power test (DRP; Touchstone Applied Science Associates, 1983). The instrument included 63 items that measured reading comprehension. KR-20 coefficients were used to measure reliabilities which reported to have ranged between .93 and .97 for different forms of the test. Correlations between the DRP and the California Achievement Test-70 (CAT-70) reading comprehension test were reported to have ranged between .77 (Grade 3) and .85 (Grade 8) for an urban school sample.

Writing performance was measured by giving the participants 20 minutes to write an essay on the topic: of what the students believed to be the qualities of a successful teacher. Two of the researchers independently scored the essays using a holistic scoring method which was developed by one of the researchers. The scoring method was reported to have been developed based on methods described by Cooper (1985). The raters were unaware of the identities of the participants and participants' scores on other measures. A final writing score was determined by averaging the scores of the two raters. Interrater reliability was .75.

Participants completed the self-efficacy instruments at the time they were recruited and asked to return the questionnaires at the time they were scheduled for reading and writing performance testing. Performance testing was administered in groups of 20-50 participants during one of five testing sessions. The first twenty minutes of each testing session was set aside for the timed writing test. The reading test was self-paced and followed the time writing test in each testing session.

The correlation between reading component efficacy and reading performance was $r = .53$, $p = .007$, and the correlation between reading task efficacy and reading performance was $r = .30$, $p = .007$. The correlation between writing component efficacy and writing performance was $r = .32$, $p = .007$ and the correlation between writing task efficacy and writing performance was $r = .17$, $p = .007$.

In their discussion of the results, the authors pointed out that there was a significant relation between self-efficacy beliefs and reading and writing performance for college students and that these beliefs were independent from actual performance skills. In addition, they noted that there was a stronger relation between reading self-efficacy and reading performance in their study than there was between writing self-efficacy and writing performance. They suggested that there was the possibility that the difference could have been attributed to reliability difficulties in scoring the writing samples, but that the difference was consistent with prior studies of self-efficacy beliefs and reading and writing performance. The authors stated that "there may exist real differences in the structure of the relations between beliefs and achievement for writing and reading" (Shell, et al., 1989, p. 97). They suggested that since the relation between self-efficacy and achievement increases as skill increases, the results of their study may have indicated that their participants' writing skills were simply not as well developed as were their reading skills.

Studies Utilizing Classroom-Related Performance Measures

Siegel, Galassi, and Ware (1985)

In this study the researchers compared the ability of two theoretical models to predict mathematics performance on a final mathematics examination. The first model was comprised of Bandura's (1997) social learning theory variables and it included situationally specific mathematics skills, incentives, self-efficacy expectations and outcome expectations. The second model the researchers called the math aptitude-anxiety model and it included the following variables: general mathematics ability (quantitative score of the Scholastic Aptitude Test), gender, sex role orientation, and mathematics anxiety.

The sample consisted of 97 women and 46 men for a total of 143 participants who were enrolled in the second semester of an introductory mathematics course at an eastern university. The course was required for some majors (e.g., business), but was not open to students whose majors were math, engineering or the physical sciences. The majority of participants (117) were freshmen. Participation in the study was voluntary and about half of the students who were enrolled in the course participated. The participants attended different sections of a standard lecture course taught by graduate assistants, used common course materials, and took the final examination. The participants completed all of the measures in the study.

Self-efficacy expectations were measured by asking the students to rate their ability to correctly solve each of 10 problems on the final exam immediately after reading the exam for the first

time. The researchers called this measure the Math Exam Self-Efficacy Scale. The students indicated on a 1- to 10-point scale (highly uncertain to completely certain) degree of confidence in their ability to answer each problem correctly. The level of self-efficacy score was determined by the number of problems out of 10 that the participants expected to answer with a confidence rating above 1. The strength of self-efficacy score was determined by summing the confidence ratings for each of the problems and dividing that number by the number of problems (10). The math efficacy scale was administered immediately prior to beginning the mathematics final exam. The internal consistency for the strength measure was determined using Cronbach's alpha and it was .87.

Forward entry (a priori ordered) multiple regression analyses were used to determine the amount of variance in the performance on the mathematics final exam that was accounted for by the variables included in the social learning theory and for the variables included in the math aptitude-anxiety model. Of specific relevance to the proposed study are the results of the strength of self-efficacy measure and the level of self-efficacy measure. Strength of self-efficacy as measured by the Math Exam Self-Efficacy Scale accounted for a modest (1.6%) amount of variance in math performance, $F(1, 137) = 4.73$, $p < .05$. The level of efficacy measure did not explain additional variance beyond the strength of self-efficacy measure, $F(1, 137) = .10$, $p > .05$. The two efficacy measures together did not account for a significant amount of variation, $F(2, 137) = 2.41$, $p > .05$.

The authors hypothesized that the population (college level) might have accounted for the lesser role that self-efficacy played in the prediction of academic performance in this study. This was one of the hypotheses suggested and discussed by the authors of the meta-analytic study (Multon, et al., 1991) reviewed earlier in this paper. In addition, the authors suggested that other methodological differences such as variables and order of entry into the regression equation might also have accounted for the variable role they believe self-efficacy has played in different studies with different target behaviors.

Wood and Locke (1987)

Wood and Locke conducted this study to examine the relationship between academic self-efficacy and performance in college classes. The researchers also obtained measures of academic grade goals and ability from four samples. The first sample of students was used to select and pilot valid items from a larger pool of self-efficacy measures. These items were then used with the three other samples.

Participants in samples 2 and 3 were college undergraduates enrolled in a junior level management course. There were 194 participants in sample 2 and 212 participants in sample 3. The participants in sample 4 (N = 111) were enrolled in a large undergraduate psychology course at the same university as the participants in samples 2 and 3. The authors did not offer any additional demographic data regarding the participants, nor did they state whether participation was voluntary or required as part of the course requirements.

Wood and Locke completed four validation studies on an instrument that initially included seven subscales with 29 items. From those studies they derived an instrument which included 17 of the original 29 items and six of the seven original subscales that had the highest interitem reliability, lowest standard error and greatest predictive validity for academic performance. The final version of this instrument included the following subscales: Class Concentration, Memorization, Understanding, Explaining Concepts, Discriminating Concepts, and Note Taking. The scale reliabilities (Cronbach's alpha) on the academic self-efficacy subscales ranged from .73 to .87, and the overall reliability for the 17-item scale was .82.

For each subscale the students were asked first whether they could perform the task and then asked to rate their confidence for attaining successive performance levels of the task on a scale of 1 to 10. The example the authors gave was one for the subscale, Memorization. The participants were asked whether they could memorize the facts and concepts presented in the course for four levels, 50%, 70%, 90%, and 100% of the facts and concepts.

Students completed the self-efficacy questionnaire immediately after the first hourly course exam but before receiving exam grades. The authors explained the timing of the administration of the self-efficacy questionnaire was in keeping with Bandura's (1986) recommendation that self-efficacy ratings are most meaningful after participants receive some feedback regarding recent performance. The researchers wanted the students to rate their self-efficacy expectations based on their ability to cope with

the course demands but not make their ratings based only on their grade.

The academic performance measure for the study was the total number of points earned in the course which was based primarily on two or three hourly exams and a final exam. The self-efficacy (SE) scale measured self-efficacy magnitude (SEM) by asking the students to respond either "yes" or "no" as to whether they could attain the specified level of attainment. The SEM score was the total number of "yes's." Self-efficacy strength (SES) was measured by asking the students' to rate confidence in their ability to perform at the specified level on a scale of 0 to 100. The SES score was the mean confidence rating for all items.

Hierarchical regressions were run using the course totals for each of the 3 samples as the dependent variable. In the first set of analyses, ability was entered first and was followed by the two SE measures and the goals measures. SES yielded significant increments in all three samples to R^2 but SEM did not. In the second set of analyses ability was entered first and was followed by the goal measures and then the SE measures. SES was significant in two of the three samples and SEM was significant in one.

The authors reported the correlation between self-efficacy strength and course performance as $r = .27$, $p < .01$. and suggested several explanations for the moderate correlations in the three samples. They pointed out that the higher correlations between SES and performance in earlier laboratory studies might be explained by the timing of the administration of the self-efficacy measures. According to these authors, in earlier laboratory studies the self-

efficacy measures were taken minutes before performance, and they believed that those self-percepts strongly impacted the participants' performance of the designated task. They contrasted this with the administration of the self-efficacy measures in their samples which occurred about two months before the end of the course. This was relevant to the present study because one of the self-efficacy measures was administered in the present study about a week prior to the beginning of each rotation.

A second explanation that Wood and Locke (1987) offered was also relevant to the present study. They contended that performance feedback had been extremely task specific in most studies prior to theirs. They contrasted this with the measure of performance feedback in their study, which was grade performance, and then proceeded to point out that grade performance "is not one specific task but the complex outcome of multiple tasks (studying, class attendance, note-taking, memorizing, exam taking, etc.)" (p. 1023). Wood and Locke considered the results of their study to be all the more impressive because they used an aggregate performance measure.

The third explanation that Wood and Locke (1987) offered for the moderate effects of self-efficacy in their study was the possibility of pre-selection bias. The students enrolled in their study had already been pre-selected for their ability to complete college level course work, and the authors believed that this restricted the range and tended to reduce the validity of the self-efficacy scales. Ability level was one of the moderators of the relationship between self-efficacy and performance that was

41

discussed earlier in the Multon, et al. (1991) meta-analysis, and it may also have influenced the results of the present study as medical students are considered to have high academic ability.

Pintrich (1989)

The purpose of this study was to examine the interactive relationships between student motivation and cognition and student performance on different college tasks. One of the components of the Motivated Strategies for Learning Questionnaire (MSLQ) was the Expectancy for Success subscale that was included to measure self-efficacy expectations. It is the data from that subscale that was most relevant to the present study.

Participants included 224 college students enrolled at three institutions of higher learning in the state of Michigan, a four-year state university, a small liberal arts college, and a community college. Seven classes of students (2 English, 3 Biology, and 2 Psychology), and six instructors (1 English, 3 Biology, and 2 Psychology) participated in the study.

Self-efficacy was measured by the Expectancy for Success subscale contained within the Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ is a self-report questionnaire that asks students to rated themselves on a variety of motivational and cognitive items. The alpha for the Expectancy for Success subscale was reported to be .80. The rating scale was described as a 7-point Likert scale. This was tile extent to which the questionnaire was described except for references by Pintrich to its use in previous studies (e.g., McKeachie, Pintrich, & Lin, 1985; Pintrich, 1986), and Pintrich's (1989) comment that "the results from these studies

42

demonstrate reasonable internal reliability of the scales and moderate correlations of the scales with academic performance" (p. 143). The students completed the MSLQ at the beginning of the term.

Academic achievement was measured by course performance. There was variation of course performance measures across the different classes but it generally consisted of three types of assignments or tasks which included exams, essays or papers, and labs. Exams was a performance measure in all seven courses and the majority of the courses included essay assignments as a performance measure. The biology courses also had lab assignments. Final course grade was also included as a performance measure. Due to the variation of course measures across the seven classes, all performance data were converted to z-scores within each class before any analyses of the data were conducted.

The zero-order correlations between self-efficacy scores and performance scores were reported by Pintrich (1989) as follows: exams (n = 224) $r = .45$, $p < .01$; labs (n = 75) $r = .27$, $p < .05$; papers (n = 110) r = .26, $p < .01$; and course grade (n = 224) $r = .45$, $p = .01$. Pintrich pointed out that the results were consistent with results from other studies that had linked motivational components and performance measures, and he suggested that the MSLQ provided a valid measure of students' motivational orientation. Pintrich did not offer any explanation regarding the variation in correlations between self-efficacy scores and the different performance measures. Though not directly related to the proposed study, it is interesting to note that the results of Pintrich's study suggested

that self-efficacy was related to the cognitive and metacognitive study strategies that were included in his study.

<u>Mone and Baker (1992)</u>

This study sought to examine a model of cognitive and affective antecedents and consequences of personal goals. Specifically, the investigators studied the relationships among the following variables: self-efficacy and aptitude as antecedents of personal goals and academic performance, goal-performance discrepancies, locus of causality and stability dimensions of causal attributions and affective responses as consequences of personal goals. Of specific relevance to the present study was the relationship between self-efficacy and academic performance.

Participants in Mone and Baker's study were students from a large western university who were enrolled in an introductory management course. Participation was voluntary and the participants received extra course credit for their participation. Since the variables were assessed five times during the semester, the number of participants varied for the five administrations of the instruments. Prior to the first exam data were collected from 461 students (273 men and 188 women) of a total of 485 enrolled in the course. Following the first exam, 421 students participated. Preceding the second exam 410 participated. Following the second exam, 390 students participated and prior to the final exam 380 students participated. A control group was used to assess whether there was a reactive effect of testing from the pre-examination measures and no significant differences ($p = .05$) were found. Taking into consideration the 153 students who were in the control group

and incomplete or incorrectly completed surveys and absences, there was usable data from 251 participants.

Academic self-efficacy was measured by asking the participants to rate their confidence on a scale of 1 to 10 for earning each of three grade levels (A, B, and C). The academic self-efficacy measure was calculated by averaging the confidence score across the grade levels on the scale. Interitem reliability was assessed in a pilot study using 50 volunteers from an introductory management course. The Cronbach's alpha reliability coefficient for the scale was .87.

Academic performance was measured by the grades for the midterm exams and the final exam. The letter grade was converted to a 5-point scale (A = 5.0 to F = 1.0). Each of the exams was worth 25% of the exam grade which comprised 75% of the course grade. The other 25% of the course grade included the following: laboratory case writeups assigned and graded by teaching assistants and 15 extra credit points (3.25% of course grade) from voluntary extracurricular activities like the research project being described here. The authors pointed out that all of the procedures in the study were approved by that college's human subjects review committee.

The Pearson correlation coefficients between academic self-efficacy and academic performance were statistically significant for the three performance trials (r = .30, .32 and .34 respectively, $p \leq .01$ respectively). Hierarchical regression equations were run to assess the interactions between the variables. Mone and Baker found that grade self-efficacy predicted personal goals and personal goals predicted exam performance, but the direct effects of self-efficacy

on performance after controlling for G.P.A. and personal goals was not significant in any of the three trials. Performance, however, did predict academic self-efficacy following the first and second exams.

Lent, Lopez and Bieschke (1993)

In this study the investigators examined the relations among several variables including: prior achievement, self-efficacy, outcome expectations, and prediction of students' choice of and performance in mathematics-related college courses. Of relevance to the present study was the relation between students' self-efficacy and their performance in the college courses.

The participants included in the study were 166 students (59 males and 107 females) who were enrolled in introductory psychology courses at a large midwestern university. The majority of the participants were white (85%) and either freshmen or sophomores (74%). The mean age of the participants was 19.58 years with a $SD = 1.90$. The average high school rank of the participants was at the 78th percentile with a $SD = 15.31$. The authors did not state whether their participation was voluntary, but the students were given credit for their participation in the study.

Mathematics self-efficacy was measured with a slightly revised version of Betz and Hackett's (1983) Mathematics Self-Efficacy-College Courses Scale. The participants were asked to rate on a 10-point scale confidence regarding their ability to complete a variety of mathematics-related college courses with a grade of B or better. Fifteen courses were listed on the questionnaire and the self-efficacy strength score was calculated by summing individual

course ratings and dividing by 15. Stronger self-efficacy was reflected by higher scores. The internal consistency for the revised scale was coefficient alpha = .92, and the test-retest reliability at two weeks was r = .94 both of which were reported from a previous study (Lent et al., 1991). The data from this instrument were obtained at group testing sessions. The performance measure used in the study was students' grades in mathematics-related courses.

The results of this study indicated that mathematics course grades and mathematics self-efficacy beliefs were significantly correlated (r = .39, p < .01). The results of the study corroborated earlier findings that indicated mathematics self-efficacy related positively to college students' performance in mathematics tasks (Siegel et al., 1985). Of particular relevance to the proposed study was the high school rank of the participants. They were ranked in the upper quartile and would be considered high-achieving students as are the participants in the proposed study. In the Multon et al. (1991) meta-analysis reviewed earlier, achievement level was a moderating factor. It is interesting to note that the correlation between self-efficacy beliefs and performance in this study (.39) is similar to the one calculated in the meta-analysis (.33). In addition, in the Multon et al., (1991) meta-analysis participant age was another factor that moderated the relation between self-efficacy beliefs and academic performance. Within the normal-achieving range, the college student samples in the meta-analysis was (.35) which is similar to this study's results (.39).

Horn, Bruning, Schraw, Curry and Katkanant(1993)

The investigators in this study used a path model to explore academic success. They included the following measures in their path model: self-efficacy, domain knowledge, general ability, different study approaches, and a sample of the students' lecture notes to determine their relation to a classroom achievement measure. Of particular relevance to the present study was the relation of self-efficacy to classroom performance.

The participants included in the study were 104 undergraduate students enrolled in an entry-level course in human development at a large midwestern university. The majority of the students were freshmen (39%) and sophomores (39%), and the sample included 79 females and 25 males. Participation was voluntary and participants received extra course credit.

Academic efficacy was assessed using a modified version of an instrument developed by Shell, et al. (1989) which measured reading self-efficacy and writing self-efficacy. This instrument was described in an earlier section of this paper. Thirty-five of the original 51 items were used for this study: 19 of the 27 reading efficacy items and 16 of the writing efficacy items. The investigators in this study did not describe the method they used to determine which items would be used for their academic efficacy instrument. They did report the alpha coefficient for their revised version as .94. The academic efficacy questionnaire was administered within the first two weeks of class.

An aggregate test score for each student was used as the academic performance measure for this study. This measure was

calculated by summing the first three exams given during the term. All three of the exams were multiple-choice format with approximately 70-75 items on each exam. The exams were constructed to measure primarily recall or simple comprehension of basic factual information.

The zero -order correlation between academic efficacy and academic performance in this study was .21, $p < .05$. The results of the path analysis revealed that although there was no significant direct effect between efficacy and performance, efficacy was positively related to endogenous variables (selection and use of study strategies) that it did affect performance (e.g., organizational, $\beta = .22$, $t (101) = 2.29$, $p < .05$), and connecting strategies, $\beta = .24$, $t (101) = 2.52$, $p < .01$. Based on the pattern of the results, the investigators suggested that ability and self-efficacy might have compensated each other. They proposed that ability provides the intellectual means to improve performance and efficacy provides an additional self-regulatory component which enables learners to purposefully select and execute study strategies.

Zimmerman and Bandura (1994)

This study sought to evaluate, by the use of path analysis, the following variables with regard to their contribution to writing performance: verbal aptitude, self-regulatory efficacy for writing, self-efficacy for academic achievement, grade goals and self-evaluative standards. Most relevant to the present study was the relation of the two self-efficacy scales and academic achievement as measured in Zimmerman and Bandura's study by course grades.

The participants in this study were 95 freshmen students enrolled in either an advanced writing course or a regular writing course at a "highly selective" (Zimmerman & Bandura, 1994, p. 849) university. The students ranged from 17 to 20 years old and their median age was 18 years. There were 52 females and 43 males in the study, with 47 students attending a regular writing course and 48 students attending an advanced writing course. The majority of the students were White with approximately 25% representation of minorities in the sample.

Two self-efficacy scales were developed for this study. They were administered in the courses at the beginning of the academic quarter. The first scale was developed to assess the students' beliefs about personal efficacy to regulate writing activities. Twenty-five items were included in the Writing Self-Regulatory Efficacy Scale, which the researchers developed by analyzing the writing process, consulting with faculty in the writing program, and using their acquired knowledge of the self-regulation of motivation. Strength of efficacy was measured by asking students to rate on a 7-point scale their level of confidence that they could perform the designated activities (1 being could not perform to 7 being could perform very well). The Cronbach reliability coefficient for the scale was .91.

A second scale was developed for this study to assess self-efficacy for academic achievement. The students' efficacy strength was measured by asking them to rate on a scale from 1 (high uncertainty) to 7 (high certainty) their belief that they could achieve each of 12 academic grades ranging from A to F including +

and - gradations. The Cronbach reliability coefficient for the scale was .87.

Writing course grades were used to measure academic achievement. Four male instructors and four female instructors were each asked to include a randomly selected class in the study. The students enrolled in their classes had not previously been taught by the instructors.

Following are correlations of variables that are relevant to the proposed study. Perceived self-regulatory efficacy for writing was significantly related to perceived self-efficacy for academic achievement ($r = .36, p < .001$). Self-regulatory efficacy for writing did not significantly correlate with final grades. Self-efficacy for academic achievement, however, did correlate significantly with final grades ($r = .46, p < .001$).

Zimmerman and Bandura completed a multivariate test for the fit of their path analysis model and no significant divergence was revealed: chi-square (10) = 11.07, not significant (ns). Nonsignificant causal paths were deleted from their published model. In their model, perceived self-regulatory efficacy for writing directly influenced perceived self-efficacy ($P = .41$, $p < .05$) and indirectly influenced academic achievement. Writing grade achievement was affected directly by perceived academic self-efficacy ($P = .26, p < .05$), and the combined direct and indirect effects of academic self-efficacy on final grades were $P = .38$, $p < .05$.

There are two aspects of this study that are of particular relevance to the proposed study. First, it was reassuring to find

that Bandura who had originally emphasized the importance of task-specific measures when examining self-efficacy and performance measures, had completed a field study with more global, aggregate measures of self-efficacy and performance. Second, the study sample included normal to high-achieving college-level students, a sample similar to the one in the proposed study, and even with this restriction, the researchers found that self-efficacy correlated significantly with performance measures.

Mone (1994)

In this study Mone investigated the role of process versus outcome self-efficacy in relation to personal grade goals and academic performance and also the difference in the static versus the dynamic nature of these relationships. This was the first study I found that differentiated these two types of academic self-efficacy. Mone described outcome self-efficacy as a measure of an individual's perception of self-confidence for the attainment of task performance levels, course grades, in this study. Process self-efficacy was described as a measure of more specific academic tasks.

It appears that Mone reported on the same sample of participants as was used in the Mone and Baker (1992) study reviewed earlier in this paper. Participants in the study were students from a large western university who were enrolled in an introductory management course. Participation was voluntary and the participants received extra course credit for their participation. As the variables were assessed five times during the semester, the number of participants varied for the five administrations of the

52

instruments. Prior to the first exam data were collected from 461 students (273 men and 188 women) of a total of 485 enrolled in the course. Following the first exam, 421 students participated. Preceding the second exam 410 participated. Following the second exam, 390 students participated and prior to the final exam 380 students participated. A control group was used to assess whether there was a reactive effect of testing from the pre-examination measures and no significant differences (p = .05) were found. Taking into consideration the 153 students who were in the control group, incomplete or incorrectly completed surveys and absences, there was usable data from 252 participants.

Outcome (grade) self-efficacy was measured by asking the participants to rate their confidence on a scale of 1 to 10 for earning each of three grade levels (A, B, and C). The academic self-efficacy measure was calculated by averaging the confidence score across the grade levels on the scale. Interitem reliability was assessed in a pilot study using 50 volunteers from an introductory management course. The Cronbach's alpha reliability coefficient for the scale was .87.

Process (academic) self-efficacy was measured by Wood and Locke's (1987) ASE instrument which was reviewed earlier in this paper. Wood and Locke completed four validation studies on an instrument that initially included seven subscales with 29 items. From these studies they derived an instrument which included 17 of the original 29 items and six of the seven original subscales that had the highest interitem reliability, lowest standard error and greatest predictive validity for academic performance. This

instrument included the following subscales: Class Concentration, Memorization, Understanding, Explaining Concepts, Discriminating Concepts, and Note Taking.

For each subscale the students were asked first whether they could perform the task and then asked to rate their confidence for attaining successive performance levels of the task on a scale of 1 to 10. The example the authors gave was one for the subscale, Memorization. The participants were asked whether they could memorize the facts and concepts presented in the course for four levels, 50%, 70%, 90%, and 100% of the facts and concepts. The process self-efficacy strength was the average confidence responses across the subscales for different performance levels. The scale reliabilities (Cronbach's alpha) on the academic self-efficacy subscales ranged from .73 to .87, and the overall reliability for the 17-item scale was .82.

Academic performance was measured by actual grades for the midterm examinations and the final examination. The letter grade was converted to a 5-point scale.

Using Pearson's correlations for outcome self-efficacy and academic performance revealed that outcome (grade) self-efficacy was significantly, positively related to performance in all three performance trials, r = .31, .32, .34, p < .01. The correlations for process self-efficacy and academic performance were also statistically significant but the coefficients were weaker than when the outcome self-efficacy measure was used (r = .20, p < .01, r = .12, p < .05, r = .19, p < .01).

Mone then compared outcome (grade) versus process (academic subskills) self-efficacy measures in regressions that included self-efficacy, personal grade goals, and academic performance. He pointed out that each dependent variable was regressed on multiple antecedents but that his focus was on the differing effects of the two measures of self-efficacy. With regard to academic performance and change in performance, Mone's results revealed that outcome self-efficacy significantly predicted performance in all periods, betas = .15, .14, .17, $p < .05$, but did not significantly predict change.

Mone, Baker and Jeffries (1995)

The purpose of this study was to examine the relationships between self-efficacy, self-esteem, personal goals, and performance over multiple performance trials. The researchers also investigated the time-dependency effects of self-efficacy, self-esteem, and personal goals as they related to task performance and feedback. In this study Mone and his colleagues proposed the following hypotheses:

Hypothesis 1a: Self-efficacy will be more highly predictive of personal goals and performance than will self-esteem in Trial 1.

Hypothesis 1b: Over repeated trials, self-efficacy will remain a stronger predictor of personal goals and performance, relative to self-esteem.

Hypothesis 2a: Personal goals and performance will be more highly predictive of self-efficacy than self-esteem following Trial 1 performance.

Hypothesis 2b: The greater ability of personal goals and performance to predict self-efficacy vs. self-esteem will remain over repeated trials.

Hypothesis 3: Distal measures of self-efficacy and self-esteem will better predict personal goals and performance than proximal measures.

Hypothesis 4: Personal goals and performance will have a greater positive relationship with proximal rather than distal measures of self-efficacy and self-esteem. (Mone, et al., 1995, p. 718-719)

Participants in the study included 215 students (101 women, 114 men) who were enrolled in an introductory management course at a western university. Participation in the study was voluntary and no mention was made as to whether or not participation earned extra course credit.

Academic self-efficacy was measured by the Grade Self-Efficacy scale which Mone (1994) found to be a more valid predictor of both grade goals and exam performance than Wood and Locke's (1987) Academic Self-Efficacy scale. The participants were asked to rate on a scale of 0 to 9 their self-confidence regarding the attainment of each of four grade levels (A, high B, low B, and C) The self-efficacy measure was the average of these four scores. The participants were divided into two groups. The distal measurement group consisted of 132 of the participants and they completed the Grade Self-Efficacy scale 2 weeks prior to each of the three course exams. The proximal measurement group consisted of 83 of the

participants and they completed the Grade Self-Efficacy scale 2 days prior to each of the three course exams.

Academic performance was measured by the actual performance on each of the three exams. The raw exam score was converted to a 9-point scale (A=9, A-=8, B+=6, B=6, B-=5, C+=4, C=3, C-=2, D=1, F=0).

The researchers initially constructed separate correlation tables of their hypothesized relationships for the distal and proximal measures. They combined the two tables after they found almost complete agreement with regard to statistical significance and direction of the coefficients between the two groups.

The Pearson product-moment correlations between the three self-efficacy measures and the three academic measures were as follows: SE 1 and PERF 1, $r = .32$, $< .01$, SE 2 and PER 2, $r = .24$, $< .01$, SE 3 and PERF 3, $r = .38$, $< .01$).

The researchers tested their hypotheses with hierarchical and moderated regression analyses. The results indicated that self-efficacy was a statistically significant predictor of performance. Self-efficacy was significant at $p < .01$ in each trial and accounted for 6% to 14% of the variance in performance. Of additional interest to the proposed study, was indication from the results of this study that there were no statistical significant timing differences for the measurement of self-efficacy with regard to the prediction of performance.

Mone and his colleagues offered three possible reasons for the lack of significant timing differences. First they suggested that self-efficacy in this group of participants was relatively stable and

therefore offset any timing differences. They also suggested that although the distal measures may have been more motivational and more significantly predictive, that the proximal measures may also have been accurate in spite of the motivational impact of the measures. And finally, it was possible that the timing differences in their study were not proximal and distal enough to reveal significance particularly with regard to postperformance measures.

Self-Efficacy Studies in Medical Education

The majority of the self-efficacy studies found in the medical education literature were related to health behavior efficacy. The investigators of these studies were primarily interested in physician perceived efficacy regarding their preventive care and health promotion practices (Attarian, Fleming, Barron, & Strecher, 1987; Becker & Janz, 1990; Glanz & Gilboy, 1992; Lewis, Clancy, Leake, & Schwartz, 1991; Mann & Putnam, 1989; Rosen, Logsdon, & Demak, 1984) or patient efficacy regarding health promotion practices: smoking cessation (Brod & Hall, 1984; Chambliss & Murray, 1979a; Coelho, 1984; Condiotte & Lichtenstein, 1981; DiClemente, 1981; Maddux & Rogers, 1983; McIntyre, Lichenstein, & Mermelstein, 1983; Nicki, Remington, & MacDonald, 1985; Prochaska, Crimi, Lapanski, Martel, & Reid, 1982; Prochaska & DiClemente, 1984; Strecher, Becker, Kirscht, Eraker, & Graham-Tomasi, 1985;), weight control (Chambliss & Murray, 1979b; Jeffrey, et al., 1984;), and exercise (Ewart, Taylor, Reese, & Debusk, 1984; Kaplan, Atkins, & Reinsch, 1984). Teacher efficacy regarding teaching skills in ambulatory care settings was the focus of one study (Vanek, Snyder, Hull, & Hekelman, 1996) found in the medical education literature.

58

Another study (Eachus,1993) reported on the development of the Health Student Self-Efficacy scale designed as a diagnostic tool for monitoring the academic progress of students enrolled in health-related courses. I found only two studies that focused on medical students' self-efficacy, and neither of these related self-efficacy to academic performance. A review of these two studies follows.

Margolies, Wachtel and Schmelkin (1986)

The purpose of this study was to investigate whether a relationship exists between attitudes towards psychiatry and students' perceived self-efficacy in psychosocial and psychiatric assessments tasks. The authors hypothesized that those students with negative attitudes toward psychiatry would also have low scores on the perceived self-efficacy in psychiatry scale.

The participants were 167 entering first year medical students and 156 entering second year medical students enrolled at New York University Medical School. About half of each of the two groups (81 and 78 respectively) participated in the study. The other half of each group completed forms of the same format but with items that were not used in the study. The instruments were administered during the first week of school. Participation was voluntary with over 99% compliance.

The self-efficacy questionnaire consisted of a ten-item scale developed through collaboration with the undergraduate curriculum committee. The items were representative of skills that were introduced and practiced during the first year medical behavioral science course and the second year psychopathology course. The participants were asked to rate their level of confidence for each of

59

the ten items on a six-point Likert type scale that ranged from "quite uncertain" to "certain." The questionnaire consisted of parallel scales with one scale asking students to rate their confidence in their ability to perform the tasks at the present time and the other scale asking the students to rate their confidence in their ability to perform the tasks as future physicians. The efficacy score was calculated by summing all the items and dividing by the number of items. The alpha reliability coefficients for the two scales were .88 and .85 respectively.

The psychiatry attitude questionnaire consisted of 32 items with content relevant to four areas: desire to work with psychiatric patients, ability of physicians to help psychiatric patients (outcome expectancy), the importance of the psychiatric specialty, and the importance of the biopsychosocial approach to medicine. Students responded to each statement on a six-point Likert type scale that ranged from "strongly disagree" to "strongly agree." Alpha reliability coefficients for the four scales were .74, .58, .60 and .64 respectively.

The authors utilized canonical analyses to examine correlations among the four attitude and two self-efficacy variables. A separate analysis was run for each class year. No significant correlations were found among the attitude and self-efficacy variables for the entering first year students. Two significant correlations were found between the variable sets for the second year students which overall accounted for 47% of the variance in the canonical variates. The first canonical correlation revealed a strong relationship between perceptions of self-efficacy

as a future physician and attitudes towards outcome expectations, and to a lesser degree, attitudes towards the importance of a psychiatric specialty and a desire to work with psychiatric patients. The second canonical correlation suggested a relationship between current perceptions of self-efficacy and attitudes towards the importance of a biopsychosocial model of illness.

In their discussion the researchers pointed out that the students' current sense of self-efficacy was consistent with their educational level. The current self-efficacy scaled ratings were higher for the second year class than for the first year class. This was particularly true with regard to psychosocial assessment items and would be expected since the second year class had completed a behavioral science course during their first year of medical school.

With regard to future efficacy, the ratings were only slightly higher for the second year class than for the first year class. Both classes indicated a higher level of confidence with regard to their effectiveness as future physicians in assessing and treating patients with psychosocial issues than they did with their current ability to assess and treat patients with psychiatric problems.

The researchers asserted that this latter finding indicated a deficiency in students' perceptions of their ability to acquire necessary psychiatric skills. They argued that students' efficacy percepts, (taking into consideration strength and accuracy of the percepts) could influence interests and attitudes, behavioral choices, energy expenditure, and performance capabilities with regard to psychiatric skills. The authors pointed out that self-efficacy is most influenced by personal and vicarious mastery

experiences, and suggested teaching undergraduate medical students specific skills in psychiatry, rather than focusing solely on attitude development.

Tresolini and Stritter (1994)

The purpose of this study was to investigate how the students at one medical school developed health-promotion patient education skills, and how those learning experiences contributed to the students' self-efficacy regarding the education of patients about smoking cessation, nutrition, and exercise.

The design of the study was a case-study approach. The unit of analysis for the study was the predoctoral program of a mid-sized public medical school at a large southeastern university. The predoctoral program consisted of the traditional two years of basic science curriculum followed by two years of clinical rotations.

Data were collected from student interviews, faculty interviews, and review of institution documents and records. The primary source of data for the study were interviews with 28 fourth-year medical students that occurred during the last three months of the academic year. The participants were randomly selected from the group of students entering primary care residencies which included family medicine, general internal medicine, pediatrics and obstetrics/gynecology. The researchers chose these primary care fields because they felt those students would have been more likely to have had learning experiences related to health promotion. The interviews were semistructured and lasted from 45 to 100 minutes. At the time of their interviews, the

students were also asked to complete the Self-Confidence in Patient Education for Health Promotion questionnaire.

The researchers also conducted semi-structured interviews with six faculty who were involved in health promotion-related programs and teaching. In addition, the researchers reviewed the following documents: course and curriculum guides, catalogs, schedules, evaluation forms, summaries of activities funded by academic awards in preventive medicine, and articles that had been recommended by the faculty interviewees. The medical school archival records that Tresolini and Stritter reviewed included: collections of data regarding student characteristics, specialty choice and patterns of course preference.

The semistructured interview guide used in the student interviews was reviewed by faculty in the college of medicine and the college of education, and it was pilot-tested with medical students. A separate interview guide was developed for each of the faculty interviews based on the individual faculty member's role in teaching health promotion to medical students. However, core topics were included in each of the faculty interview guides.

The Self-Confidence in Patient Education for Health Promotion (SPEHP) questionnaire was developed based on a health promotion instrument used by Mullen and Holcomb (1990). Instrument validity issues were addressed by a review of the literature regarding the evaluation of medical students' knowledge and skills in patient education for health promotion. Also the instrument was reviewed by clinical medical faculty to assess its compatibility with medical

practice and by educational psychologists to assess its compatibility with self-efficacy theory.

Self-efficacy magnitude and generality across domains was assessed on the questionnaire with three items of increasing levels of difficulty for each of the three health promotion topics (smoking cessation, nutrition, and exercise). Strength of self-efficacy was assessed by asking the students to rate their self-confidence for each of the nine items on the following 4-point scale: 1 = completely lacking in confidence, 2 = somewhat lacking in self-confidence, 3 = somewhat confident, and 4 = very confident. Cronbach's alpha coefficients for the whole questionnaire and for each of the subscales ranged from .66 to .88. With regard to the self-efficacy data, the researchers computed mean scores for each item, for each domain, for the entire questionnaire and for each level of skill.

With regard to the qualitative data, the researchers used an overall description of health-promotion curriculum activities to help them understand individual students' experiences. They used self-efficacy theory to help them assess what data were relevant, to create categories for the data, and to find alternative explanations.

Reliability and validity for the study was addressed by the use of multiple data sources, a clear and accessible data set, feedback from colleagues and selected subjects regarding preliminary analyses, and early and continuing attention to and clarification of researcher bias.

In analyzing the students experiences, the researchers found the most obvious differentiating factor was the degree of student interest in educating patients in health promotion. Upon closer examination of the data from the "interested students," they found that a key role was played by clinical faculty role models who demonstrated patient-education techniques to those students. When Tressolini and Stritter (1994) sorted the data using these two factors, five elements were identified as the distinct characteristics of various patterns of experience:

(a) degree of student interest in pursuing learning in health promotion,

(b) beliefs about appropriate roles for physicians and medical students in educating patients for health promotion,

(c) extent of opportunities taken to perform patient education,

(d) presence or absence of a clinical instructor role model in patient education for health promotion, and

(e) degree of sophistication of patient-education strategies learned. (p. 251)

Using these five criteria to analyze each student's experiences in each of the three health-promotion areas, three unique patterns emerged with each varying on two or more of the criteria.

Patterns One and Two were both characterized by intensely interested, involved and self-directed learners. The primary differentiating factor between the two patterns was the opportunity to work with a physician role model whose work emphasized the

importance of health-promotion practices, and those opportunities appeared to occur purely by chance.

Pattern Three was sharply contrasted with Patterns One and Two. The students in Pattern Three lacked interest in one or more of the areas of health-promotion or in health promotion in general, and they did not believe that patient education in health promotion was the responsibility of a practicing physician.

Not surprisingly, Pattern One experiences were associated with the strongest self-efficacy perceptions in all areas, followed by Patterns Two and Three. In Pattern One the scores across the three difficulty levels were similar, but in Patterns Two and Three the scores decreased as the difficulty levels increased. "In general, students' learning experiences were consistent with self-efficacy theory, with students having more comprehensive and integrated sources of self-efficacy information having higher self-efficacy scores" (p. 253).

Summary

The literature reviewed has at least the following implications for the present study:

(1) There is clearly a closer relation between self-efficacy and performance at the level of individual tasks.

(2) The relation between self-efficacy and academic performance may be moderated by the amount of time during which self-efficacy beliefs and performance measures are addressed.

(3) Achievement level may moderate the relation between self-efficacy and academic performance with stronger

relations occurring among lower achieving students than among normal-achieving students.

(4) Age may moderate the relation between self-efficacy and academic performance within the normal-achieving range with age strengthening that relationship.

(5) Measures of self-efficacy often add significant unique variance beyond ability and achievement measures in the prediction of academic performance but as a single predictor it is often not sufficient for the prediction of academic performance.

Chapter III

Methodology

Design of the Study

The present study can best be described as one type of
correlational study, the prediction study. According to Borg and Gall
(1989), educational researchers perform many prediction studies
with the purpose of identifying variables that predict academic and
vocational success. Borg and Gall (1989) pointed out that prediction
studies provide three types of information: "the extent to which a
criterion behavior pattern can be predicted; data for theory building
about possible determinants of the criterion behavior pattern; and
evidence regarding the predictive validity of the test or tests that
are correlated with the criterion behavior pattern" (p. 583).

Prediction studies can be differentiated based on which of
these three types of information the researcher is most interested
in obtaining. The present study was designed to obtain information
regarding the extent to which third-year medical students' written,
oral and clinical scores on the Family Medicine Clerkship can be
predicted from the pre-rotation self-efficacy scores, the post-
rotation self-efficacy scores and the self-efficacy gain scores.

For prediction studies and relationship studies, correlations
are computed for the criterion behavior and the variables that are
considered to be related to the criterion, which in the present study
would be the students' self-efficacy scores. Though it is not
necessary to measure the predictor variables before the criterion

68

behavior occurs in relationship studies, it is necessary to do so in prediction studies.

Selection of the Sample

Participants in the present study were all Third-Year Family Medicine Clerkship students completing the required one-month clerkship during the 1996-1997 academic year at a southwest medical school. The sample size was 103 participants, and the mean age of the participants was 27 years (SD = 4.14). There were 68 male participants and 35 female participants. Fifty-six participants were enrolled in the first six Family Medicine Clerkship rotations (early group) and 47 participants were enrolled in the last six rotations (late group).

Data Collection

Pre-rotation self-efficacy data were collected from clerkship students the first morning of each scheduled rotation. There were 12 four-week Family Medicine clerkship rotations scheduled during the 1996-97 academic year with an average of eight students per rotation. The students were required to pick up course materials during the week prior to the beginning of each rotation. The self-efficacy questionnaire was one of several forms the students were required to complete and turn in to the clerkship coordinator during the orientation seminar scheduled the first morning of each rotation.

The students completed a post-rotation self-efficacy questionnaire during the last week of each rotation and turned it in to the clerkship coordinator prior to taking the oral examination at the end of the rotation. The self-efficacy questionnaire was one of several required items that were turned in to the course coordinator

at the end of the rotation (e.g., logbook, audiotape recorder, course evaluations).

There were three separate performance measures that were correlated with the pre-rotation self-efficacy scores, the post-rotation self-efficacy scores and the self-efficacy gain scores. The performance measures gathered in the final week of each rotation included the following: oral examination scores, written examination scores, and clinical scores.

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Instruments

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Self-Efficacy Questionnaire

Because self-efficacy is considered task-specific, rather than a global trait that can be measured by an omnibus test, instruments should be designed for each specific domain of functioning under study (Bandura, 1982). To adequately evaluate self-efficacy, the evaluation instrument was designed to assess in detail the three dimensions of self-efficacy: level, strength and generality. Level of self-efficacy was measured by listing in order tasks that vary in difficulty most commonly from less to more difficult or complex. Strength was measured by having individuals designate on a scale their degree of confidence that they could perform each task on the ordered list. Generality was demonstrated by the patterns that were revealed by the multidomain measures.

The 26-item Family Medicine Clerkship Self-Efficacy Questionnaire was suggested by an instrument used by Tresolini and Stritter (1994). To address issues of validity, (a) a review of the literature was conducted by a group of family medicine physician faculty regarding knowledge and skills necessary to perform

successfully in a family medicine clerkship, and (b) the self-efficacy instrument was reviewed by a family medicine physician faculty member and an instructional psychologist to determine its congruence with medical practice and self-efficacy theory.

To assess the level and generality of self-efficacy perceptions, the items on the questionnaire were listed in order of increasing difficulty as determined by a group of five family medicine physician faculty. The faculty were asked to rate the level of difficulty for the 12 domains as well as the items ordered within each domain. The difficulty level for each domain as well as that for each of the items ordered within each domain was determined by averaging the level of difficulty ratings of five Family Medicine physician faculty. Level of self-efficacy scores was determined by the number of items out of 26 that the participants answered with a confidence rating above 1. Strength of self-efficacy perceptions was measured by asking the students to rate their degree of confidence for each of the 26 items on a 6-point scale which will range from 1 = none to 6 = much. Strength scores were calculated by summing the ratings for each of the items. Only the strength of efficacy scores were analyzed because of the ceiling effect for the level scores and the multidomain measures. A copy of the self-efficacy instrument can be found in Appendix A.

The reliability of the self-efficacy questionnaire was measured by assessing the internal consistency of the instrument using the Cronbach's alpha index. The Cronbach's alpha for the pre-rotation administration of the instrument was .93, and the

71

Cronbach's alpha for the post-rotation administration of the instrument was .92.

Written Examination

The Family Medicine Third Year Clerkship written examination is a criterion referenced exam that was developed in 1989, by two family medicine physician faculty. One of the faculty was a national board exam item writer at the time the written exam was first developed. The other faculty has since become a national board exam item writer, and he has been the individual responsible for updating and modifying the exam based on annual item analyses and student evaluation of the exam.

The written examination was designed to assess the students' fund of knowledge of the core topics in Family Medicine. The 183 multiple choice and true/false items included in the written examination were developed from 126 learning objectives grouped within 27 clinical core topics (domains). The core topics and learning objectives were developed from reviews of several national ambulatory care surveys by the two family medicine physician faculty who developed the written exam. The course learning objectives were included in the course guide which the students received the week prior to the start of each Family Medicine clerkship rotation.

The item formats included: single items, multiple item sets, and case clusters. The single items were designed to test basic fund of knowledge of clinical diagnosis and treatment plans (multiple-choice format). The multiple item sets described single patient-centered vignettes with each question linked to the initial patient-

centered vignette, but each question testing a different point. These items were designed to be answered independent of each other (multiple-choice format and true/false format). The case clusters included a single-patient or family-centered vignette in which information might be added as the case unfolds (multiple-choice and true/false format). Samples for each of these types of questions can be found in Appendix B.

The written exam has been reviewed and updated annually using an item analysis. Bearing in mind the limitations with the use of coefficients of internal consistency designed for norm-referenced tests (NRTs) with criterion-referenced tests (CRTs), using the Kuder-Richardson Formula 20 (KR20) the coefficient alpha for the 1995-96 written exam was .63.

Oral Examination

The oral examination was developed to simulate the process of hypothesis generation, focused data gathering, and evaluation of clinical data that occurs during the rotation while students work with preceptors in primarily ambulatory but also hospital settings (Schwiebert & Davis, 1993). The oral examination and the written examination were developed from the same 126 objectives grouped within 27 clinical domains.

The 30-minute examination consisted of questions based on two written patient-centered cases. The questions for each case were of two types: data generating and data interpretation. The data generating questions were based on a chief complaint with minimal clinical data and required students to generate a differential diagnosis or an evaluation strategy. The following is an

example: A 43-year old-white male presents with a two-week history of lower back pain. Give three or four likely conditions you are considering in his differential diagnosis. With each condition indicate additional findings (history, examination) that, if present, would make that diagnosis likely. Additional clinical data were then given to the student to shape the student's response and help the student to differentiate the diagnosis. The student was asked a data interpretation question such as: Given this additional information, indicate and defend your differential diagnosis.

Because of the number of students in the clerkship each month, the students were divided into two groups for the oral examination, and there were two different oral exam sessions. Two sets of patient cases were used, with a different set for each exam session.

Each student was asked to arrive 20 minutes before his or her scheduled examination time to review the two cases to be used during the oral examination. During this 20 minutes, the students were allowed to write notes that they could refer to during the exmination, but they could not use any reference materials to generate their notes. To attempt to minimize sharing of information regarding the exam between the two groups, a different set of cases was used for each of the two groups.

Each exam session had three examiners from the Department of Family Medicine present: the clerkship director, a full-time physician faculty member, and a third-year resident. Prior to each of the two exam sessions, the three examiners met to review the cases and review the responses to each question that was suggested

on the score sheet (unlisted but reasonable responses received credit also). Points were given based on "appropriateness of student responses, the amount of prompting a student required, attempts to cover gaps in knowledge with false information, and the student's ability to respond succinctly" (Schwiebert & Davis, 1993, p. 183).

The following is a description of the process that was used for determining each student's score on the oral examination.

The maximum score for the examination is 100 points; these points are allocated in advance based on the number of suggested responses for each question and the difficulty of each question (determined from a standardized index of question types developed by the department of family medicine). After listening to the student's response to each question and before examining the next student, each examiner independently enters the proportion of the maximum achievable points he or she feels the student has earned. Each student's raw score is calculated by combining the three evaluators' scores and dividing by 300.

Two calculations are involved in arriving at the student's adjusted score (the final oral examination grade). Examiners who were present at both examination sessions agree on a student in each group who has performed comparably, and the difference in raw scores between those two students are added to the raw scores of all students in the group of the student who has the lower raw score. Examiners next have to agree on the grade (%) they feel the overall top performer has earned; the difference between this

and the student's raw score is added to each student's score to arrive at the final adjusted score.   (Schwiebert & Davis, 1993, p. 183)

As reported by Schwiebert and Davis (1993), inter-rater reliability for this method of scoring the oral examination was measured using Cronbach's alpha. The Cronbach alpha was 0.875. The chi-square test of homogeneity was nonsignificant (P=.159, df =20). An example of an oral exam question and evaluation format can be found in Appendix B.

Clinical Score

Each student's clinical score was determined by that student's assigned clerkship preceptors. The evaluation instrument used by the preceptors was based on one developed by the dean's office to be used for clerkships and clinical electives, and it was modified by the clerkship director. A copy of this evaluation instrument can be found in Appendix C.

Data Analyses

The self-efficacy scores and the academic performance scores are continuous scores, therefore, the Pearson Product Moment Correlation statistic was performed to correlate the pre-rotation efficacy scores with each of the academic performance scores, the post-rotation efficacy scores with each of the academic performance scores, and the efficacy gain scores with each of the academic performance scores.

A t-test was performed to compare the self-efficacy scores (pre-rotation, post-rotation, and gain scores) of the students enrolled in the Family Medicine Clerkship during the first six months

of the academic year (early group) with those students enrolled in the last six months (late group).

A t-test was performed to compare the self-efficacy scores (pre-rotation, post-rotation, and gain self-efficacy scores) of the male students with those of the female students.

A t-test was performed to compare the academic performance scores (oral exam scores, written exam scores, clinical scores) of the male students with those of the females students.

A principal components solution with Varimax orthogonal rotation was performed to determine the number of uncorrelated pre-rotation factors and post-rotation factors in the Third Year Clerkship Self-Efficacy Questionnaire. Once these factors were determined, the pre-rotation factor scores and the post-rotation factor scores were then correlated with each of the three performance measures to see if any of the factors significantly correlated with any of the performance measures. In addition a t-test was used to compare the pre-rotation factor scores of the males and females as well as the post-rotation factor scores of the males and females.

Chapter IV

Results

Reliability of Self-Efficacy Questionnaire

The reliability of the self-efficacy questionnaire was measured by using the Cronbach's alpha index to assess the internal consistency of the instrument for each of the administrations. The coefficient alpha for the self-efficacy questionnaire at the first administration was .9270. The coefficient alpha for the self-efficacy questionnaire at the second administration was .9229.

Descriptive Statistics

The means and standard deviations for the pre- and post-rotation self-efficacy scores and the three performance measures are presented in Table 1.

Table 1

Mean and SDs for Self-Efficacy and Performance Measures

	Means	SDs
Prescr	80.05	19.76
Postscr	109.56	18.74
Oral	86.40	6.19
Written	87.23	4.63
Clinical	92.48	3.17

Correlation of Self-Efficacy Scores with Academic Performance
Scores

The Pearson Product Moment Correlation statistic was performed to correlate the pre-rotation efficacy scores with each of the academic performance scores, the post-rotation efficacy scores with each of the academic performance scores, and the efficacy gain scores with each of the academic performance scores. These correlations are presented in Table 2.

Table 2

Correlation of Self-Efficacy Scores with Academic Performance
Scores

	prescr	postscr	gainscr	oral	written	clinical
prescr	1.00					
postscr	0.65	1.00				
gainscr	-0.47	0.36	1.00			
oral	0.22	0.16	-0.09	1.00		
written	0.16	-0.04	-0.25	0.29	1.00	
clinical	0.17	0.24	0.07	0.24	0.17	1.00

The results revealed the pre-rotation self-efficacy scores and the oral exam scores were very moderately though significantly correlated ($r = .22$, $p < .05$). There was a very moderate, though statistically significant, correlation between the post-rotation self-efficacy scores and the clinical scores ($r = .24$, $p < .02$), and a moderate, though statistically significant, negative correlation between the gain scores and the written exam scores ($r = -0.25$, $p < .02$).

Comparison of Self-Efficacy Scores of Early Group and Late Group

Two-tail t-tests were performed to compare the self-efficacy scores (pre-rotation, post-rotation, and gain scores) of the students enrolled in the Family Medicine Clerkship during the first six months of the academic year (early group) with those students enrolled in the last six months (late group). A t-test assuming equal variances as well as a t-test assuming unequal variances were performed for the three comparisons. The results revealed a significant difference ($p < .01$) between the pre-rotation self-efficacy scores of the two groups and it was significant when assuming equal variances as well as unequal variances. The results of the t-test assuming equal variances is presented in Table 3 and the results of the t-test assuming unequal variances is presented in Table 4.

Table 3

T-test Assuming Equal Variances of Pre-Rotation Self-Efficacy Scores of Early Group and Late Group

	Early Group	Late Group
Mean	73.179	88.234
Variance	411.495	247.835
Observations	56	47
Pooled Variance	336.957	
Hypothesized Mean Difference	0	
df	101	
t	-4.146	
P(T<=t) two-tail	0.00007	
t Critical two-tail	1.984	

Table 4

T-test Assuming Unequal Variances of Pre-Rotation Self-Efficacy

Scores of Early Group and Late Group

	Early Group	Late Group
Mean	73.179	88.234
Variance	411.495	247.835
Observations	56	47
Pooled Variance	254.710	
df	100.426	
t	-4.238	
P(T<=t) two tail	0.00005	
t Critical two-tail	1.984	

The results also revealed a significant difference ($p < .01$) between the post-rotation self-efficacy scores of the two groups, and it was significant when assuming equal variances as well as unequal variances. The results of the t-test assuming equal variances is presented in Table 5 and the results of the t-test assuming unequal variances is presented in Table 6.

Table 5

T-test Assuming Equal Variances of Post-Rotation Self-Efficacy Scores of Early Group and Late Group

	Early Group	Late Group
Mean	104.625	115.446
Variance	418.675	213.122
Observations	56	47
Pooled Variance	325.056	
Hypothesized Mean Difference	0	
df	101	
t	-3.034	
P(T<=t) two-tail	0.003	
t Critical two-tail	1.984	

Table 6

T-test Assuming Unequal Variances of Post-Rotation Self-Efficacy Scores of Early Group and Late Group

	Early Group	Late Group
Mean	104.625	115.447
Variance	418.675	213.122
Observations	56	47
Pooled Variance	254.710	
df	98.587	
t	-3.123	
P(T<=t) two tail	0.002	
t Critical two-tail	1.984	

No difference was found between the self-efficacy gain scores of the two groups.

Comparison of Self-Efficacy Scores of Male and Female Students

Two-tail t-tests were performed to compare the self-efficacy scores (pre-rotation, post-rotation, and gain scores) of the male students with those of the female students. A-test assuming equal variances as well as a t-test assuming unequal variances were performed for the three comparisons. There was no between the males and females on any of the three self-efficacy measures. The means and standard deviations for the male and female students' pre- and post-rotation self-efficacy scores are presented in Table 7.

Table 7

Means and SDs for Males' and Females' Self-Efficacy Scores

	Mean	SD
Males' Prescr	82.51	19.72
Females' Prescr	75.26	19.22
Males' Postscr	111.54	18.38
Females' Postscr	105.71	19.11

Comparison of Academic Performance Scores of Male and Female Students

Two-tail t-tests were performed to compare the performance scores (oral scores, written scores and clinical scores) of the male students with those of the female students. A-test assuming equal variances as well as a t-test assuming unequal variances were performed for the three comparisons. There was no between the males and females on any of the three academic performance measures. The means and standard deviations for the male and female students' performance measures are presented in Table 8.

Table 8

Means and SDs for Males' and Females' Performance Measures

	Means	SDs
Males' Oral	85.84	5.57
Females' Oral	87.51	7.20
Males' Written	87.18	4.72
Females' Written	87.34	4.52
Males' Clinical	92.65	3.28
Females' Clinical	92.14	2.96

KMO and Bartlett's Test

The result of the Kaiser-Meyer-Olkin measure of sampling adequacy test (an index for comparing the magnitudes of the observed correlations coefficients to the magnitudes of the partial correlations coefficients) was high for the pre-rotation efficacy

86

responses (.858) and also for the post-rotation efficacy responses (.876).

The value of the test for sphericity (based on a chi-square transformation of the determinant of the correlation matrix) was high for the pre- and post-rotation efficacy data (Bartlett's Test of Sphericity = 1629.096 and 1670.743 respectively). The associated significance level was small (Significance = .000) for both the pre-rotation as well as the post-rotation efficacy data therefore the null hypothesis that there were no correlations among the items on the self-efficacy questionnaire was rejected and a principal components analysis with Varimax orthogonal rotation was performed.

Principal Components Analysis

The principal components solution with Varimax orthogonal rotation retained six uncorrelated pre-rotation factors for the Third Year Clerkship Self-Efficacy Questionnaire. These are presented here:

Factor 1

1) perform a lung exam

2) perform an abdominal exam

3) perform an ears, nose, and throat (ENT) exam

4) perform a cardiovascular exam.

Factor 2

1) evaluate and manage patients being seen in followup for chronic problems

2) counsel patients on the modification of lifestyle risk factors

3) develop a differential diagnosis for a common problem

4) evaluate or assess geriatric patients

5) perform a focused history and physical exam

Factor 3

1) perform a pap smear

2) perform a pelvic exam

3) perform a saline KOH vaginal preparation.

Factor 4

1) perform an anoscopy or sigmoidoscopy

2) perform cerumen removal

3) perform cryosurgery

4) perform typmanometry

Factor 5

1) interpret an ECG

2) interpret a urinalysis

3) perform suturing

4) perform an injection

Factor 6

1) obtain a three-generation genogram

2) perform a musculoskeletal exam

Refer to Table 9 in Appendix D for the rotated component matrix for the pre-rotation self-efficacy factors. Refer to Table 10 in Appendix D for the pre-rotation self-efficacy factors in table form.

The principal components solution with Varimax orthogonal rotation retained five uncorrelated post-rotation factors for the Third Year Clerkship Self-Efficacy Questionnaire. These are presented here:

Factor 1

1) perform an abdominal exam

2) perform a cardiovascular exam

3) develop a differential diagnosis for a common problem

4) perform an ears, nose, and throat exam (ENT)

5) perform a focused history and physical (H&P) exam

6) perform a lung exam

7) perform a history of present illness (HPI) in a patient presenting with a common problem.

Factor 2

1) perform a saline KOH vaginal preparation

2) perform a pap smear

3) perform a pelvic exam

Factor 3

1) perform cerumen removal

2) perform cryosurgery

3) interpret an ECG;

4) perform an injection

5) perform suturing

Factor 4

1) obtain a three-generation genogram;

2) counsel patients on modification of lifestyle risk factors

3) assess long-and short-term risks to a patient's health

Factor 5

1) perform an anoscopy or sigmoidoscopy

2) evaluate and manage patients being seen in followup for chronic problems

3) evaluate or assess geriatric patients

Refer to Table 11 in Appendix D for the rotated component matrix for the post-rotation self-efficacy factors. Refer to Table 12 in Appendix D for the post-rotation self-efficacy factors in table form.

Correlation of Pre-rotation Factor Scores with Performance Scores

The Pearson Product Moment Correlation statistic was performed to correlate the pre-rotation self-efficacy factors with each of the academic performance scores These correlations are presented in Table 13.

Table 13

Correlation of Pre-rotation Self-Efficacy Factor Scores with Performance Scores

	1	2	3	4	5	6	Clinical
1	1.000	.000	.000	.000	.000	.000	.189
2	.000	1.000	.000	.000	.000	.000	.097
3	.000	.000	1.000	.000	.000	.000	.070
4	.000	.000	.000	1.000	.000	.000	.000
5	.000	.000	.000	.000	1.000	.000	.029
6	.000	.000	.000	.000	.000	1.000	-.035
Clinical	.189	.097	.070	.000	.029	-.035	1.000
Oral	.122	.070	.059	.076	.118	.129	.244
Written	-.008	.102	.209*	-.134	.266**	-.130	.166

Note. *p< .05. **p< .01.

The results indicated the pre-rotation self-efficacy Factor 3 and the written exam scores were significantly correlated ($r = .21$, $p < .05$). In addition the pre-rotation self-efficacy Factor 5 and the written exam were significantly correlated ($r = .27$, $p < .01$).

Correlation of Post-Rotation Self-Efficacy Factor Scores with Performance Scores

The Pearson Product Moment Correlation statistic was performed to correlate the post-rotation self-efficacy factors with each of the academic performance scores These correlations are presented in Table 14.

Table 14

Correlation of Post-Rotation Self-Efficacy Factor Scores with Performance Scores

	Clinic	Oral	Writ	1	2	3	4	5
Clin	1.000	.244	.166	.134	-.040	.133	.286**	.087
Oral	.244	1.000	.287	.058	.182	.087	-.050	.028
Writ	.166	.287	1.000	-.020	.114	-.039	-.238*	.021
1	.134	.058	-.020	1.000	.000	.000	.000	.000
2	-.040	.182	.114	.000	1.000	.000	.000	.000
3	.133	.087	-.039	.000	.000	1.000	.000	.000
4	.286	-.050	-.238	.000	.000	.000	1.000	.000
5	.087	.028	.021	.000	.000	.000	.000	1.000

Note. *p < .05. **p < .01.

The results indicated the post-rotation self-efficacy Factor 4 and the clinical scores were correlated (r = .29, p < .01). In addition the post-rotation self-efficacy Factor 4 and the written exam were negatively correlated (r = -.24, p < .05).

Comparison of Pre-Rotation Factors Scores of Male and Female Students

Two-tail t-tests were performed comparing each of the six self-efficacy pre-rotation factor scores of the male students with those of the female students. A-test assuming equal variances as well as a t-test assuming unequal variances were performed for all six comparisons, and there was no difference between the males and females on any of the six pre-rotation self-efficacy factor scores.

Comparison of Post-Rotation Factors Scores of Male and Female Students

Two-tail t-tests were performed comparing each of the five self-efficacy post-rotation factor scores of the male students with those of the female students. A-test assuming equal variances as well as a t-test assuming unequal variances were performed for all five comparisons, and no difference was found between the males and females on any of the five post-rotation self-efficacy factor scores.

Chapter V

Discussion

The primary purpose of this study was to determine whether there was a relationship between the medical students' perceived self-efficacy on designated skills and their academic achievement in a third-year family medicine clerkship. As reported in the results, moderate correlations were found between the self-efficacy measures and some of the performance variables. The results of the study revealed moderate correlations between the pre-rotation self-efficacy scores and the oral exam scores ($r = .22$, $p < .05$), the post-rotation self-efficacy scores and the clinical scores ($r = .24$, $p < .05$), and a negative correlation between the gain scores and the written exam ($r = -0.25$, $p < .02$). These results are similar to some of the correlations reported in the literature review for studies using classroom-related performance measures (Wood & Locke, 1987; Horn, Bruning, Schraw & Curry, 1993; Mone, 1994;) though lower than others (Pintrich, 1989; Mone & Baker, 1992; Lent, Lopez & Bieschke, 1993; Zimmerman & Bandura, 1994)

The relationship of self-efficacy and academic performance may very well have been moderated by the level at which they were measured. Self-efficacy was measured at a task performance level, whereas academic performance was measured at a more complex, multiple tasks level in this study. This was reflected in the results reported by Mone (1994) as well. In his study a stronger relationship was found between outcome self-efficacy (confidence regarding the grade one would earn in the course) and course

performance measures than was found between process self-efficacy (specific tasks) and the course performance measures.

The amount of time that elapsed during which the self-efficacy beliefs and performance measures were assessed may also have influenced the results. Bandura (1986) recommended that the efficacy instrument be administered shortly before performance is to be assessed. It is interesting to note, however, that the difference in time between the two administrations of the efficacy instrument in this study, four weeks prior to and one to two days prior to the assessment of performance, does not appear to have had a strong influence on the correlations. The correlations between the post-rotation self-efficacy scores and the performance scores were not significantly higher than were the correlations between the pre-rotation self-efficacy scores and the performance scores.

I believe the strongest influence on the relationship between self-efficacy and academic performance in this study was the high ability level of the participants. The homogeneity of the group very likely restricted not only the range of the self-efficacy scores but the performance scores as well thus weakening the correlation between the two. Perhaps Bandura's self-efficacy construct is not predictive beyond a certain combined ability and efficacy level.

The fact that the pre-rotation self-efficacy scores correlated significantly with the oral exam scores but not significantly with the clinical scores, and the post-rotation self-efficacy scores correlated significantly with the clinical scores but not with the oral exam scores is puzzling. The only explanation I can offer for the negative correlation between the self-efficacy gain scores and

the written exam scores is that it may reflect a ceiling effect with regard to the better students' self-efficacy gain scores. However, the magnitude of the correlations, even those that are significant, are small and the absolute differences between the significant and nonsignificant correlations are actually quite small.

It is not surprising that there were significant differences between both the pre-rotation self-efficacy scores (p < .01) and the post-rotation self-efficacy scores (p < .01) of the early group and the late group. As Bandura asserts, the strongest influence on an individual's perception of self-efficacy is enactive attainment (task performance) The late group of students, having experienced more clinical rotations before they started the Family Medicine rotation, would have had the benefit of more enactive attainment, "hands-on" experiences, and also more vicarious experiences (observation of others) than would the students in the early group. This would help to explain the significant differences between the two groups on the pre-rotation self-efficacy scores as well as the post-rotation self-efficacy scores.

In addition, I believe the approach to medicine taken by Family Medicine practitioners helped the late group to assimilate knowledge they had acquired from earlier rotations. Family medicine is a broad specialty comprised of knowledge from many different medical specialties (e.g., obstetrics and gynecology, pediatrics, general internal medicine), and this rotation may have served as an integrative experience for the late group. It is not uncommon when working with family medicine clerkship students to hear them say they are glad they had family medicine late in the

year because it helped pull all of the information gained on other third-year clerkships together for them.

It is important to point out that students on the family medicine third-year clerkship very likely experience all four of the primary sources of information upon which self-knowledge of one's efficacy is based (enactive attainment, vicarious experience, verbal persuasion, physiological states). The expectation would be that these would strengthen the perceived self-efficacy of both groups but would be especially beneficial to the late group because of their previous clinical experiences. Enactive attainment (task performance) is highly emphasized and expected by the clerkship director and the community preceptors. In the community setting clerkship students usually experience more "hands-on" education than in any of the other third-year clerkships so this rotation may be the best opportunity the late group of students has had to apply previously gained knowledge in a "real world" setting.

The students spend the first day at their assigned community site observing their preceptors (vicarious experience). However, after the first day, they are expected to complete a focused history and physical, present this information to their preceptors, develop an assessment of the patient's problem and defend it, and develop a treatment plan and defend it on at least six patients each day they spend in the clinic (enactive attainment). All students are expected to see at least 70 patients by themselves during the four-week clerkship rotation and often they see more than the required 70 patients. The students receive immediate feedback from their preceptors upon completion of their patient case presentation, and

further clarification and discussion between the preceptor and student often occurs when the preceptor returns with the student to see the patient together.

The family medicine clerkship rotation is a very popular rotation during the third year of medical school primarily because of this personal attention, encouragement (verbal persuasion) "hands-on" experience (enactive attainment) and feedback the students receive from experienced and committed community family physicians.

As stated in the results section, no difference was found between the male and female students on any of the self-efficacy measures or the performance measures. This may well be the result of the strict medical school admissions criteria which include personal interviews as well as college GPAs and MCAT scores.

After having discussed the results of the principal components analysis with the Third-Year Family Medicine Clerkship director, I believe the item clusters in the six pre-rotation factors represent the third-year medical students' concept of their medical experience at that point in their medical education. I have interpreted the factor loadings for the six pre-rotation efficacy items in the following way.

It appears that pre-rotation Factor 1 is the students' concept of "the physical exam" as it is taught in their second-year course, Principals of Clinical Medicine II, and also as it is emphasized as the basic parts of the physical exam in the inpatient setting in the hospital during their other third-year clerkships.

Pre-rotation Factor 2 appears to represent areas for which the students may have limited experience and may also perceive as complex, based on this lack of experience.

The items in Pre-rotation Factor 3 clustered together because they are commonly known by the students, at almost any stage of the their medical education, as items associated with the gynecological exam .

I believe Pre-rotation Factor 4 represents procedures performed commonly in the outpatient setting for which the students would have had limited experience in their inpatient rotations prior to the family medicine rotation.

Pre-rotation Factor 5 appears to represent procedures the students may have encountered while on their other inpatient rotations.

I find Pre-rotation Factor 6 difficult to explain. Students are familiar with the family genogram from their first-year course, Principals of Clinical Medicine I, though they are not likely to have actually obtained the information from a patient and drawn the genogram. As for the other item included in Pre-rotation Factor 6, perform a musculoskeletal exam, I know from years of talking with clerkship students that this is one of the parts of the physical exam they feel most unsure of performing well and for which they receive limited experience on all of their third-year rotations including the family medicine clerkship rotation.

I believe the difference in the way the items loaded on the post-rotation factors represents the impact the family medicine

clerkship rotation had on the students' perception of these items. I interpreted the five post-rotation factors in the following way.

What is interesting about Post-rotation Factor 1 are the three items that were added to the four pre-rotation items to create this factor. The additional items include: develop a differential diagnosis for a common problem; perform a focused history and physical exam; and perform a history of present illness (HPI) in a patient presenting with a common problem. These three post-rotation items are fairly unique to the ambulatory care experience during the family medicine rotation, and the four pre-items can conceptually be integrated with the three post-rotation items when students are working with patients in the clinic (outpatient) setting.

Post-rotation Factor 2 consists of the same three items as Pre-rotation Factor 3, items associated with a gynecological exam. Experiences on the family medicine clerkship rotation would very likely not have influenced a change in the loadings of these items as they are the same for an inpatient or outpatient gynecological exam.

Post-rotation Factor 3 is interesting in that it appears to be a consolidation of procedures most often encountered by students during their family medicine clerkship rotation.

Post-rotation Factor 4 is a completely new loading of items with no previous associations with each other in the pre-factor loadings. It appears that after having experienced the family medicine clerkship, the students associated the genogram with its usefulness in assessing and counseling patients with regard to health risk factors.

Post-rotation Factor 5 is a somewhat unusual combination of items; however, all three of the items included in this factor are areas that many third-year students have commented on as being among the most challenging and complex when they are encountered during the family medicine clerkship rotation.

In summary, I believe the difference in item loadings, pre- and post-rotation, was heavily influenced by the students' experiences during their family medicine clerkship rotation. I believe the post-rotation factors represent a much clearer understanding by the students of ambulatory medicine as it is practiced by family medicine physicians.

As stated in the results, Pre-rotation Factor 3 correlated significantly ($r = .21$, $p < .05$) as did Factor 5 ($r = .27$, $p < .01$) with the written exam. The only interpretation I can offer is one of ability in general. Perhaps Factor 3 and Factor 5 represent areas of knowledge that differentiate the better students from the rest of their class. This question could be addressed in a future study by determining the upper and lower quartiles of the group (based on the written exam scores) and comparing the scores of the two groups on the items clustered in these two factors to determine whether there was a significant difference between the two groups.

The Post-rotation Factor 4 correlated positively ($r = .29$, $p < .01$) with the clinical scores and negatively ($r = -.24$, $p < .05$) with the written exam scores. Since this factor includes procedures most commonly encountered in the outpatient setting, it is not surprising that it correlated with the clinical scores. I do not have

an explanation for its negative correlation with the written exam scores.

As the results indicated, there were no differences between the male and female students' pre-factor scores or post-factor scores. I would interpret this to mean the male and female students did not differ in the way they perceived the item clusters.

Conclusions

The results of this study did not reflect as strong a relationship between the self-efficacy measures and the academic performance measures as was anticipated. However, it is the only study of which this author is aware, that has sought to study a sample of individuals of such high levels of ability and self-efficacy. It may be that the predictive power of the construct of self-efficacy, with regard to academic performance, flattens out beyond certain levels of efficacy and ability. To confirm this, self-efficacy studies of other high-ability individuals would need to be conducted. These studies might include participants from graduate colleges, colleges of dentistry and law schools. As no gender differences were found in the present study, it would also be interesting to see if any gender differences emerged from the proposed studies.

The unexpected results of the principal components analysis may well be the most valuable part of this study. Though unanticipated, the factors revealed more than simply items with similar self-efficacy ratings. The way the factors loaded also revealed the students' perceptions of family medicine prior to and after the clerkship experience. If the purpose of the family

medicine clerkship rotation is to alter the students' knowledge structure of the way medicine is practiced by primary care physicians, then it appears the clerkship was successful in this regard. When a comparison is made between the way the items loaded prior to the rotation and the way they loaded after completion of the rotation, a more sophisticated, refined concept of family medicine emerges.

Recommendations

For researchers interested in studying the relationship between task-level self-efficacy and academic performance in a medical school setting, I would recommend measuring performance at the task level as well. This could be done using the performance measures of an Objectively Structured Clinical Examination (OSCE). An OSCE is an observed evaluation of specific medical skills and procedures. Simulated work stations are set up and students are observed and rated by department faculty members as they move through each of the stations performing the required skills and procedures. If the relationship between task-level self-efficacy and academic performance can be detected in this high-ability, high self-efficacy group, I believe the use of an OSCE is the best way to measure clerkship students' task level performance.

The difference between the medical student's perceived ability to complete a particular skill or procedure and the student's belief in the ability to learn that same skill or procedure may also need to be investigated. If the purpose of medical education is to help students to learn, then describing the self-efficacy items in the context of learning particular skills or procedures rather than

performing them, may provide a more accurate measure of academic self-efficacy.

In addition, I would recommend measuring medical students' self-efficacy on their first day of medical school, and again at the end of each academic year. Self-efficacy reflects an individual's perceived ability to organize and perform the appropriate actions needed to accomplish specific tasks, but in medical education the tasks are extremely complex. If the students are incrementally learning to organize and perform the appropriate actions, then a longitudinal increase in their self-efficacy measures may be a more accurate measure of their academic self-efficacy.

My final recommendation is a call for further research into a clarification between general and specific measures of self-efficacy. With a high-ability, high self-efficacy group of individuals, such as medical students, a more general measure of self-efficacy may more accurately reflect the relationship between self-efficacy and academic performance. I suggest a more general, academic self-efficacy instrument be developed for medical education that is less task-specific than the instrument used in the present study.

References

Andrus, G. R. & Debus, R. L. (1978). Persistence and the causal perception of failure: Modifying cognitive attributions. <u>Journal of Educational Psychology, 70,</u> 154-166.

Attarian, L., Fleming, M., Barron, P. & Strecher, V. (1987). A comparison of health promotion practices of general practitioners and residency trained family physicians. <u>Journal of Community Health, 12,</u> 31-39.

Ashton, P. T. & Webb, R. B. (1986). Making a difference: Teachers' sense of efficacy and student achievement. New York: Longman.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. <u>Psychological Review, 84</u>(2), 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. <u>American Psychologist, 37</u>(2), 122-147.

Bandura, A. (1986). <u>Social foundations of thought and action: A social cognitive theory.</u> New Jersey: Prentice-Hall.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. <u>Developmental Psychology, 25</u>(5), 729-735.

Bandura, A. & Adams, N. E. (1977). Analysis of self-efficacy theory of behavioral change. <u>Cognitive Theory and Research, 1</u>(4), 287-310.

Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioral change. <u>Journal of Personality and Social Psychology, 35</u>(3), 125-139.

Bandura, A., Adams, N. E., Hardy, A. B., Howells, G. N. (1980). Tests of the generality of self-efficacy theory. <u>Cognitive Theory and Research, 4,</u> 39-66.

Bandura, A. & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. <u>Journal of Personality and Social Psychology, 41</u>(3), 586-598.

Barling, J. & Abel, M. (1983). Self-efficacy beliefs and tennis performance. Cognitive Therapy Research, 7, 265-272.

Becker, M. H. & Janz, N. K. (1990). Practicing health promotion: The doctor's dilemma. Annals of Internal Medicine, 113, 419-422.

Bickel, J., Galbraith, A., & Quinnie, R. (1995). Women in U. S. academic medicine statistics. Washington, D. C.: Association of American Medical Colleges.

Borg, W. R. & Gall, M. D. (1989). Educational research: An introduction (5th ed.). New York: Longman.

Brod, M. I. & Hall, S. M. (1984). Joiners and nonjoiners in smoking treatment: A comparison of psychological variables. Addictive Behaviors, 9, 217-221.

Betz, N. E. & Hackett, G. (1981). The relationship of career-related self-efficacy expectations to perceived career options in college women and men. Journal of Counseling Psychology, 28(5), 399-410.

Brown, I., Jr., & Inouye, D. K. (1978). Learned helplessness through modeling: The role of perceived similarity in competence. Journal of Personality and Social Psychology, 36(8), 900-908.

Brown, S. D., Lent, R. W., & Larkin, K. C. (1989). Self-efficacy as a moderator of scholastic aptitude-academic performance relationships. Journal of Vocational Behavior, 35, 64-75.

Campbell, N. K. & Hackett, G. (1986). The effects of mathematics task performance on math self-efficacy and task interest. Journal of Vocational Behavior, 28, 149-162.

Chambliss, C. A. & Murray, E. J. (1979a). Cognitive procedures for smoking reduction: Symptom attribution versus efficacy attribution. Cognitive Therapy and Research, 3, 91-95.

Chambliss, C. A. & Murray, E. J. (1979b). Efficacy attribution: Locus of control and weight loss. Cognitive Therapy Research, 3, 349-353.

Clement, S. (1987). The self-efficacy expectations and occupational preferences of females and males. Journal of Occupational Psychology, 60, 257-265.

Coelho, R. J. (1984). Self-efficacy and cessation of smoking. Psychological Reports, 54, 309-310.

Condiotte, M. M. & Lichenstein, E. (1981). Self-efficacy and relapse in a smoking cessation program. Journal of Consulting Clinical Psychology, 49, 648-658.

Cooper, C. R. (1985). Holistic evaluation of writing. In C. R. Cooper (Ed.), Researching response to literature and the teaching of literature: Points of departure. (pp. 3-31). New Jersey: Ablex.

Corno, L. & Mandinach, E. B. (1983). The role of cognitive engagement in classroom learning and motivation. Educational Psychologist, 18(2), 88-108.

DiClemente, C. C. (1981). Self-efficacy and smoking cessation maintenance: A preliminary report. Cognitive Therapy and Research, 5, 175-187.

Eachus, P. (1993). Development of the health student self-efficacy scale. Perceptual and Motor Skills, 77, 670.

Ewart, C. K., Taylor, C. B., Reese, L. B., & Debusk, R. F. (1984). Effects of early postmyocardial infarction exercise testing on self-perception and subsequent physical activity. American Journal of Cardiology, 41, 1076-1080.

Glanz, K. & Gilboy, M. B. (1992). Physicians, preventive care, and applied nutrition: Selected literature. Academic Medicine, 67, 776-781.

Hackett, G. (1985). Role of mathematics self-efficacy in the choice of math-related majors of college women and men: A path analysis. Journal of Counseling Psychology, 32(1), 47-56.

Hackett, G. & Betz, N. E. (1992). Self-efficacy perceptions and the career-related choices of college students. In D. H. Schunk & J. L. Meece (Eds.), Student perceptions in the classroom (pp. 229-246). New Jersey: Erlbaum Assoc.

Hackett, G., Betz, N. E., Casas, J. M., & Rocha-Singh, I. A. (1992). Gender, ethnicity, and social cognitive factors predicting the academic achievement of students in engineering. Journal of Counseling Psychology, 39(4), 527-538.

Horn, C., Bruning, R., Schraw, G., Curry, E. & Katkanant, C. (1993). Paths to success in the college classroom. Contemporary Educational Psychology, 18, 464-478.

Jeffrey, R. W., Bjornson-Benson, W. M., Rosenthal, B. S. Lindquits, R. A., Kurth, C. L. & Johnson, S. L. (1984). Correlates of weight loss and its maintenance over two years of follow-up among middle-aged men. Preventive Medicine, 13, 155-168.

Kaplan, R. M., Atkins, C. J. & Reinsch, S. (1934). Specific efficacy expectations media exercise compliance in patients with COPD. Health Psychology, 3, 223-242.

Keyser, V. & Barling, J. (1981). Determinants of children's self-efficacy beliefs in an academic environment. Cognitive Therapy and Research, 5(1), 29-40.

Kloosterman, P. (1988). Self-confidence and motivation in mathematics. Journal of Educational Psychology, 80(3), 345-351.

Ladd, G. W. & Price, J. M. (1986). Promoting children's cognitive and social competence: The relation between parents' perceptions of task difficulty and children's perceived and actual competence. Child Development, 57, 446-460.

Lee, C. (1982). Self-efficacy as a predictor of performance in competitive gymnastics. Journal of Sports Psychology, 4, 405-409.

Lee, C. (1984). Accuracy of efficacy and outcome expectations in predicting performance in a simulated assertiveness task. Cognitive Therapy Research, 8, 37-48.

Lent, R. W. Brown, S. D., & Larkin, K. C. (1984). Relation of self-efficacy expectations to academic achievement and persistence. Journal of Counseling Psychology, 31(3), 356-362.

Lent, R. W. Brown, S. D., & Larkin, K. C. (1986). Self-efficacy in the prediction of academic performance and perceived career options. Journal of Counseling Psychology, 33(3), 265-269.

Lent, R. W., Lopez, F. G., & Bieschke, K. J. (1991). Mathematics self-efficacy: Sources and relation to science-based career choice. Journal of Counseling Psychology, 38(4), 424-430.

Lent, R. W., Lopez, F. G., & Bieschke, K. J. (1993). Predicting mathematics-related choice and success behaviors: Test of an expanded social cognitive model. Journal of Vocational Behavior, 42, 223-236.

Lewis, C. E. , Clancy, C. , Leake, B., Schwartz, J. S. (1991). The counseling practices of internists. Annals of Internal Medicine, 114, 54-58.

Maddux, J. E. & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. Journal of Experimental Social Psychology, 19, 469-479.

Mann, K. V., & Putnam, R. W. (1989). Physicians' perceptions of their role in cardiovascular risk reduction. Preventive Medicine, 18, 45-58.

Margolies, M. A., Wachtel, A. B. & Schmelkin, L. P. (1986). Perceived self-efficacy in psychiatry. Journal of Psychiatric Education, 10, 120-128.

McIntyre, D. O., Lichenstein, E. & Mermelstein, R. J. (1983). Self-efficacy and relapse in smoking cessation: A replication and extension. Journal of Consulting Clinical Psychology, 51, 632-633.

McKeachie, W. J., Pintrich, P. R., & Lin, Y. (1985). Teaching learning strategies. Educational Psychologist, 20, 153-160.

Meier, S., McCarthy, P. R., & Schmeck, R. R. (1984). Validity of self-efficacy as a predictor of writing performance. Cognitive Therapy and Research, 8(2), 107-120.

Mone, M. A. (1994). Comparative validity of two measures of self-efficacy in predicting academic goals and performance. Educational and Psychological Measurement, 54(2), 516-529.

Mone, M. A. & Baker, D. D. (1992). A social-cognitive, attributional model of personal goals: An empirical evaluation. Motivation and Emotion, 16(4), 297-321.

Mone, M. A. & Baker, D. D. (1995). Predictive validity and time dependency of self-efficacy, self-esteem, personal goals, and academic performance. Educational and Psychological Measurement, 55(5), 716-727.

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. Journal of Counseling Psychology, 38(1), 30-38.

Nicki, R. M., Remington, R. E. & MacDonald, G. A. (1985). Self-efficacy, nicotine-fading self-efficacy monitoring and cigarette smoking behavior. Behavioral Research and Therapy, 22, 477-485.

Norwich, B. (1987). Self-efficacy and mathematics achievement: A study of their relation. Journal of Educational Psychology, 79(4), 384-387.

Perry, D. G., Perry, L. C., & Rasmussen, P. (1986). Cognitive and social learning mediators of aggression. Child Development, 57, 700-711.

Pintrich, P. R. (1986, April). Motivation and learning strategies interactions with achievement. Paper presented at the American Educational Research Association conference, San Francisco, CA.

Pintrich, P. R. (1989). The dynamic interplay of student motivation and cognition in the college classroom. In M. L. Maehr and C. Ames (Eds.), Advances in motivation and achievement: Motivation Enhancing Environments, (pp. 117-160). Connecticut: JAI Press

Pintrich, P. R. & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, 82(1), 33-40.

Prochaska, J. O., Crimi, P., Lapanski, D., Martel, L. & Reid, P. (1982). Self-change processes, self-efficacy and self-concept in relapse and maintenance of cessation of smoking. Psychological Reports, 51, 983-990.

Prochaska, J. O. & DiClemente, C. C. (1984). Self change processes, self-efficacy and decisional balance across five stages of smoking cessation. In A. R. Liss (Ed.), Advances in Cancer Control: Epidemiology and Research. New York: Alan R. Liss, Inc.

Relich, J. D., Debus, R. L., & Walker, R. (1986). The mediating role of attribution and self-efficacy variables for treatment effects on achievement outcomes. Contemporary Educational Psychology, 11, 195-216.

Rosen, M. A., Logsdon, D. N. & Demak, M. M. (1984). Prevention and health promotion in primary care: Baseline results on physicians from the INSURE Project on lifecycle preventive health services. Preventive Medicine, 13, 535-548.

Schunk, D. H. (1981). Modeling and attributional effects on children's achievement: A self-efficacy analysis. Journal of Educational Psychology, 73(1), 93-105.

Schunk, D. H. (1989). Self-efficacy and achievement behaviors. Educational Psychology Review, 1(3), 173-209.

Schunk, D. H. (1992). Theory and research on student perceptions in the classroom. In D. H. Schunk & J. L Meece (Eds.), Student perceptions in the classroom (pp. 3-23). New Jersey: Erlbaum Assoc.

Schunk, D. H. & Carbonari, J. P. (1984). Self-efficacy models. In J. D. Matarzzo, S. M. Weiss, J. A. Herd, N. E. Miller, & S. M. Weiss (Eds.), Behavioral health (pp. 230-247). New York: John Wiley & Sons.

Schunk, D. H. & Gunn, T. P. (1986). Self-efficacy and skill development: Influence of task strategies and attributions. Journal of Educational Research, 79(4), 238-244.

Schwiebert, P. & Davis, A. (1993). Increasing inter-rater agreement on a family medicine clerkship oral examination: A pilot study. Family Medicine, 25(3), 182-185.

Shell, D. F., Murphy, C. C., & Bruning, R. H. (1989). Self-efficacy and outcome expectancy mechanisms in reading and writing achievement. Journal of Educational Psychology, 81(1), 91-100.

Shrock, S. A. & Coscarelli, W. C. C. (1989). Criterion-referenced test development: Technical and legal guidelines for legal and corporate training. New York: Addison-Wesley.

Siegel, R . G., Galassi, J. P., & Ware, W. B. (1985). A comparison of two models for predicting mathematics performance: Social learning versus math aptitude-anxiety. Journal of Counseling Psychology, 32(4), 531-538.

Strecher, V. J., Becker, M. H., Kirscht, J. P., Eraker, S. A. & Graham-Tomasi, R. P. (1985). Psychosocial aspects of changes in cigarette-smoking behavior. Patient Education and Counseling, 7, 249-262.

Strecher, V. J., DeVellis, B., Becker, M. H., & Rosenstock, I. M. (1986). The role of self-efficacy in achieving health behavior change. Health Education Quarterly, 13(1), 73-92.

Tresolini, C. P. & Stritter, F. T. (1994). An analysis of learning experiences contributing to medical students' self-efficacy in conducting patient education for health promotion. Teaching and Learning in Medicine, 6 (4), 247-254.

Vanek, E. P., Synder, C. W., Hull, A. L., & Hekelman, F. P. (1996). The relationship between teachers' confidence and use of clinical teaching skills in ambulatory care settings Teaching and Learning in Medicine, 8 (3), 137-141.

Weinberg, R., Gould, D., & Jackson, A. (1979). Expectations and performances: An empirical test of Bandura's self-efficacy theory. Journal of Sports Psychology, 1, 320-331.

Weiner, B. (1979). A theory of motivation for some classroom experiences. Journal of Educational Psychology, 71, 3-25.

Wood, R. E. & Locke, E. A. (1987). The relation of self-efficacy and grade goals to academic performance. Educational and Psychological Measurement, 47, 1013-1025.

Zimmerman, B. J. & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. American Educational Research Journal, 31(4), 845-862.

Zimmerman, B. J. & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. Journal of Educational Psychology, 82(1), 51-59.

Zimmerman, B. J. & Martinez-Pons, M. (1992). Perceptions of efficacy and strategy use in the self-regulation of learning. In D. H. Schunk & J. L. Meece (Eds.), Student perceptions in the classroom (pp. 185-207). New Jersey: Erlbaum Assoc.

Appendix A

INITIAL INFORMATION SHEET

PLEASE COMPLETE THIS SHEET, TEAR IT OUT AND **BRING WITH YOU TO ORIENTATION** THE FIRST DAY OF YOUR C LERKSHIP. THIS INFORMATION WILL BE DISTRIBUTED TO THE PHYSICIANS WITH WHOM YOU'LL WORK AND WILL HELP THEM PLAN YOUR CLERKSHIP EXPERIENCE.

Name: _____   Date: _____

SS#: _____   Site No: _____

CLERKSHIP EXPERIENCE

For each clerkship completed, circle your level of involvement; **1** - Responsible for patient care with supervision, **2** - Assisted with patient care, but not responsible for medical decision-making; and **3** - Observed patient care, sometimes assisted with simple procedures.

		Level of Involvement		
A.	Internal Medicine	1	2	3
B.	OB-GYN	1	2	3
C.	Pediatrics	1	2	3
D.	Psychiatry	1	2	3
E.	Surgery	1	2	3
F.	Selective I: _____	1	2	3
G.	Selective II: _____	1	2	3
H.	Selective III: _____	1	2	3

We want the Family Medicine Clerkship to meet your unique learning needs! Please help your physician supervisors provide this by indicating what has made (or would make) a third year clerkship an especially valuable learning experience for you (examples include: an opportunity to evaluate and manage patients, a chance to practice case presentations): _____

_____

_____

Please circle the one number best describing your current level of confidence in each of the following areas; **1** - No experience/feel very inadequate, and **6** - Much experience/feel very confident.

				Confidence			
		None				Much	
A.	Performing or interpreting the following procedures:						
	i. cryosurgery (warts, etc.)	1	2	3	4	5	6
	ii. injections	1	2	3	4	5	6
	iii. cerumen removal	1	2	3	4	5	6
	iv. pap smear	1	2	3	4	5	6
	v. suturing	1	2	3	4	5	6
	vi. anoscopy/sigmoidoscopy	1	2	3	4	5	6

114

		Confidence					
		None				**Much**	

B.	Obtaining basic family information,including a three generation genogram	1	2	3	4	5	6
C.	Performing or interpreting the following:						
	i. tympanometry	1	2	3	4	5	6
	ii. saline/KOH vag. prep.	1	2	3	4	5	6
	iii.. urinalysis (UA)	1	2	3	4	5	6
	iv.. electrocardiogram (ECG)	1	2	3	4	5	6
D.	Performing the following parts of the physical exam:						
	i. ear/nose/throat exam	1	2	3	4	5	6
	ii. abdominal exam	1	2	3	4	5	6
	iii lung exam	1	2	3	4	5	6
	iv. cardiovascular exam	1	2	3	4	5	6
	v. musculoskeletal exam	1	2	3	4	5	6
	vi. pelvic exam	1	2	3	4	5	6
	vii. eye exam	1	2	3	4	5	6
E.	Assessing long- and short-term risks to a patient's health, (i.e., obtaining a risk-oriented history)	1	2	3	4	5	6
F.	Performing a history of present illness (HPI) in a patient presenting with a common problem (e.g., chest pain, abdominal pain, shoulder pain and physical exam	1	2	3	4	5	6
G.	Performing a focused (10 to 15 minute) HPI and physical exam	1	2	3	4	5	6
H.	Developing a differential diagnosis in a patient presenting with a common problem	1	2	3	4	5	6
I.	Counseling patients on modification of lifestyle risk factors (e.g., tobacco abuse)	1	2	3	4	5	6
J.	Evaluating and managing patients being seen in followup of chronic problems (e.g., asthma, hypertension, diabetes)	1	2	3	4	5	6

		None					Much	
K.	Evaluating/assessing geriatric patients	1	2	3	4	5	6
L.	Applying sensitivity, specificity, and the threshold model to daily patient care decisions	1	2	3	4	5	6

FINAL INFORMATION SHEET

PLEASE COMPLETE THIS SHEET AFTER YOUR LAST SESSION IN THE OFFICE AND RETURN IT TO THE CLERKSHIP COORDINATOR BEFORE TAKING THE WRITTEN EXAM. THIS INFORMATION CORRESPONDS WITH THE *INITIAL INFORMATION SHEET* FILLED OUT AT THE BEGINNING OF THE ROTATION.

Name: _____ Date: _____

SS#: _____ Site No: _____

CLERKSHIP EXPERIENCE:

Please circle the one number best describing your current level of confidence in each of the following areas: **1** - No experience/feel very inadequate, and **6** - Much experience/feel very confident.

A. Performing or interpreting the following procedures:

		None		Confidence		Much	
i.	cryosurgery (warts, etc.)	1	2	3	4	5	6
ii.	injections	1	2	3	4	5	6
iii.	cerumen removal	1	2	3	4	5	6
iv.	pap smear	1	2	3	4	5	6
v.	suturing	1	2	3	4	5	6
vi.	anoscopy/sigmoidoscopy	1	2	3	4	5	6

B. Obtaining basic family information, including a three generation genogram

1 2 3 4 5 6

C. Performing or interpreting the following:

i.	tympanometry	1	2	3	4	5	6
ii.	saline/KOH vag. prep.	1	2	3	4	5	6
iii..	urinalysis (UA)	1	2	3	4	5	6
iv..	electrocardiogram (ECG)	1	2	3	4	5	6

D. Performing the following parts of the physical exam:

i.	ear/nose/throat exam	1	2	3	4	5	6
ii.	abdominal exam	1	2	3	4	5	6
iii	lung exam	1	2	3	4	5	6
iv.	cardiovascular exam	1	2	3	4	5	6
v.	musculoskeletal exam	1	2	3	4	5	6
vi.	pelvic exam	1	2	3	4	5	6
vii.	eye exam	1	2	3	4	5	6

E. Assessing long- and short-term risks to a patient's health, (i.e., obtaining a risk-oriented history)

1 2 3 4 5 6

117

		None				Much	
F.	Performing a history of present illness (HPI) in a patient presenting with a common problem (e.g., chest pain, abdominal pain, shoulder pain and physical exam	1	2	3	4	5	6
G.	Performing a focused (10 to 15 minute) HPI and physical exam	1	2	3	4	5	6
H.	Developing a differential diagnosis in a patient presenting with a common problem	1	2	3	4	5	6
I.	Counseling patients on modification of lifestyle risk factors (e.g., tobacco abuse)	1	2	3	4	5	6
J.	Evaluating and managing patients being seen in followup of chronic problems (e.g., asthma, hypertension, diabetes)	1	2	3	4	5	6
K.	Evaluating/assessing geriatric patients	1	2	3	4	5	6
L.	Applying sensitivity, specificity, and the threshold model to daily patient care decisions	1	2	3	4	5	6

Appendix B

Single Item

1. What is the most common cause of sexually transmitted disease in the United States?

   a) Neisseria gonorrhoeae
   b) Mycoplasma hominis
   c) Escherichia coli
   d) Treponema pallidum

Multiple Item Set

A 69-year-old man with known severe arteriosclerotic cardiovascular disease is found dead in his camper. He was camping in the mountains where nighttime temperatures were well below freezing. According to investigators, there are no signs of foul play on the body. As deputy medical examiner, you are asked to determine the cause of death. Which of the following would lead you to suspect that this was other than a natural death?

   1) Marked rigor mortis is present, even though the man was seen alive about 12 hours before being discovered.
   2) The kerosene heater is on but has run out of fuel, and the camper temperature is 40°F.
   3) The man's dog is also dead.
   4) There is an open bottle of nitroglycerin on the bedside table.

Case Cluster

A 20-year old white male college student with a 7-year history of type I diabetes mellitus sees you for lethargy and vomiting following a 3-day gastrointestinal illness. He normally takes 20 U of neutral protamine Hagedorn insulin every morning, but he stopped taking it the last 2 days because he was not able to keep any food down. His physical findings are as follows:

Blood pressure	90/70
Pulse	130/min
Respirations	28/min; Kussmaul's
Temperature	37.7°C (99.9F)
General	acetone on breath
HEENT	negative
Chest	clear
Heart	rapid, regular rhythm without murmur
Abdomen	tender without rebound; palpable liver edge and reduced bowel sounds
Neurologic	obtunded and hyperflexic without localizing abnormalities

His laboratory findings are as follows:

Hematocrit	50% (N 45-52)
Hemoglobin	15.8g/dL (N 13-18)

WBCs	16,000/µL	(N4300-10,800)
Polymorphonuclear		
cells	90%	(N25-62)
Lymphocytes	10%	(N20-53)
Creatine	1.6 mg/dL	(N 0.6-1.5)
BUN	40mg/dL	(N-8-25)
Phosphorus	2.3 mg/dL	(N 8-25)
Sodium	130 mEq/L	(N 135-145)
Potassium	5.6 mEq/L	(N3.5-5.0)
Chloride	90 mEq/L	(N 100-106)
Bicarbonate	12 mEq/L	(N 24-30)
Urinalysis		
Specific gravity	1.028	
pH	7.0	
Glucose	4 +	
Ketones	strong	
Protein	trace	
Serum glucose	800 mg/dL	
Serum ketones	positive 1:2	
Arterial blood gases		
pH	7.08 (N 7.35-7.45)	
pO$_2$	92 mm Hg (N 75-100)	
pCO$_2$	19 mm Hg (N 35-45)	
ECG	sinus tachycardia with low amplitude T waves	

A chest roentgenogram shows active disease, and an abdominal roentgenogram reveals gastric dilation and nonspecific gas pattern.

Which of the following factors contribute to this patient's diabetic ketoacidosis?

1. insulin deficiency
2. glucagon deficiency
3. epinephrine excess
4. accelerated gluconeogenesis
5. fatty acid oxidation

Immediate therapy should be _____.

6. regular insulin, 25 U stat, given intravenously
7. regular insulin, 8-10 U/hr by intravenous drip
8. potassium phosphate, 40 mEq.L/hr given intravenously
9. lactated Ringer's solution, 500 µL/hr given intrevenously
10.isotonic saline, 2 L rapidly infused intravenously

The patient improves. New laboratory test results are as follows:

Serum glucose	250 mg/dL
Serum potassium	3.4 mEq/L
Serum sodium	135 mEq/L
Serum bicarbonate	18 mEq/L
Serum chloride	90 mEq/L

Appropriate therapy now includes _____.

      11.isotonic saline, 500 μL/hr intravenously
      12.potassium phosphate, 40 mEq/L given intravenously

Example of an Oral Exam Question

Clinical Data

M.B. is a 42 year old African American woman presenting to you for the first time with a 6 month history of "constant" headaches. She had seen another physician who diagnosed "tension headaches" and treated her with several medications, including phenergan (an antihistamine), Darvocet N 100 (an analgesic), buspirone (a minor tranquilizer), alprazolam (a minor tranquilizer) and acetominophen with codeine (Tylenol#3), an analgesic. She's currently taking buspirone, 5 mg bid, and Darvocet prn for severe headaches. She consults you because _none of the medications the other physician prescribed has relieved her headaches_, and she hopes you can help her "feel better." Review of her records reveals the following normal studies over the last 2 months: a blood chemistry profile (Chem 20), CBC, sed. rate, and magnetic resonance imaging (MRI) scan of the head.

Question 1:   _Indicate additional information (history, physical exam) relating to her presenting problem you'd want to obtain during her brief office visit today. For each item you mention, indicate why it is important to your assessment or management of her problem today._

	Responses (check off/write in)	**Notes on Process**	**POINTS TOTAL/MAX.**
[ ]	**description** of her headaches (quality, location, duration etc.)		
[ ]	**psych.** review of systems (re. depr, anxiety esp)		
[ ]	ask about **stressors** in her life (work, home, financial)		
[ ]	**general health**/other medical diagnoses she has		
[ ]	**Family history** of headaches		
[ ]	other **medications** she's taking		
[ ]	**palpate** head and neck for tenderness		
[ ]	other:_____		
[ ]	other: _____		
[ ]	other: _____		**20**

Rationale mentioned (cross off, write in)

description—can help differentiate type of headache (i.e., tension vs migraine vs. mixed_____

_____

_____

123

psych—clarify whether she's anxious or depressed, can thereby guide drug selection and counselling strategy_____.

_____

_____

stressors—clue to causes of headaches, addressing these stressors may help relieve headaches_____

_____

_____

general health—some systemic illnesses can be associated with headaches, severe systemic illness increases chance of organic headache

_____

_____

family history-headaches may be a learned coping behavior; migraines tend to run in families_____

_____

_____

medications—some medications (e.g., ocps) can worsen headaches; certain ingestants (eg, caffeine, ergots, etoh) can cause rebound HA_____

_____

_____

palpate--tenderness of scalp or paraspiinals of neck associated with tension headache (tho absence of this sign doesn't rule this diagnosis out)_____

other:_____

other:_____

other: _____   **17**

Additional information (supply to student at this point)

M.B. describes her headaches as "constant", dull, and localizes them to both temples and "the back of my eyes." She says the headaches sometimes make her feel "dizzy" and nauseated and that light bothers her eyes when the headaches are particularly bad. She describes herself as "healthy," except for the headaches and the only medications she's taking are those for her headaches. She denies ethanol or tobacco use.

She and her current husband have been married 7 years and she describes their marriage as "happy." Both of them were married once before and a 12 year old daughter from her previous marriage lives with them. M.B. works as a computer operator and her husband, who is 44 years old, works as a teacher and supplements his income delivering pizzas.

M.B.'s parents are divorced and her father, who is 62, is remarried. She is the middle of 4 siblings, all of whom are living and in good health. Her father has headaches now, but she can't recall either parent suffering from headaches as she was growing up.

M.B. relates that since the headaches began, she has had bouts of feeling tense. She tends to "toss and turn" at night and it often takes her an hour to fall asleep. She denies

mood fluctuations, feeling blue or depressed, loss of appetite, loss of interest in sex/hobbies/ other activities.

Question 2   Based on the information available, indicate what type(s) of headache she's experiencing. For each diagnosis you list, indicate your rationale.

POINTS

Responses (check off/write in)   **Notes on Process**

TOTAL/MAX.

[ ]   **tension/"muscle contraction"**

[ ]   **mixed headache** (elements of migraine and muscle contraction)

[ ]   other: _____

[ ]   other: _____

[ ]   other: _____   9

Rationale mentioned (cross off, write in)

tension—dull, "constant", finances may be a stressor, BUT no obvious symptoms/signs of depression_____

_____

_____

mixed-presence of above symptoms + nausea and photophobia_____
other _____

_____

other:_____

other: _____   9

125

Appendix C

EVALUATION OF STUDENT'S CLINICAL PERFORMANCE DURING FAMILY MEDICINE CLERKSHIP CLINICAL EVALUATION

Student's Name:_____SSN:_____

Course Number:_____

Course Title:_____

Class:_____

Evaluator's Name:_____

☐ MIDCOURSE for your use only

Rotation Month/Year:_____

☐ FINAL GRADE

PLEASE RETURN IN THE ENCLOSED ENVELOPE BY_____

Please select and circle the one number best representing this student's clinical performance in each area listed below; where 8-9=A, 6-7=B, 4-5=C, 2-3= D, 1=F. In making your evaluation, consider the progress this student has made during this clerkship and how well (s)he compares with his/her peers. In completing the comments section, cite critical incidents characteristic of this student's performance.

1. **Fund of knowledge** (circle one):
   Consider this student's demonstration of knowledge of: preclinical course work (anatomy, physiology, pathophysiology, pharmacology); and his/her knowledge of the differential diagnosis/diagnostic criteria/evaluation of conditions covered in previous or current clinical course work.

   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

      1   2   3   4   5   6   7   8   9
   (lowest/worst)   (highest/best)

COMMENTS:_____

_____

2. **History-Taking** (circle one):
   Consider thoroughness (need to supplement information gathered by this student?); accuracy (does student's history agree with yours?); conciseness (does student include pertinent positives and negatives?); efficiency (does student complete focused history in 10-15 minutes or complete history in 20-30 minutes?).

      1   2   3   4   5   6   7   8   9
   (lowest/worst)   (highest/best)

COMMENTS:_____

_____

3. **Physical Examination** (circle one):
   Consider thoroughness (does student omit parts of exam relevant to patient's problem?),
   accuracy (can you rely on this student's findings?); adeptness (during an observed exam,
   consider the student/s smoothness and confidence performing the exam and using basic
   diagnostic tools such as stethoscope, sphygmomanometer, oto/ophthalmoscope, etc.).

   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

   (lowest/worst)   (highest/best)

COMMENTS: _____

___ _____

4. **Case Presentation/Write ups** (circle one):
   Consider timeliness (are progress notes and write ups in the chart when you expect
   them? Is this student always up to date on his/her patients?); organization (do
   student's notes and presentations follow a logical SOAP format?); conciseness (does
   student focus on pertinent positives and negatives? Are his/her case presentations
   complete in 1-2 minutes?); thoroughness (do you need to supplement notes or
   presentations with additional data? does (s)he address pertinent LAQ CODIERS
   areas?

   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

   (lowest/worst)   (highest/best)

COMMENTS: _____

_____

5. **Problem assessment/Judgment** (circle one):
   Does student consider prevalent/common problems? Are assessments consistent with
   clinical data? Is student able to defend assessments with strong diagnostic criteria?
   Does student apply the threshold model to test selection? Is student able to
   appropriately prioritize when confronted with several tasks?

   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

   (lowest/worst)   (highest/best)

COMMENTS: _____

_____

6. **Attitude and Professional Demeanor** (circle one):
Is student able to learn from mistakes and quickly acquire new knowledge and skills? Is student aware of his/her limitations? Does (s)he seek/accept responsibility? Does (s)he seek out and use learning resources (books/articles)? Does (s)he seek and respond appropriately to feedback? Does student ask appropriate questions and seem interested? Is the student dependable and punctual, and does (s)he complete assignments on time? Is the student's demeanor appropriate for patient care activities?

       1   2   3   4   5   6   7   8   9
(lowest/worst)   (highest/best)

COMMENTS: _____

_____

7. **Interpersonal Skills (patient/peers/staff)** (circle one):
During _observed_ interview, does the student demonstrate empathy, appropriate use of open-ended and directed questions, eye contact, ability to put patient at ease, positive regard, communication with patient in lay terms? Does your staff make it a point to comment favorably about this student? Are you proud to have this student associated with you? Does student communicate with you and staff honestly, directly, and appropriately?

       1   3   3   4   5   6   7   8   9
(lowest/worst)   (highest/best)

COMMENTS: _____

_____

8. **Overall evaluation** (circle one):
Consider your _overall_ evaluation of this student and his/her knowledge, attitude, and skills relative to other students you've worked with.

       1   2   3   4   5   6   7   8   9
(lowest/worst)   (highest/best)

COMMENTS: _____

_____

_____

_____

_____

129

PLEASE ASSIGN STUDENT **A PERCENTAGE GRADE** FOR CLINICAL PERFORMANCE.
THIS SHOULD BE ASSIGNED BASED ON THE DESCRIPTION BELOW BEST
CHARACTERIZING THIS STUDENT, AND YOU SHOULD <u>MARK</u> A SPECIFIC
PERCENTAGE.

NOTE: A = 100-89.5, B = 89.4-79.5, C = 79.4-69.5, D = 69.4-59.5, F = <59.4

100%

95

90%

Top 5 to 10% of OU students, performs superiority in most areas
and is extremely competent. Top candidate for any residency
program.

85

80%

Top 2/3 to 3/4 of class. Competent in all areas; a "solid" performer
who has no major deficiencies. Should be a good house officer and
could recommend highly for a residency position.

75

70%

Lower 10 to 15% of class. Minimally acceptable performance during
this clerkship. Has some obvious areas of weakness. Needs close
supervision and direction.

65

60%

Performs consistently below average for level of training. Needs repeated
direction and help. (Examples include students who are uneasy with patients,
poorly organized, poorly motivated, unsure in making assessments, or have
difficulty getting appropriate history, below average knowledge base, or
difficulty with practical application of knowledge.) Would definitely benefit
from remedial work in this area. Would have difficulty recommending this
student for a residency position.

55

50%

Consistently inadequate performance in one or more areas. (Examples include
students who have: <u>inadequate knowledge</u> [consistently inappropriate
assessments, plans], <u>poor attitude</u> [dishonest, undependable, consistently
disregards patient needs and concerns, "con artist", challenges everything and
does not listen, consistently slovenly-appearing], <u>poor skills</u> [antagonistic
relationships with peers, faculty, or office staff or inability to obtain an
adequate H&P].) Unable to recommend for residency training with confidence
the student would perform in a competent manner.

MID-EVAL GRADE = _____%   FINAL GRADE
= _____%

Date: _____   Signed: _____

GENERAL COMMENTS: (This section must be completed by the preceptor. It will be included in Dean's Letter of Evaluation for Residency Applications. PLEASE TYPE OR PRINT.)

_____

_____

_____

_____

_____

_____

_____

COMMENTS FOR COUNSELING STUDENT IMPROVEMENT: (Will not be included in Dean's Letter)

_____

_____

_____

_____

_____

GRADE COMPONENT	PERCENT OF EVALUATION % POINTS		SCORE OR GRADE %	FINAL GRADE Points
Oral Examination(s)	25%	50		
Formal Assignment(s)	10%	20		
Written Examination(s)	25%	50		
Clinical Performance	40%	80		
TOTAL	100%	200		

Date:_____   Signed:_____

(Course Director-L. Peter Schwiebert, MD)

Dr. Peter Schwiebert
Univ. of Okla.
Dept. of Family Medicine
900 NE 10th
OKC, OK 73104
271-8183   Fax-271-4125

Appendix D

Table 9

Rotated Component Matrix Pre-Rotation Self-Efficacy Factors

	1	2	3	4	5	6
lungpr	.836	.240	.128	.044	.319	.068
abdpr	.783	.314	.068	.234	.264	-.023
entpr	.687	.211	.354	.149	.069	.065
cardpr	.661	.254	.116	.049	.514	.074
eyepr	.461	.037	.461	.209	.045	.282
fupr	.246	.748	.218	.196	.294	.008
lifstypr	.290	.665	.144	.148	.099	.235
diffpr	.351	.662	.206	-.039	.366	-.036
geriatpr	.018	.621	.343	.391	.140	.075
focuspr	.443	.591	.281	.038	.079	.128
riskpr	.212	.483	-.015	.186	-.120	.471
hpipr	.315	.473	.172	-.266	.282	.420
sensitpr	-.130	.456	.169	.316	.111	.407
papre	.103	.227	.878	.035	.064	-.052
pelvicpr	.234	.196	.868	.051	.107	.103
kohpr	.156	.200	.866	.127	.183	.055
anospr	.173	-.090	-.078	.797	.099	-.069
cerumpr	.332	.181	.167	.674	.068	-.000
cryopr	-.056	.276	.066	.641	.229	.075
tymppr	.007	.206	.256	.521	.277	.226
ecgpr	.259	.093	-.038	.149	.803	.085
uapr	.252	.134	.357	.155	.595	.086
sutpr	.104	.129	.159	.457	.536	.038
injecpr	.139	.291	.143	.299	.535	.054
genopr	.010	.114	-.011	-.069	.096	.819
muscpr	.527	-.012	.250	.252	.123	.553

Table 10

Pre-Rotation Self-Efficacy Factors

Factor 1

perform a lung exam

perform an abdominal exam

perform an ears, nose and throat (ENT) exam

perform a cardiovascular exam

Factor 2

evaluate and manage patients seen in a followup visit for chronic problems

counsel patients on modification of lifestyle risk factors

develop a differential diagnosis for a common problem

evaluate and assess geriatrics patients

perform a focused history and physical (H&P)

Factor 3

perform a pap smear

perform a pelvic exam

perform a saline KOH vaginal preparation

Factor 4

perform an anoscopy/sigmoidoscopy

perform cerumen removal

perform cryosurgery

perform tympanometry

Factor 5

interpret an ECG

interpret a urinalysis

perform suturing

perform an injection

Factor 6

obtain a 3-generation genogram

perform a musculoskeletal exam

Table 11

Rotated Component Matrix of Post-Rotation Self-Efficacy Factors

	1	2	3	4	5
abdpo	.778	.135	.259	.103	.064
anospo	-.144	-.102	.239	.123	.643
cardpo	.769	.196	.324	.112	.145
cerumpo	.269	.151	.628	.110	.165
cryopo	-.048	-.056	.758	.140	-.113
diffpo	.696	.259	.044	.160	.364
ecgpo	.321	.264	.528	-.057	.246
entpo	.765	.162	.310	.200	-.115
eyepo	.300	.398	.375	.289	.049
focuspo	.695	.173	.110	.210	.133
fupo	.426	.367	.132	.250	.608
genopo	.231	.029	.161	.837	-.046
geriatpo	.449	.238	.068	.059	.575
hpipo	.687	.035	-.035	.390	.188
injecpo	.218	.113	.515	.303	.322
kohpo	.245	.834	.068	.098	.177
lifstpo	.408	.294	.193	.595	.301
lungpo	.805	.125	.241	.195	.022
muscpo	.360	.378	.454	.233	.071
pappo	.096	.921	.080	.037	.056
pelvicpo	.167	.881	.190	.131	.030
riskpo	.370	.167	.114	.633	.248
sensitpo	.499	.247	-.022	.285	.402
sutpo	.161	.122	.554	.089	.317
tymppo	.264	.181	.449	-.165	.429
uapo	.241	.360	.255	.388	.302

Table 12

Post-Rotation Self-Efficacy Factors

Factor 1

perform an abdominal exam

perform a cardiovascular exam

develop a differential diagnosis for a common problem

perform an ears, nose and throat (ENT) exam

perform a focused history and physical (H&P) exam

perform a lung exam

perform a history of present illness (HPI) in a patient presenting with a common

problem

Factor 2

perform a saline KOH vaginal preparation

perform a pap smear

perform a pelvic exam

Factor 3

perform cerumen removal

perform cryosurgery

interpret an ECG

perform an injection

perform suturing

Factor 4

obtain a 3-generation genogram

counsel patients on modification of lifestyle risk factors

assess long-and-short-term risks to a patient's health

Factor 5

perform an anoscopy/sigmoidoscopy

evaluate and manage patients being seen in followup for chronic problems

evaluate/assess geriatric patients