INVESTIGATING RESEARCH PRODUCTIVITY AMONG
REHABILITATION DOCTORAL STUDENTS

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ABSTRACT

Rehabilitation educators have expressed concern regarding low levels of research interest and productivity among graduate students in scientist-practitioner training programs. Investigation of the individual and situational factors that differentiate research-productive students from non-productive students may prove helpful for stimulating research productivity within graduate programs. This study examined the relationships between social cognitive variables, elements of the research training environment, career goals, and research productivity.

Participants were 141 rehabilitation doctoral students who completed the Interest in Research Questionnaire, the Research Self-Efficacy Scale- Revised, the Research Outcome Expectations Questionnaire-Revised, the Career Goals Measure, and the Research Training Environment Scale- Revised. Analyses of variance and covariance were used to assess differences between non-productive, low-productive and high-productive groups, as measured by the Research Productivity Measure (RPM). Significant differences were found between productivity groups on perceptions of the research training environment and research outcome expectations. No significant differences were found for research interest, research self-efficacy, or career goals.
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Chapter I
INTRODUCTION

Many authors have argued in favor of implementing a scientist-practitioner model to guide the training and practice of professionals in rehabilitation counseling (e.g., Bellini & Rumrill, 1999; Dellario, 1996; Leahy, Patterson, Rubin, & Walker, 1994; Wegener, Hagglund, & Elliott, 1998). The scientist-practitioner model places emphasis on training students to competently conduct and use research, in addition to acquiring solid clinical skills. Theoretically, training programs that adhere to this model emphasize the development of students’ research capabilities as well as clinical skills. The goal of the model is to develop professionals who are competent in both clinical and scientific roles (Bellini & Rumrill, 1999).

Wegener et al. (1998) argued that the need for rigorous training in research is relevant to all levels of preparation for rehabilitation professionals. They argued that maintaining an emphasis on the “science” aspect of the scientist-practitioner model is crucial for advancing knowledge in a reliable, empirically-based manner. Additionally, they stated that an emphasis on science and research training will equip practitioners with skills to assume more influential roles in the health care system. Scientifically-trained rehabilitation professionals will be proficient at managing resources, defining
successful outcomes, and determining efficacious interventions across all levels of health care (Wegener et al., 1998).

The scientist-practitioner model is designed to ensure that graduate students in rehabilitation are trained to utilize research findings and conduct field-oriented research. Integration of research and practice will result in (a) provision of higher quality services to consumers with disabilities, (b) empirically-based program evaluations across rehabilitative settings, and (c) more efficient use of resources, as research findings inform clinical practice (Dellario, 1996). Rehabilitation professionals invested in providing quality clinical services to consumers will benefit from being prepared to participate in a wide array of research activities in conjunction with clinical practice.

To date, however, the scientist-practitioner model has been an implicit rather than explicit influence in rehabilitation graduate programs (Bellini & Rumrill, 1999; Leahy et al., 1994). Despite the theoretical importance of research, authors in rehabilitation counseling have expressed concern regarding low levels of research interest and productivity in the field (e.g., Bellini & Rumrill, 1999; Dellario, 1996; Leahy et al., 1994; Wegener et al., 1998).

Apathy towards research among rehabilitation professionals has been demonstrated in the literature. For example, Leahy and
colleagues (1993) conducted a survey to assess certified rehabilitation counselors’ perceptions of the importance of empirically-derived knowledge domains. Participants (n=1,535) practiced in a wide variety of work settings (e.g., hospitals, schools, mental health centers, for-profit and non-profit agencies) and had a minimum of 5 years of work experience. The majority of participants were trained at the master’s level (88%).

Participants completed a survey that listed 58 empirically derived knowledge domains and subdomains (e.g., “psychosocial and cultural impact of disability;” “individual counseling practices and interventions”). Using a 5-point Likert scale, participants rated the perceived importance of each knowledge domain to their work as a rehabilitation counselor. The domain “program evaluation and research,” which encompassed many aspects of research including research methodology, research design, and consumption of literature, was perceived as significantly less important (p < .01) than all of the practical domains such as acquisition of vocational counseling skills.

The results of the Leahy et al. (1993) study bring into question the degree of emphasis that is placed on research in the graduate training of rehabilitation students. Clearly, a gap exists between the purported importance of research and the perceived utility of research for practicing rehabilitation
professionals. The findings in this study indicate a need to strengthen the link between research and clinical practice.

What accounts for low levels of research interest and productivity among rehabilitation professionals? To answer this question, it is useful to consider a predominant assumption held by many practitioners: that “research” is a separate entity from “clinical work.” Although research is considered important to counseling practice, the typical practitioner neither engages in nor reads research, and may in fact hold negative attitudes about research (Leahy et al., 1993). In rehabilitation settings, a great deal of time is devoted to direct service of consumers and families, administrative duties, and agency-specific tasks (e.g., outreach activities, writing grants, and crisis intervention). Students may graduate and become practitioners with limited ability to apply findings from published research and program evaluation studies to professional practice. For example, as Schaller and Parker (1997) noted, rehabilitation counselors may collect and record data and information that are used for program evaluation as a routine part of their job, but may have little understanding of the process of program evaluation.

When assessing research interest and productivity, it is useful to consider the differential career goals between master’s and doctoral level students. Results of a recent
survey suggest that most graduates of master’s level rehabilitation programs pursue clinical careers. Kelley, Dixon, Emener, and Wright (1999) surveyed graduates (n=165) of one master’s level rehabilitation counseling program to assess career outcomes of program participants. Respondents ranged from less than one year post-graduation to twenty-four years post-graduation. Respondents completed a survey regarding their current career status and satisfaction with their graduate training. Ninety-two percent of respondents were active practitioners in agencies, hospitals, and private practice. None of the respondents reported (a) interest in pursuing a doctoral degree in rehabilitation, or (b) pursuit of a research-oriented (as opposed to practice-oriented) position. Granted, the sample in this study was relatively small, and all participants were graduates of one program; thus, the findings may not be generalizable across programs. Nevertheless, the findings provide information about the career choices of counselors at a wide range of career stages (beginning to advanced), and suggest that individuals who are educated at the master’s level are primarily interested in the direct practice of rehabilitation counseling. Thus, Kelley et al. (1999) argued that research training at the master’s level will optimally prepare students to conduct and utilize research in applied settings.
Doctoral training, in contrast, provides a foundation for both practice-oriented and research-oriented professionals to develop research competencies and interests (Bieschke, Bishop, & Herbert, 1995). In fact, it may be argued that a heavy emphasis on science and research training is what distinguishes doctoral education from master’s level education in rehabilitation (Bellini & Rumrill, 1999). Consider the following mission statement for an established rehabilitation doctoral program:

"The doctoral program is designed to prepare rehabilitation counseling professionals for leadership positions in administration, research, rehabilitation education, and rehabilitation counseling clinical practice. Using a scientist-practitioner model, the program emphasizes the development of new knowledge and its practical application to improve the lives of people with disabilities (Maki et al., 2000, p. 7)"

Though doctoral programs in rehabilitation differ in exact course content and programmatic goals, a common theme is expressed in the literature: preparation of professionals to assume leadership roles in academic institutions and other applied settings. Doctoral training programs are designed to ensure that doctoral-level rehabilitation professionals are adequately trained for academic and other leadership positions. Students with little or no involvement in research activities during their doctoral training will be ill-equipped to meet the challenges of an academic position. In contrast, students who acquire experience in tasks such as conducting research,
interpreting data, and presenting their results will be prepared for post-graduation research activities. Therefore, examining the research training of doctoral students may be crucial to understanding the variables that impact the research interests and research productivity of rehabilitation doctoral students.

Statement of the Problem

Doctoral programs in rehabilitation that adhere to a scientist-practitioner model are designed to train students who are competent at conducting and consuming research. All 29 doctoral programs in rehabilitation in the United States require students to take at least one statistics course and one research design course; a majority of programs require more than one course in research or statistics (Maki et al., 2000). In addition, all doctoral students in rehabilitation programs are required to produce an independent dissertation.

The inclusion of basic statistics and research courses in the curriculum may not be sufficient for increasing students’ research interest and research productivity beyond program requirements. One study of rehabilitation doctoral students indicated that students have relatively low levels of research self-efficacy, especially in implementing research tasks such as collecting and analyzing data (Bieschke, Bishop, & Herbert, 1995). Furthermore, as suggested by the results of Bieschke et al. (1995) (reviewed in Chapter 2), students’ interest in
research appears to be closely connected to the types of outcomes they expect to occur as a result of engaging in research behavior. To increase students’ research competence and interest, it is critical to assess the intrapersonal and environmental factors that contribute to attitudes and behavior.

A beginning literature base of studies investigating research interest and involvement among doctoral students has emerged in professional psychology and related fields (e.g., Bieschke et al., 1996; Bishop & Bieschke, 1998; Gelso, Mallinckrodt, & Judge, 1996). However, there remains a paucity of empirical data on actual research productivity among doctoral students. To date, no empirical studies examining the research productivity of rehabilitation counseling doctoral students were found in the literature. Investigation of variables that influence research productivity among doctoral students will provide information about the degree to which research is fostered in training programs. Rehabilitation educators can use information about students’ research productivity to amend aspects of the training environment to accommodate students who vary in degrees of self-efficacy, outcome expectations, and research interests.

The purpose of the present study is to examine the relationships between social cognitive variables, environmental factors, and research productivity within a sample of
rehabilitation counseling doctoral students. The dependent variables in this study include: research interest, research self-efficacy, research outcome expectations, perceptions of the Interpersonal and Instructional elements of the research training environment, and scientist-practitioner career goals. Gender, year in doctoral program, and age are assessed as covariates. Research productivity is the independent variable.

This study will contribute to the knowledge base in rehabilitation counseling in two ways: (a) as the first study to measure research productivity among rehabilitation doctoral students and (b) by empirically testing differences in research interest, perceptions of the research training environment, research self-efficacy, research outcome expectations, and career goals between students who demonstrated three different levels of research productivity.

Definition of Terms

1. **Rehabilitation Program (doctoral level):** Rehabilitation doctoral programs vary greatly in terms of emphasis, content, and mission statement. Within this paper, “rehabilitation doctoral programs” refers to those programs which (a) offer a degree of Ph.D., Rh.D., or Ed.D; (b) emphasize preparation of professionals who serve in administrative, academic, and other
leadership roles within the rehabilitation field, and (c) are extra-medical; i.e., are rooted in psychology and/or education vs. medical or neurological rehabilitation.

2. Research Training Environment: all of the forces or elements within graduate education programs (and, more broadly, the departments and universities within which the programs are situated) that reflect attitudes toward research and science (Gelso, 1993).

3. Social Cognitive Career Theory (SCCT; Lent et al., 1994): a comprehensive framework based on social cognitive theory that is used to explain the formation of academic and career interests, and selection of vocational and educational pursuits (Bishop & Bieschke, 1998). SCCT serves as a model for understanding the relationship between social cognitive variables (i.e., self-efficacy beliefs and outcome expectations) and research behavior.

4. Research Self-Efficacy Beliefs: an individual’s confidence in being able to successfully complete various aspects of the research process (Kahn & Scott, 1997). In keeping with SCCT, research self-efficacy is assumed to be a fluid trait that can be altered by environmental influences.

5. Research Outcome Expectations: the consequences or events that are expected to result from participation in research activities (e.g., professional advancement, financial gains).
In SCCT, outcome expectations co-operate with self-efficacy to influence behavior.

6. **Research Productivity**: Broadly defined to encompass a range of student research activities, research productivity refers to: presentation and/or attendance at local, regional, or national conferences; preparation of manuscripts, both empirical and non-empirical; collection of data; publication of manuscripts, both empirical and non-empirical; participation in program evaluation; and participation in grant writing projects.
Chapter II

REVIEW OF THE LITERATURE

In order to develop a clearer understanding of the variables that contribute to research productivity among individuals in rehabilitation counseling, it is useful to examine individual and situational variables that have previously been linked to these two constructs. The literature indicates that two social cognitive variables, self-efficacy and outcome expectations, are useful for predicting students’ research interest. Elements of the research training environment have also been identified as predictors of research interest and productivity.

This chapter reviews the theoretical and empirical literature that is related to research productivity. First, social cognitive career theory (SCCT) is presented as a framework for understanding research behavior. Second, a model for investigating specific elements of the research training environment is presented. Third, empirical studies of research interest and research productivity are reviewed. Finally, the research hypotheses of the present study are described.

Social Cognitive Career Theory: Theoretical Background

Social cognitive variables are intrapersonal factors that have begun to receive some attention in the professional
psychology literature in relation to research behaviors. The following section introduces social cognitive career theory (SCCT; Lent et al., 1994), an extension of Bandura’s (1986) social cognitive theory. Two social cognitive variables, self-efficacy and outcome expectations, are discussed as they apply to research behavior.

Social cognitive theory states that "people act on their judgments of what they can do, as well as on their beliefs about the likely effects of various actions" (Bandura, 1986, p. 231). Self-efficacy beliefs are defined by Bandura as "people’s judgments of their capabilities to organize and execute courses of action to attain designated types of performances" (Bandura, 1986, p. 391). According to social cognitive theory, self-efficacy is seen as a dynamic set of beliefs about oneself that are specific to particular performance domains which interact in complex ways with other person, behavior, and contextual factors (Bandura, 1986).

Outcome expectations, defined as "personal beliefs about probable response outcomes" (Bandura, 1986, p. 392), constitute the "action" component of social cognitive theory. Although self-efficacy beliefs are concerned with one’s response capabilities (i.e., “can I do this?”), outcome expectations involve the imagined consequences of performing particular behaviors (i.e., “if I do this, what will happen?”). Outcome
expectations interact with self-efficacy beliefs in the process of determining the course of action that will be chosen.

According to Bandura (1986), self-efficacy expectations are affected by four factors: (a) performance attainments, (b) modeling, (c) verbal persuasion, and (d) emotional reactions such as anxiety and fear. Bandura also assumed that self-efficacy beliefs have a powerful influence on initiation and persistence of behavior. Outcome expectations are believed to complement self-efficacy beliefs in the prediction of specific behaviors (Bandura, 1986). For example, students’ beliefs about what outcomes might occur as a result of engaging in research can be expected to affect the initiation and persistence of research behaviors.

Bandura (1986) argued that self-efficacy is a stronger determinant of an individual’s behavior than outcome expectations. There are many instances in which people may anticipate valued outcomes accruing from a given course of action, but avoid such action if they doubt their capabilities. A strong sense of self-efficacy, however, may sustain efforts even where outcome attainment is uncertain (Bandura, 1986). This may explain, for example, why most studies that have examined the impact of social cognitive variables on research behavior have placed a stronger emphasis on self-efficacy beliefs than on outcome expectations.
Another important component of social cognitive theory is the way in which social cognitive variables interact with environmental variables. Bandura (1986) advocated a model of interaction termed triadic reciprocality. In this scheme, (a) personal attributes, such as internal cognitive and affective states and physical attributes; (b) external environmental factors, and (c) overt behavior, all operate as interlocking mechanisms that affect one another bidirectionally.

The model of triadic reciprocality provides a framework for examining research productivity. Considering each of the three domains in relation to research behavior, personal attributes may include research self-efficacy, research outcome expectations, and demographic variables; environmental factors include elements of the research training environment, and overt behavior is represented by research productivity.

In conceptualizing the relationship between social cognitive theory and the process of career development, Lent et al. (1994) proposed social cognitive career theory (SCCT) as a framework for examining interest formation and vocational choice. Social cognitive career theory addresses the role of cognitive variables in determining behavior. It describes how academic and career interests are formed, and accounts for both person-specific factors (such as predispositions, gender, ethnicity, race) and "contextual affordances," or environmental
influences. This model assumes that career development is influenced by both objective and perceived environmental factors. Within this framework, vocational interests are influenced by self-efficacy and outcome expectations. Thus, it is hypothesized that people form enduring interests in activities for which they view themselves to be efficacious and for which they anticipate positive outcomes.

SCCT provides a broad framework for understanding the formation of academic and career interests, as well as vocational and educational pursuits. Applied to the study of research behavior, SCCT delineates a specific model for examining research interest and productivity. In research training environments, for example, an objective factor such as taking a research course might be less influential to student’s career development than attitudes or behaviors about research that are exhibited by faculty members. As Lent et al. (2000) described,

“People are not seen as merely passive repositories of past or present environmental influences...they can certainly be affected adversely or beneficially by events that are beyond their control or awareness; yet, how individuals construe the environment and themselves also affords the potential for personal agency in one’s career development (p. 37).”

Recognizing that an individual’s perceptions of an experience are as influential to career and academic choices as
actual objective experiences raises an important issue for research training programs. To adequately assess the effectiveness of a research training environment, one must look beyond the tangible elements (e.g., number of statistics courses) and consider how social cognitive factors, specifically, self-efficacy and outcome expectations are shaped by the overall climate of the training environment, faculty modeling, and colleagues' attitudes toward research.

Although Bandura (1986) argued that self-efficacy is often a more potent determinant of behavior than outcome expectations, Lent and colleagues (1994) suggested that one's perceptions of self-efficacy and outcome expectations have relatively equal influence on the formation of interests. Empirically assessing the degree to which outcome expectations and self-efficacy influence research productivity will provide a better picture of how these two social cognitive variables interact to determine behavior.

The Research Training Environment: Theoretical Background

According to SCCT, career development is influenced both by objective and perceived environmental factors. Objective factors may include the quality of educational experiences and financial means one has to facilitate his or her career pursuits. Once again, however, SCCT stresses that individuals are not merely passive recipients; they have the ability to
utilize personal agency in making choices, determining courses of action, and formulating perceptions of the environment. The effect of environmental factors, then, is determined as much by individual perceptions as by objective conditions.

Social cognitive career theory can serve as a framework for understanding the influence of the research training environment on doctoral students. Experiences of the research training environment are as much a product of their unique perceptions as objective factors (i.e., number of statistics courses taken). The following section presents a model for measuring perceptions of the research training environment, followed by a review of empirical studies that have examined the direct and indirect effects of the research training environment on research interest and research productivity.

The research training environment has developed as a target of attention in studies of research interest, attitudes, and productivity. Given that graduate school is a time when research interests are formed and when research competencies are developed (Mallinckrodt, 1997), it is useful to gather information from graduate students about their experiences. The research training environment may also have a significant impact on the post-graduation research productivity of students.

The research training environment has been investigated in two ways. First, it has been treated as a direct contributor to
students’ research interest and productivity. Second, it has been examined as a variable that interacts with other variables, such as research self-efficacy and personality, to contribute to research interest and productivity among graduate students in professional psychology programs (e.g., Bishop & Bieschke, 1998; Kahn & Scott, 1997).

What elements comprise the research training environment? Gelso (1993) defined the research training environment as “all those forces in graduate education programs (and, more broadly, the departments and universities within which the programs are situated) that reflect attitudes toward research and science” (p. 470). In keeping with this definition, research training environments that contain certain key ingredients will enhance graduate students’ attitudes toward research, and ultimately their research productivity (Gelso et al., 1996). Originally, Gelso (1979) proposed that ten components of the research training environment might be related to students’ research interest and productivity. In 1993, this model was revised to eliminate the idea that diminished emphasis on statistics would facilitate a more efficacious training environment for students. Thus, Gelso (1993) proposed that attitudes toward research (and, ultimately, research productivity) will be enhanced to the extent that (a) faculty members model appropriate scientific behavior and attitudes; (b) students’ scientific activity is
positively reinforced; (c) students are involved in research early in their training and in a minimally threatening way; (d) students are taught to look inward for research questions and ideas when they are developmentally prepared for this responsibility; (e) the training environment emphasizes that science can be a partly social experience; (f) instructors acknowledge that all studies are flawed and limited in one way or another; (g) varied approaches to research, such as qualitative and quantitative approaches, are taught and valued; (h) students are shown how science and practice can be merged effectively; and (i) in the latter part of graduate education, there is a focus on how scholarly activities may be accomplished in all types of practice settings.

Gelso (1979; 1993) assumed that many research training environments lack the necessary ingredients to facilitate students' attitudes toward research and research productivity. Additionally, Gelso (1979) pointed out that many students in counseling psychology are ambivalent about the role of research in their subsequent professional lives. This is likely to have an impact on research productivity. For instance, many students do not pursue research or other scholarly activities upon completion of graduate school. Theoretically, an effective research training environment will produce scholars who are invested in continuing to engage in research-related behaviors.
It has been suggested that selecting students into doctoral programs who have strong research interests may ensure a more research-focused student body (Gelso, 1979; Holland, 1986). However, Mallinckrodt et al. (1990) argued against changing admission standards or criteria, as this could result in diminished emphasis on developing the clinical skills of doctoral students. Instead, Mallinckrodt and colleagues (1990) suggested that modifying the training environment to ensure that the important ingredients characterized by Gelso (1993) are emphasized may be a more fruitful way of enhancing students’ research interest. This would ensure that attention is paid to both intrapersonal and contextual dynamics.

One such dynamic that has been examined is the relationship between research self-efficacy and the research training environment. If people believe that they have the ability to complete a given behavior successfully, then they are more likely to engage in that behavior. A person’s level or magnitude of self-efficacy is related to whether that person will attempt a particular behavior, whereas self-efficacy strength is related to the persistence of a behavior despite failure or setbacks. In the field of counseling psychology, for example, the research training environment has been identified as a place where students’ research self-efficacy can be enhanced, and self-efficacy beliefs can be altered.
Additionally, the magnitude of one’s research self-efficacy can be strengthened in a quality research training environment (Gelso, 1993).

Recent studies of research behavior have investigated the relationship between research self-efficacy and elements of the research training environment. This interaction may take place in two ways. First, the research training environment may influence the development of research self-efficacy directly, such as through the facilitation of research teams. Second, the individual’s experience in the training environment may alter the individual’s self-efficacy; for example, the individual comparing him or herself to other students. Though the second form of interaction is more subtle and more difficult for faculty to control, both types of experiences affect students’ research self-efficacy and are likely to affect subsequent research interests and/or productivity. Clearly, social cognitive variables may interact with elements of the research training environment in complex ways. Empirical investigations of relationships between the research training environment, social cognitive variables, and research interest and productivity are described in the following section.
Empirical Data

Several authors have empirically tested Gelso’s (1979; 1993) propositions regarding elements of the research training environment. This section provides an overview of studies that have examined the research training environment in relation to research interest and research productivity. First, studies investigating research interest are reviewed. Second, studies that investigate research productivity are reviewed. Finally, the research questions of the present study are presented.

Research Interest

Several researchers have investigated the impact of the training environment by surveying current and former students to determine which aspects of training were perceived as most influential. The following studies examined the influence of elements of the research training environment on research interests.

Royalty and Reising (1986) surveyed counseling psychologists to examine how they perceived their research training while they were in graduate school. Participants were 355 members of Division 17 (Counseling Psychology; APA). Participants completed the Survey on Research Training (SORT), which asked about current levels of research involvement, and about research skills acquired in graduate school, interest in
research resulting from graduate training, and how well-prepared they felt to initiate and conduct research. Participants identified positive and negative influences on their level of research interest and skill development. Positive influences included: (a) colleagues and mentors, (b) curiosity about research, (c) grant funding and writing, (d) pressure by faculty to get published, (e) publishing and presenting at professional conferences, and (f) prestige that is attributed to researchers. Negative influences on research interest and skill included: (a) lack of time, money, and other support, (b) negative perceptions about the quality of counseling research, (c) the belief that traditional views on research are oppressive, (d) absence of collegial interest in research, (e) lack of statistical, computer, or research skills, (f) lack of knowledge about the publication process, and (g) an “anti-research” work environment.

In a 1990 study, Mallinckrodt and colleagues surveyed 358 students in 10 counseling psychology doctoral programs to assess the relationship between change in research interest and (a) research training environment, (b) Holland personality type (specifically, Investigative interests) and (c) environment-personality interaction. This study was the first to compare the effects of individual characteristics and environmental variables on research interest. Personality traits were
characterized by Holland’s (1986) typology. Repeated measures t-tests indicated that the overall increase in research interest was significant for the general sample (p < .01). Additionally, students in the two most impactful programs had significantly higher Investigative scores (n= 79, M = 3.87, SD = 2.18) than did students at the other eight programs (n = 279, M = 2.68, SD = 2.10), F(1, 356) = 19.35, p < .001). Personality variables accounted for more of the unique variance in current research interest (10%) than either environment factors (4%) or person-environment interactions (1.0-1.5%). Additionally, some person-environment interaction was found (r=.24). The authors concluded that personality variables (Holland type), training environment variables, and person-environment interactions may all influence students' interest in research. A more in-depth analysis of specific intrapersonal factors, such as self-efficacy, would have been useful in the attempt to explain differences in research interest within the sample.

Research interest has been investigated in three studies of rehabilitation counseling students. Syzmanski et al. (1994) recognized a need to assess the effectiveness of research instruction in rehabilitation counseling programs. A quasi-experimental pretest-posttest nonequivalent, untreated control group design was used to investigate the impact of a specific class format on research self-efficacy and research interest of
master’s level rehabilitation counseling students. An experimental group (n=30) of students completed an applied research course that was designed by the first author and taught by two other authors. The course was designed to aid students in acquiring skills and information to alleviate their fears and misconceptions of research design and statistics, and address the application of concepts from the course to practical situations. Students were instructed through applied case studies, regular homework assignments, and discussion of issues that are important to novice researchers, including addressing student’s fears about research (i.e., competency in statistics).

A control group (n=31) was enrolled in another statistics course during the same semester. Given that the course content varied greatly between the control group and the intervention group, it is unclear why students in a different statistics course were selected as controls. It may be assumed that the two groups were expected to be learning similar statistical concepts, with only the intervention group being exposed to specific examples by which to apply the concepts that were introduced.

The authors developed an instrument, the Research Instruction Outcomes Tool (RIOT) to evaluate the impact of the research course. The RIOT is an 18 item Likert-type scale with values ranging from 1 (poor) to 5 (excellent) and a comment section in which students were asked what they liked most and
least about the class. Items are classified into three sections: Research Anxiety, Perceived Research Utility, and Confidence in Research Ability. Sample items include: “The thought of evaluating research articles makes me nervous” (Research Anxiety); “Doing research can help me to improve my professional practice” (Perceived Utility of Research). The internal consistency reliability for the 18-item scale is approximately .90 (Szymanski et al., 1994).

Though the authors caution that this instrument measured the intervention as a whole, making it difficult to know exactly which aspects of the course were most salient, analysis of covariance (with pre-test scores serving as covariates, which were used to statistically adjust post-test means to account for pre-test differences) indicated that the research instruction decreased research anxiety ($F_{1,58}=18.05; p<.001$), increased perceived utility of research ($F_{1,57}=8.16; p=.006$), and increased confidence in research-related abilities ($F_{1,57}=9.16; p=.004$). Students in the control group also reported increased research self-efficacy and increased perceived utility of research; however, the degree of increase was significantly greater for the experimental group. The authors concluded that a research course like this one, which focuses on understanding and planning research, will broaden students’ understanding of
research and help them to apply what they have learned in statistics courses.

In a similar study, Schaller and Parker (1997) examined the effect of an applied graduate-level research course on rehabilitation counseling students' perceptions of research. A quasi-experimental pretest-posttest nonequivalent control group design was used to measure students' levels of perceived research anxiety, perceived research utility for professional practice, and confidence in research skills. Participants (n=19) were enrolled in a required course in applied research. The course content was a replication of that used by Szymanski et al. (1994) and was intended to reduce perceived anxiety and increased perceived utility of research among master’s level students. Examples of course content included: a) presentation of readings that were purposefully chosen to include critical issues of research methodology in the students' areas of interest; (b) critique and discussion of quantitative and qualitative journal articles; and (c) consistent opportunities for students to apply course content by discussing key concepts, differentiating between methodologies used in studies, and integrating discussion about statistical analyses into discussions of application, in order to provide concrete examples of how statistics are useful to rehabilitation counselors. A comparison group (n=8) of master’s students was
enrolled in another applied research course in the same department during the same semester which did not adhere to the Syzmanski et al. (1994) model. The RIOT (Syzmanski et al., 1994) was administered to a total of 23 (n=15 treatment group, 8 control group) participants during the first week of the semester and during the second-to-last class to measure changes in students’ perceptions about research.

Despite the small sample size in this study, a statistically significant difference was found between pre- and post-test scores for the treatment group on one variable, perceived research anxiety ($r = -.415$; ES = 1.00; $p < .05$). Although reducing students’ perceived research anxiety was not a stated objective of the course, the authors stated that pedagogical practices were included to address it indirectly. The assumption was that if students’ anxiety about research were decreased, they would be more willing to approach and engage the material, and use their knowledge in the future. Additionally, the authors stated that the methods of instruction used in this course (i.e., immediate clarification of material after it is presented, using applied case studies) may reduce anxiety by helping students realize that research is actually the means for linking theory and practice. The authors further added that students’ written evaluative comments indicated that this type of applied model of research training would benefit students in
the early stages of their graduate work. The authors recommended future studies of larger groups of students, and recommended incorporation of Syzmanski et al.'s (1994) model of applied graduate research instruction into graduate program curriculum.

Most recently, Szymanski, Swett, Watson, Lin, & Chan (1998) extended the findings from Szymanski et al. (1994) and Schaller and Parker (1997) to further evaluate the effect of a "contextualized instruction" (i.e., applied research course) on student's research perceptions. The sample consisted of master's level students (n=40) enrolled in a rehabilitation psychology research course during two concurrent semesters. The course format was identical to the one in Szymanski et al.'s (1994) study. A cohort design was used to compare post-test scores on the RIOT from the first semester students with pre-test scores on the RIOT for second semester students. For the analyses, the authors chose an alpha level of .10 to provide adequate statistical power to detect medium size effects and to lower beta, given the limited sample size. The samples varied significantly on all three dependent variables, with students in the post-instruction group reporting decreased research anxiety ($t_{35} = -5.21$, $p < .01$), greater perceived utility of research ($t_{35} = 1.92$, $p = .06$), and greater confidence in their ability to conduct research ($t_{35} = 4.37$, $p < .01$).
In addition, a qualitative questionnaire was administered to students upon completion of the applied research course to gain information about students’ unique perceptions about the course. A majority of students indicated that the course helped them to understand and critique research articles, and to understand research methods. Several students reported feeling less fear about research. In particular, students reported feeling confident in their ability to apply research to practice. Szymanski et al. (1998) concluded that contextualized research instruction can have a significant, positive impact on students’ research self-efficacy and perceived utility of research.

The results of these studies provide preliminary support for Gelso’s (1993) propositions that graduate students’ interest in research and expected value of doing research in their careers will be positively affected by ingredients of the research training environment, particularly (a) early and minimally threatening involvement in research activities, (b) teaching and valuing of various approaches to research, and (c) demonstrating to students how science and practice can be wedded. In these studies, many students reported that activities with a strong interpersonal component (such as research teams) or that included active participation or high personal investment (such as writing a thesis) had the most positive
influence on their interest in research. The means by which research is presented to students can simultaneously have an impact on research interest and research self-efficacy. The impact of research instruction on actual research productivity, however, warrants further investigation.

The empirical literature clearly suggests that the research training environment may play an important role in altering research interest and behavior of individuals who are otherwise ambivalent about research activity. However, the training environment alone cannot account for individual differences in levels of interest and involvement in research activities. Therefore, it is essential to consider how the individual’s internal experience contributes to his or her attitudes toward research.

Applying social cognitive career theory to the study of research interest, one might expect both research self-efficacy and outcome expectations to be significantly related to research interest. Bieschke and colleagues (1995) assessed the degree to which research self-efficacy, research outcome expectations, and the research training environment predicted interest in research among a sample of doctoral students in rehabilitation counseling (n=93). The independent variables were research self-efficacy, research outcome expectations, and the research training environment. Outcome expectations was included to assess the
degree to which the perceived “rewards” of conducting research (e.g., publication in professional journals, prestige, tenure) influenced students’ research behavior. The dependent variable was interest in research. A standard multiple regression was performed. Overall, 46% of the variance was accounted for, indicating that the independent variables together contributed significantly to predicting interest in research (R squared = .46; p < .001). Of the three independent variables, however, outcome expectations was the only variable to significantly contribute unique variance to the regression equation, accounting for 43% of the variance (p < .001). This finding was inconsistent with previous research studies (e.g., Mallinckrodt et al., 1990; Phillips & Russell, 1994) which found the research training environment and research self-efficacy to be the primary predictors of research interest. This finding opposes Bandura’s (1986) theory of self-efficacy, which delineates self-efficacy as the strongest determinant of behavior. Given the significant portion of unique variance accounted for by outcome expectations, Bieschke et al. recommended the inclusion of outcome expectations as a predictor variable in future studies of research interest. Additionally, an examination of training environments is warranted, such that faculty may be modeling an “outcomes-based” approach to conducting research, which students are following.
Bieschke et al. (1996) examined the psychometric properties of the Research Self-Efficacy Scale to establish its utility in studies of research behavior. In the same study, Bieschke et al. (1996) examined variables that predicted interest in research among doctoral students. A sample of doctoral students (n=177) from a wide variety of disciplines completed the instrument. In addition to conducting a factor analysis of the RSES, a hierarchical regression strategy was used to predict research self-efficacy and interest in future research involvement. Research self-efficacy, as measured by three of the subscales of the RSES, and previous research involvement were found to be predictors of interest in future research involvement, accounting for 29% of the variance (R squared = .289). Number of years in graduate school and previous involvement in research were significant predictors of research self-efficacy, accounting for 12% of the variance (R squared = .124). A statistically significant relationship was not found between interest in pursuing a scientific or academic career and research self-efficacy. The relatively low amount of variance in predicting interest in future research involvement and research self-efficacy warrants further consideration and empirical investigation of how other demographic and environmental variables influence research behaviors.
Bishop and Bieschke (1998) conducted the first empirical test of Lent et al.’s (1994) social cognitive career theory. In this study, four propositions of SCCT were explicitly tested. Participants were doctoral students (n=184) in counseling psychology. A recursive path analysis was used to assess the direct contribution of research self-efficacy and research outcome expectations to interest in research. (Three regressions were conducted in the analysis; only the results of the regression predicting interest in research are reported here.) Consistent with the social cognitive model, personality characteristics, gender, and year in program were tested as “person inputs,” and research training environment and year in doctoral program were tested as “contextual affordances.” Five factors were found to be significant predictors of research interest: research outcome expectations (B= .64, p < .001), research self-efficacy (B= .17, p < .01), two personality variables: Holland Investigative type (B = .16, p < .01), Holland Artistic type (B = -.11, p < .05), and age (B = .12, p < .05). Additionally, the research training environment, Investigative interests, and year in program indirectly affected research self-efficacy, while Investigative interests, research self-efficacy beliefs, and research training environment impacted interest in research through their effects on research outcome expectations. The regression with all variables
entered to predict research interest directly and indirectly accounted for 62% of the variance. Thus, support was found for the application of social cognitive career theory to understanding research interest among counseling psychology doctoral students.

Two findings in the Bishop and Bieschke (1998) study are particularly noteworthy. First, though numerous relevant predictor variables were assessed, only 21% of the variance in predicting research self-efficacy was accounted for. Assessing other variables that may contribute to research self-efficacy, such as specific elements of the research training environment, may account for a greater percentage of the variance. Second, outcome expectations accounted for 41% of the variance in explaining future interest in research. In keeping with social cognitive theory, one would expect self-efficacy beliefs to be a stronger predictor of research interest than outcome expectations. This finding, in conjunction with the results of the Bieschke et al. (1995) and Bieschke et al. (1998) studies, suggests that outcome expectations are more influential in the prediction of research interest than is indicated by social cognitive theory.
Research Productivity

Several studies have examined research productivity among counseling professionals, though none have included a sample of students in rehabilitation doctoral programs. Royalty and Magoon (1985) surveyed counseling psychologists to assess their levels of research productivity. Participants held a broad range of career roles, some research oriented (e.g., academic or research positions at a university) and some practice oriented (e.g., private practitioners or counseling center clinicians). Participants were asked about their research productivity, involvement in scholarly activities, and attitudes toward research. Participants who reported producing research at high levels, in comparison with low-level producers, were more likely to have completed their Ph.D. at a younger age, to have been interested in research while in graduate school, to feel that graduate school had prepared them for the difficulties of getting published, and to have perceived their program as expecting students to produce research.

Galassi, Brooks, Stoltz, and Trexler (1986) surveyed training directors of programs in counseling psychology to assess students’ research productivity. Programs with highly productive students, when compared with less productive programs (measured by actual student research presented or published), tended to (a) involve students in research at an earlier point
in their training; (b) were more likely to require participation on research teams; and (c) placed more emphasis on the philosophy of science in their training environments. Additionally, students were more likely to use complex research designs in their dissertation (i.e., causal models vs. simple correlations) which suggests faculty in these programs were encouraging students to use research to critically examine relationships between variables.

Galassi et al. (1987) conducted a follow-up study in which 112 training directors from non-APA approved counseling psychology doctoral programs were asked about research training practices and emphases in their programs. They found that programs with greater student productivity (a) were more scientifically-oriented than less productive programs, (b) provided more encouragement and support for student research, and (c) required students to take at least one research course. The authors noted, however, that most of the differences between highly productive and less productive programs were related to informal aspects of research training, and most of the formal requirements (e.g., number of required research courses) were similar across programs. The findings from the two studies by Galassi et al. suggest that equipping students with the tools to critically think about, understand, and conduct research is an important step toward enhancing students’ productivity.
Krebs et al. (1991) investigated potential influences on research productivity in a sample of individuals (n=260) who had graduated from counseling psychology doctoral programs since 1970. Research productivity was hypothesized to be positively related to (a) Investigative personality type (measured by Holland code), and (b) characteristics of the research training environment. A significant positive correlation was found between Investigative personality type and research productivity (r = .15; p < .01). A significant positive correlation was also found between perceptions of the research training environment and research productivity (r = .19; p < .01). Almost every respondent cited at least one element of his or her doctoral training program as having an influence on his or her desire to publish in scientific journals. Additionally, positive relationships were found between elements of the research training environment and the respondents’ levels of empirical productivity in the past two years. Therefore, the results of this study indicate that effective doctoral training environments, as defined by Gelso (1979), are related not only to positive attitudes toward research but also to research productivity.

Krebs et al. (1991) suggested that measuring research productivity would yield more information about the impact of the research training environment than simply gathering
information pertaining to research attitudes and interest. However, they cautioned that productivity alone is unlikely to adequately reflect one’s involvement with research. For example, an individual who is highly invested in conducting research may encounter competition when attempting to publish in professional journals. In order to produce a comprehensive picture of research involvement, then, Krebs et al. recommended that studies that measure productivity continue to include measures of research interest and attitudes toward research.

Phillips and Russell (1994) examined the relationships between research self-efficacy, perceptions of the research training environment, and research productivity among graduate students in counseling psychology (n=125). They found a positive relationship between research self-efficacy and perceptions of the training environment (r = .39, p < .001, accounting for 15.3% of variance in perceptions of research training environment). A positive relationship was also found between research self-efficacy and research productivity (r = .45, p < .001, accounting for 20.6% of variance in research productivity). Interestingly, a significant correlation between perceptions of the research training environment and productivity was found among advanced graduate students in the sample (r = .50, p < .001), but not among all participants (r = .13, p > .30). This implies that the issue of productivity may
become more salient as students progress through their programs. Also, the authors suggested that it may be reasonable to view the training environment as exerting a “gradual, cumulative influence on students that does not lead to measurable productivity outcomes until their later years in graduate school” (p. 638). The finding that research self-efficacy was positively correlated with both the training environment and research productivity supports suggestions by earlier authors regarding application of self-efficacy theory to research training. The authors also stated that the link between research self-efficacy and productivity has not been demonstrated empirically. They noted that the results of their study appear to provide support for the application of social cognitive theory to research training.

Brown, Lent, Ryan, and McPartland (1996) reanalyzed the data from Phillips and Russell’s (1994) study to test the hypothesis that self-efficacy mediates (i.e., explains the “effects” of) the relationship between the research training environment and research productivity. While Phillips and Russell found significant direct relationships between elements of the research training environment, research self-efficacy, and productivity, Brown et al. explicitly tested SCCT by framing self-efficacy as a mediator variable. The sample consisted of advanced (4th year and beyond) students (n=69). Two
hierarchical regression analyses were conducted: first, to test the mediational hypothesis, and second, to assess the influence of gender on the relationships between research self-efficacy, elements of the research training environment, and productivity. Results of the analyses indicated that (a) students' perceptions of their research training environments were significantly related (B = .29; p < .05) to their levels of productivity; and (b) self-efficacy beliefs were also related to productivity (B = .50; p < .001) and to perceptions of the training environment (B = .50; p < .001). Additionally, the relation between perceptions of the research training environment and productivity was substantially reduced (B = .05; p > .50) after the influences of self-efficacy on productivity had been hierarchically controlled, thus supporting the mediational hypothesis.

In examining the influence of gender on self-efficacy and productivity, the relationship of self-efficacy beliefs to productivity was much stronger for male (B = .80) than for female (B = .33) students. However, the relation of the research training environment to research self-efficacy was higher for women (B = .60) than men (B = .24). The authors concluded that these results indicate that for men, the effect of the training environment on productivity is largely indirect and almost fully mediated by self-efficacy. For women, however,
the training environment is more directly related to productivity; the relationship is mediated slightly by self-efficacy.

The results of the Brown et al. (1996) study support further investigation of gender differences in the study of research productivity. The authors suggested that, in accordance with SCCT, training environments might exert a differential effect on women’s and men’s self-efficacy beliefs. For example, positive experiences in the research training environment may enable women to replace previous external attributions with more internal, ability-related attributions for their research and scholarly success (Brown et al., 1996). Thus, the research training environment can offer experiences for promoting students’ internal attributions (which could, theoretically, increase productivity among women) and experiences to directly enhance self-efficacy (which could, theoretically, increase productivity among men). Further exploration of gender differences in the relationships between the research training environment, self-efficacy, and productivity is warranted.

In another empirical test of social cognitive variables, Bieschke, Herbert, and Bard (1998) surveyed faculty members of graduate programs in rehabilitation counseling (n=130) to examine how well research self-efficacy and outcome expectations
predicted research productivity. The authors were interested in assessing the levels of research interests, self-efficacy beliefs, and outcome expectations among rehabilitation educators, as well as the degree to which each of these variables predicted productivity. In measuring productivity, respondents were asked to classify their recent publications as "empirical" or "non-empirical." A hierarchical regression strategy was used to account for variance in the two dependent variables, non-empirical and empirical productivity. None of the predictor variables significantly predicted non-empirical productivity (total $R^2 = .06$, $F$ change (1, 110) = .65, $p < .42$). Two variables were significant predictors of empirical productivity: research self-efficacy (accounting for 11% of the variance; $R^2 = .11$, $F$ change (1, 110) = 14.42, $p \leq .001$), and interest in research (accounting for 8% of the variance; $R^2 = .08$, $F$ change (1, 110) = 12.92, $p \leq .001$). The total variance accounted for in the regression predicting empirical productivity was 28% ($R^2 = .28$, $F$ change (1, 110) = 12.92, $p \leq .001$). Neither outcome expectations nor background variables were significant predictors of empirical productivity.

The authors concluded that other variables, such as personality traits, might influence non-empirical productivity. It is also important to note the relatively small (though
significant) amount of variance accounted for in predicting empirical productivity. Bieschke et al. noted that while outcome expectations was not a significant predictor of empirical or non-empirical productivity, it may be related to research interest (as found in Bieschke et al. (1995) and Bishop & Bieschke, 1998), which in turn may affect research productivity. Thus, the authors supported the inclusion of outcome expectations as a variable in future studies of research interest and productivity. Additionally, this study was the first to include an analysis of ethnicity in relationship to research interest and productivity. While significant differences in prediction of empirical or non-empirical productivity by ethnicity were not found in this study, non-white respondents exhibited greater interest in research activities than did white respondents. Further investigation of differences by ethnicity could be useful for assessing predictors of research productivity.

Finding ways to integrate all that is known thus far about social cognitive variables and the research training environment poses a challenge for researchers in this area. To date, no studies have examined the interactions between self-efficacy beliefs, outcome expectations, the research training environment, and both research interest and productivity. One recent study examined the relationships between a multitude of
intrapersonal and environmental characteristics and research
interest and productivity, with the exception of outcome
expectations. Kahn and Scott (1997) conducted a comprehensive
cross-sectional study of counseling psychology doctoral students
(n=267) in order to identify predictors of research productivity
and science-related career goals. Their model hypothesized that
(a) student’s sex is directly related to research self-efficacy,
(b) year in program is directly related to research
productivity, (c) Holland personality type is directly related
to interest in research, and (d) the research training
environment is directly related to research self-efficacy.
Research self-efficacy was hypothesized to be directly related
to interest in research. It was further predicted that both
interest in research and research self-efficacy would be
directly related to research productivity and goals. Finally,
research productivity was hypothesized to be directly related to
science-related career goals.

A structural equation model was used to test these
hypotheses. Research self-efficacy was found to be a function
of the research training environment, gender, and research
productivity. Additionally, men were found to have greater
research self-efficacy than women. The authors attributed this
to two possible factors: (a) personality differences between
men and women (specifically, a tendency for men to have more
Investigative interests and women to have more Social interests)
b) possible differential training experiences. The possibility of gender differences in the Interpersonal and Instructional factors (as identified by Kahn and Gelso, 1997) was also explored. It was found that in general, women tended to appreciate opportunities to interact with others, while men attributed more of their learning to role modeling and “teaching” by faculty. The results of Kahn and Scott’s study also implied that high levels of research self-efficacy were associated with interest in research. Contrary to social cognitive theory, which suggests that the relationship between the training environment and research interest is mediated by research self-efficacy, perceptions of the research training environment were found to be directly related to research interest. As Gelso (1993) suggested, a training environment that contains many of the elements important for influencing positive research attitudes and research productivity is likely to foster a sense of research self-efficacy, as well as interest in research (Kahn & Scott, 1997).

In sum, studies of research productivity suggest that research training environments that provide students with opportunities for research involvement and foster development of research skills are important predictors of productivity, both pre- and post-graduation. By presenting research involvement as
an essential component of professional development, research training environments play a significant role in shaping students' professional identities. The research training environment alone is not sufficient for increasing productivity. The empirical literature that was reviewed in this chapter suggests that a myriad of intrapersonal variables, such as self-efficacy, outcome expectations, and gender interact with environmental factors to influence productivity.

To date, no published studies have investigated research productivity among rehabilitation doctoral students. It is likely, however, that post-graduation research productivity of rehabilitation professionals is highest for those who pursue academic careers at research-oriented institutions. An examination of research productivity among rehabilitation professionals indicates that research is actively conducted in the departments that train rehabilitation students at the graduate level. Cook, Andrew, and Faubion (1998) assessed the professional affiliations of authors who published in three predominant rehabilitation counseling journals (Rehabilitation Education, Journal of Applied Rehabilitation Counseling, and Rehabilitation Counseling Bulletin) from 1981-1995. A substantial portion of the articles published in these major journals can be attributed to authors who were faculty members at 66 universities with rehabilitation education programs, and
the top producers of research articles were affiliated with major research institutions. Overall, universities that offer masters and doctoral rehabilitation education programs accounted for 43% of the articles published in the three journals over 15 years. Clearly, research activity is taking place within departments that train graduate students. It seems important, then, to examine research productivity among students who receive mentoring and instruction within these departments.

Finally, a recent study highlights the need for further investigation into the research training environments of rehabilitation doctoral students. Bard, Bieschke, Herbert, and Eberz (2000) re-analyzed the data from the Bieschke et al. (1995) and Bieschke et al. (1998) studies to obtain a clearer understanding of the variables that contribute to research interest among rehabilitation doctoral students and faculty. Both studies employed a hierarchical regression strategy to assess the degree to which research self-efficacy, outcome expectations, and relevant background variables predicted interest in research. In the Bieschke et al. (1995) study of doctoral students (n = 93), outcome expectations was the only significant predictor of interest in research, accounting for 42% of the variance (R squared = .42, p < .001). However, the Bieschke et al. (1998) study of faculty members revealed that both self-efficacy beliefs (accounting for 7% of the variance; p
and outcome expectations (accounting for 47% of the variance, \( p \leq 0.001 \)), were significant predictors of research interest.

While it is difficult to directly compare students and faculty, the results of this study may indicate that perceived elements of the research training environment have a great deal of influence on students’ interest in research. The authors suggested that students might, in fact, be modeling the overt behaviors exhibited by faculty members; in other words, believing that the primary reason to conduct research is to achieve a desired outcome. In academic environments where publication is encouraged among graduate faculty, it is understandable that students would receive this message. Therefore, Bard and colleagues (2000) echoed other authors (e.g., Bieschke et al., 1995, Bishop & Bieschke, 1998; Gelso, 1993; Syzmanski et al., 1994) in stating that early involvement in research activities may foster greater long-term interest in research among students. Bard et al. concluded that it may be important for faculty members to encourage students to “look inward” for research ideas and to pursue research in accordance with their own interests. It is likely that the influence of faculty members can have an impact on (a) students’ beliefs about their own research capabilities, and (b) the importance that students place on research involvement, and (c) the degree
to which rehabilitation professionals will demonstrate active involvement in research activities throughout the course of their careers.

**Conclusion**

Social cognitive variables and the research training environment contribute to understanding the research interest and productivity of doctoral students. It is clear that these variables interact with other intrapersonal and interpersonal variables to influence research involvement. The nature of the relationship between research self-efficacy, outcome expectations, interest in research, and research productivity requires further examination. Clearly, the research training environment has a significant impact on doctoral students’ research interest and behavior. Assessing specific determinants of research productivity will benefit the field of rehabilitation counseling, as the production of quality research has positive effects for academicians, practitioners, and consumers.

**Statement of the Problem**

The purpose of the present study is to examine the relationships between social cognitive variables, environmental factors, demographic variables, research interest, and research productivity in a sample of rehabilitation doctoral students.
This study will contribute to the knowledge base in rehabilitation in two ways: (a) as the first study to measure research productivity among doctoral students, and (b) by testing the relationships between research productivity and research interest, perceptions of the research training environment, research self-efficacy, research outcome expectations, and career goals.

The following research questions will be examined:

1. What are characteristics of rehabilitation doctoral students who demonstrate high research productivity?
2. What are characteristics of rehabilitation doctoral students who demonstrate moderate or no research productivity?
3. On what dimensions do highly productive students differ from moderately productive and non-productive students?
4. On what dimensions are highly productive students similar to moderately productive or non-productive students?
Chapter III

METHODOLOGY

Chapter 2 presented an overview of the theoretical and empirical literature on the research training environment, research interest, research self-efficacy, research outcome expectations, and research productivity. This chapter will present the methodological format details of the present study, including a description of research participants, instruments, procedures, and design.

Participants

The sample consisted of 141 doctoral students in rehabilitation who were enrolled in one of 26 doctoral programs in rehabilitation in the United States. Age ranged from 23 to 59 years (mean = 37, SD = 9.06). 66% (n = 93) of respondents were female, while 33% (n = 48) were male. The ethnic representation of the sample was: white (70%), African-American (20%), Asian or Asian-American (5%), and other, non-specified (4%). Students ranged from 1st through 9th year of their doctoral program (mean = 2.7).

Participants were identified through their doctoral programs. Rehabilitation programs were listed in Maki et al.’s (2000) Directory of Doctoral Study in Rehabilitation. The
population to be sampled includes students ranging from first semester of doctoral work through dissertation stage (i.e., fourth year and beyond). As of October 1999, a total of 283 students were enrolled in the combined rehabilitation doctoral programs (Maki, et al., 2000).

Procedures

Participants were identified through their doctoral programs. Training directors of each program were contacted by telephone to determine the number of students who are presently enrolled in the program; including those who have completed all course requirements but not the dissertation. The number of students currently enrolled in each program ranges from 0 to 28 (Maki et al., 2000). Following a brief introduction and overview of the study, training directors were asked to release a list of names and addresses of their students. Some of the training directors were unable to provide students’ names, due to departmental or university regulations. Thus, survey packets were distributed in two ways, depending on the program: (a) when possible, survey packets were personally addressed to students, or (b) a package containing the appropriate number of survey packets in individual envelopes, addressed to “Rehabilitation Doctoral Student”, was sent to the training director for distribution to campus mailboxes. Survey packets
were sent to every student enrolled in the rehabilitation doctoral program. A code number that corresponded with student name and/or program was assigned to each survey and written on the top left corner of the first instrument. Therefore, respondents were not anonymous; however, confidentiality was ensured in the consent form (see Appendix B). There were two benefits to maintaining respondent confidentiality but not anonymity: (a) Coding by student name helped to facilitate personalized follow-up contacts; and (b) in future analyses using this data set, data can be compared between doctoral programs.

Survey packets contained: (a) a cover letter explaining the purpose of the study and a request to return the completed packet; (b) two copies of a consent form, one for the participant and one to return to the investigator; (c) the Research Productivity Measure (Bard, 2000); (d) the Research Self-Efficacy Scale- Revised (Greeley, 1989); (e) the Research Training Environment Scale- Revised (Gelso et al., 1996), (f) the Interest in Research Questionnaire (Bieschke & Bishop, 1994); (f) the Research Outcome Expectations Questionnaire-Revised (Bieschke, 2000); (g) a brief demographic Questionnaire, (h) a Career Goals Measure (Kahn and Scott, 1997), and (i) a self-addressed stamped envelope to return the completed packet. A small incentive, described below, was also enclosed.
Weathers, Furlong, and Solorzano (1993) assessed the methodological procedures that were used in 40 mail survey studies that were published in the *Journal of Counseling Psychology* to empirically examine the relationship between methodological procedures and response rates. Weathers et al. (1993) identified several specific procedures that correlated to higher response rates. The following procedures were used in this study to maximize response rates:

1. **Personalization.** Survey packets were personalized by (a) addressing survey envelope to students by name (when names have been supplied), (b) addressing cover letter to student by name, and (c) the primary researcher’s signature on each cover letter. In addition, all follow-up correspondence was addressed to students by name, when feasible. Students were guaranteed confidentiality.

2. **Incentive.** Each survey packet contained an incentive: a 15-minute GTE long-distance telephone card, designated as a token of appreciation for the participant’s time. (Note: The telephone cards were donated to the investigator by GTE, in support of research that is related to promoting service to persons with disabilities.) The incentive was included only in the first mailing; the follow-up mailing to
non-respondents did not contain any incentive. Weathers et al. (1993) recommended the use of incentives, as incentives have been shown to increase response rates.

3. Follow-up contacts. Weathers et al. (1993) recommended that researchers conduct an initial follow-up with non-respondents within two to four weeks. The first follow-up in this study was a letter, mailed to all non-respondents three weeks after the initial survey was mailed. The letter listed my contact information (e.g. e-mail address) so students could easily request a new survey packet. Three weeks later, a new survey packet was sent to all non-respondents. When names and addresses were not known, entire new packages were sent to training directors for distribution, identical to the first mailing, with a revised cover letter that stated “In case you were unable to complete this survey when it was first sent to you in November, here is a second opportunity to participate in my dissertation study.” Also, a fax number was included in the second cover letter, as a means of expediting students’ responses. However, a cut-off date for survey completion was not specified in the cover letter. Robin (1965) suggested that follow-
up contacts should create an impression that there will be a succession of communications until some form of response is obtained (Weathers et al., 1993); thus non-respondents will be less likely to assume that they can “ignore it, and it will go away.”

Survey packets were mailed to each of the 283 identified doctoral students. A total of eight surveys were returned as “undeliverable.” Thus, the response rate for the present study was 51%.

**Instruments**

**Research Self-Efficacy**

*Research Self-Efficacy Scale (RSES; Greeley et al., 1989).*

The RSES is a 51-item inventory (see Appendix D) designed to assess an individual's perceived ability to perform a variety of tasks related to research. Bieschke et al. (1996) conducted a factor analysis on the RSES. The following four-factor structure accounted for 57% of the variance: (a) **early tasks** consists of five items and addresses the individual's efforts to brainstorm and identify a research idea; (b) **conceptualization** includes 16 items and represents the fundamental stages in developing one's thoughts about and rationale for a particular research idea; (c) **implementation** has 20 items and depicts the tasks necessary to conduct and complete a research
project; and (d) presenting the results consists of eight items and addresses organizing and preparing one's research project for both oral and written presentation. Two items assess respondents' overall sense of confidence in their research ability. Respondents are asked to use a scale ranging from 0 (not confident) to 100 (totally confident) to rate their degree of confidence for each item. The four scales of the RSES have been shown to correlate significantly. Thus, in the interest of preserving statistical power, only the total score of the RSES was evaluated in this study.

Bieschke and colleagues (1996) reported a high internal consistency coefficient for the total RSES (.96). In the present study, internal consistency was high (.98).

Outcome Expectations

Research Outcome Expectations Questionnaire-Revised (ROEQ-R) (Bieschke & Bishop, 1994). The original ROEQ is a 20-item scale consisting of 18 items reflecting positive outcomes (e.g., "My involvement in research will lead to meaningful contributions to the field") and two items reflecting negative outcomes (e.g., "My involvement in research will take time away from leisure activities") that might result from research activity involvement. Respondents are instructed to indicate their degree of agreement with each statement using a five-point
Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Preliminary reliability data revealed good internal consistency, with a coefficient alpha of .89 (Bieschke & Bishop, 1994).

In an exploratory factor analysis of the ROEQ, Bieschke (2000) identified a one-factor model, which appears to be concerned with the positive outcomes one might expect to occur as a result of engaging in research activities. High scores on this scale seem to reflect the belief that participation in research activities can result in contributions to the field, professional development, and increased respect for others. Upon conducting a confirmatory factor analysis of the one-factor model, eight items emerged that represented an excellent fit to the data (coefficient alpha = .90). Item-total correlation coefficients for the one-factor model ranged from .50 to .80. Bieschke concluded that the revised, 8-item scale, while in need of further empirical investigation (Bieschke recommended a cross-validation study to further assess the revised ROEQ), the revised ROEQ appears to be a concise, reliable instrument for use in investigations of research outcome expectations. Thus, the 8-item, one-factor scale was utilized in the present study (see Appendix E). In the present study, internal consistency for the ROEQ-Revised was .90.
Research Interest

Interest in Research Questionnaire (IRQ) (Bishop & Bieschke, 1994). This measure is composed of 16 items, each describing a different research activity (see Appendix F). Participants used a five-point Likert scale ranging from 1 (very disinterested) to 5 (very interested) to indicate their degree of interest in research activities (e.g., "Discussing research ideas with my colleagues"). The instructions informed respondents that the term "research" included both qualitative and quantitative approaches, and participants were reminded of this definition again after the second item. Internal consistency estimates appear good, as evidenced by coefficient alphas of .89 (Bishop & Bieschke, 1994) and .90 (Bieschke et al., 1995). In the present study, coefficient alpha was .90. Preliminary validity data is also available. The total score on the IRQ correlated significantly with the Investigative Scale of the Vocational Preference Inventory (Holland, 1995; r=.29), p < .05). Investigative Holland types tend to be analytical, methodical, precise, and curious. The IRQ was not significantly related to any other Holland type (i.e., Artistic, Social, Enterprising, Realistic, Conventional).

Research Training Environment

Research Training Environment Scale-Revised (RTES-R). The RTES-R (Gelso et al., 1996) is a 54-item inventory (see Appendix
C) designed to assess nine of the ten ingredients of research training environments proposed by Gelso (1979; 1993). The nine subscales of the RTES include: (a) faculty modeling of appropriate scientific behavior, (b) positive reinforcement of scholarly activities, (c) early, minimally threatening research involvement, (d) teaching relevant statistics and the logic of design, (e) teaching students to "look inward" for research ideas, (f) a concept of science as a partly social experience, (g) emphasizing that all studies are flawed and limited, (h) a focus on varied investigative styles, and (I) wedding of science and clinical practice. Participants respond to each item on a 5-point Likert type scale indicating extent of agreement (1=disagree, 3=neutral, 5=agree). To control for response bias, an approximately equal number of items are negatively stated and positively stated. Higher RTES scores indicate respondents' stronger agreement that this ingredient is present in their training environment. The respondent's score on each scale is his or her average response to the items on that scale.

Internal consistency estimate (Cronbach's alpha) for the total score of the RTES-R was .90 (Gelso et al., 1996), and test-retest reliability was high (r= .94 for total RTES). These scores represent significant improvement in the psychometric properties of the RTES-R compared to the original RTES. For
purposes of this study, only the total score of the RTES-R will be calculated.

Kahn and Gelso (1997) conducted two factor analyses of the Research Training Environment Scale- Revised (RTES-R; Kahn & Gelso, 1997). An exploratory factor analysis was conducted to assess for second-order factors that might explain the associations among the nine dimensions of the research training environment. Additionally, a confirmatory factor analysis was conducted to assess how well the RTES-R measures the nine ingredients of Gelso’s (1993) theoretical research training environment. The exploratory factor analysis resulted in two second-order factors accounting for 57.9% of the variance in the RTES-R; i.e., two ingredients of the training environment were found to be strongly predictive of interest in research. First, an Interpersonal factor was identified, which includes such variables as (a) early involvement in research, (b) offering minimally threatening training experiences to students, (c) faculty modeling of appropriate scientific behavior, (d) positive reinforcement by faculty, and (e) framing science as a social experience. Secondly, an Instructional factor was identified, which includes teaching students (a) to look inward for ideas, (b) that all experiments are inherently flawed, (c) relevant statistics and research design, (d) varied investigative styles and approaches to research, and (e) that
science can be wed with clinical practice. The confirmatory factor analysis provided tentative support for the two-factor structure. This two-dimension model is unique in that it provides a detailed outline of factors that are relevant to research training. Additionally, Kahn and Gelso (1997) stressed that interpersonal factors appear to play a critical role in producing a quality research training environment. The RTES-R can be used to measure the differential contributions of interpersonal and instructional elements of the research training environment on students' research productivity.

In the present study, internal consistency estimates were obtained for the Interpersonal and Instructional factors of the RTES- Revised. For the Interpersonal scale, Cronbach’s alpha = .89. For the Instructional scale, Cronbach’s alpha = .88.

Demographic Questionnaire and Career Goals

A brief demographic questionnaire asked students to identify their gender, age, year in doctoral program, and career goals (see Appendix G). Students were not asked to name their doctoral program, as the code on the survey provides this information. A general qualitative question was included: “Please feel free to add any comments about your research experiences, research interests, or research training environment.”
Career Goals were assessed in a manner similar to Kahn and Scott (1997). Students were presented with a list of career options that are viable to rehabilitation professionals. Participants were asked to rate their top three career preferences, in order. Consistent with Kahn and Scott's method of analysis, career goals were weighted and scored on a scale of 0 to 6, with a sum of 0 indicating primary interest in a clinically-oriented career, and 6 indicating primary interest in a research-oriented career. The mean for the present sample was 2.65 (SD = 1.99), indicating a relative balance between clinical- and research-oriented career goals.

Research Productivity

Research Productivity Measure (unpublished; Bard, 2000.) A five-item measure of research productivity, tailored to a graduate student population, was developed for the present study (see Appendix H). The following five items were assessed: (1) number of empirical articles, published or in-press, (2) number of empirical research presentations at national or regional conferences, (3) number of non-empirical articles published or in-press, (4) number of book chapters published or in-press, and (5) number of non-empirical research presentations at national/regional conferences, (6) number of articles of book chapters, empirical or non-
empirical, that are actively being prepared, and (7) number of regional or national conferences attended. The last two items were related to research involvement; however, in keeping with the stringent definition of productivity, the responses to these items were not analyzed.

A weighted scoring system was used to assess productivity in this measure. Theoretically, assigning greater “weight” to certain items makes sense; for example, the process of publishing of an empirical article requires more sophisticated research skills than conducting a non-empirical research presentation. Thus, responses were summed using the following weighted scoring system: Number of empirical publications was weighted by 2, number of non-empirical research presentations was weighted by .5, and the other three items were weighted by 1. In the present study, Cronbach’s alpha for the RPM was .72, which is comparable to internal consistency estimates obtained from other measures of research productivity using samples of graduate students.

Two issues were considered in the development of this instrument. First, the idea of assigning “weights” to the different items in the measure. For example, the issue of assigning a higher point value to “writing and publishing an empirical article” than “non-empirical research presentation at
a national or regional conference” was considered. Thus, the following question emerged: Is a weighted scoring system more useful than a non-weighted scoring system for differentiating low-productive students from high-productive students?

To address this question, I applied three different scoring systems to the items in this scale, to test for differences in reliability. As mentioned previously, only the first five items of the scale were assessed, in keeping with a stringent definition of research productivity. The three scoring systems, and reliability coefficients, were as follows:

1. Unweighted: Raw scores were summed to calculate a total score (Cronbach’s alpha = .69).
2. Weighted 1: Item 1*2, Items 2-5, *1, Item 5 * .5, then summed (alpha = .72).
3. Weighted 2: Item 1*3, Items 2-5, *2, Item 5 * 1, then summed (alpha = .71).

Cronbach’s alpha coefficients were not considerably different for the three scoring methods. Thus, it is unlikely that assignment of weights to items makes a profound difference in the internal consistency of this scale. The reliability coefficients for this scale are comparable to the internal consistency estimates obtained for other measures of research productivity among graduate students. For example, Kahn and Scott (1997) developed a 12-item productivity measure that had
an internal consistency estimate (K-20) of .67. For Phillips and Russell’s (1994) measure of productivity, developed for Phillips' dissertation study, Cronbach’s alpha = .78. Also, Brown et al. (1996) reported alpha = .69 based on reanalysis of Phillips and Russell’s data. Groth-Marnat (1984) considered alpha = .7 to be adequate for research purposes. In sum, the reliability of the five-item RPM is adequate, regardless of scoring method.

Differential weighting of items makes sense theoretically. The number of published/in-press articles is simply a greater indication of research productivity than number of non-empirical presentations. Thus, the Weighted Scoring Method 1 was used to calculate the scores for the Research Productivity Measure.

In order to facilitate comparison between respondents who reported no productivity, moderate productivity, and high productivity, data was divided into three groups for analysis. The use of three groups allows me to separate the respondents who reported no productivity from all others, as desired. Since participation in one research activity (e.g., a presentation, co-authoring an article) could shift respondents from one productivity group to the next, I was reluctant to create more arbitrarily defined “groups” than necessary. Thus, three groups were used in the analysis.
The cutoff point between “moderate” and “high” productivity groups was selected by dividing respondents who reported productivity > 0 into two equal sized groups. In the present study, the distributions were as follows:

Lowest:  N = 52, Range, 0
Moderate: N = 43, Range, 0 – 4.0
Highest: N = 46, Range, 4.5– 45 (eight scores > 10).

Once again, it is important to note that the cutoff point between “moderate” and “high” productivity was selected in order to assign an approximately equal number of respondents to each of the three groups. In keeping with the research hypotheses of this study, dividing respondents into three groups facilitates comparison of the groups on each of the outcome variables.
Chapter IV

RESULTS

Prior to analysis, variables were examined using SPSS Frequencies and Regression (SPSS 10.0, 1999) for accuracy of data entry, missing values, and fit regarding the assumptions of MANCOVA. Five cases showed missing item values; three of these failed to respond to at least three items, and two failed to complete the Career Goals measure. Thus, listwise deletion was used to delete the cases from final analysis, resulting in a sample of 136.

Scores were examined for normality using SPSS Frequencies (1999). The distribution of two scales was called into question. Tabachnick and Fidell (2001) recommend transformation of data that is skewed beyond + or −1.5. Scores on the RSES (skewness = −1.38) were somewhat skewed; however, the tendency to respond positively to questions about one’s research abilities is not unusual, particularly for graduate students, in the context of providing a “socially desirable” response. Thus, the data for this measure were not transformed. For the ROEQ, however, the data displayed significant deviation from normality (skewness= −2.25; kurtosis= 5.86). As with the RSES, skewness on this measure was anticipated, given that the items assessed students’ beliefs about research involvement. However, the degree of skewness on this measure warranted transformation of
the data. Thus, the data were transformed to produce a more normal distribution for analysis (skewness LROEQ= 1.27; kurtosis= 1.08). No multivariate outliers were detected. Table 1 presents the mean scores for each of the study variables.

Table 1: Descriptive Statistics for Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTE Interpersonal</td>
<td>3.88 (1-5 scale)</td>
<td>0.63</td>
<td>1.8 – 5.0</td>
<td>.89</td>
</tr>
<tr>
<td>RTE Instructional</td>
<td>3.87 (1-5 scale)</td>
<td>0.56</td>
<td>1.93 – 5.0</td>
<td>.88</td>
</tr>
<tr>
<td>Research Self-efficacy</td>
<td>81.65 (0-100)</td>
<td>11.68</td>
<td>34.3 – 100</td>
<td>.98</td>
</tr>
<tr>
<td>Outcome Expectations</td>
<td>4.5 (1-5 scale)</td>
<td>0.69</td>
<td>1.38 – 5.0</td>
<td>.90</td>
</tr>
<tr>
<td>Interest In Research</td>
<td>2.0 (1-5 scale)</td>
<td>0.74</td>
<td>1.0 – 4.86</td>
<td>.90</td>
</tr>
<tr>
<td>Career Goals</td>
<td>2.65 (0-6 scale)</td>
<td>1.93</td>
<td>0 – 6</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Based on the decision to treat age, gender, and year in school as covariates in a one-way multivariate analysis of covariance (MANCOVA), several assumptions were evaluated. First, the assumption of linearity was evaluated. The assumption of linearity states that continuous covariates must be linearly related to the outcome measures. In testing this assumption, there was evidence of violations for two variables: age and year in school. Age displayed a statistically significant, nonlinear relationship to career goals (F = 15.82,
p = .00). Year in school also displayed a significant nonlinear relationship with RTE- Instructional (F = 4.46; p = .037).

Homogeneity of regression is another key assumption of MANCOVA. Homogeneity of regression states that the set of covariates’ relationships to the set of outcome measures does not differ among the three productivity subgroups. Violation of this assumption suggests that there are ‘interactions’ between productivity and the covariates in their relationship to the outcome variables. Because age and year in school showed significant nonlinear relationships to Career Goals and RTE- IN, the homogeneity of regression assumption was tested separately for these two outcome variables.

Age was nonlinearly related to Career Goals, and the nonlinear relationship did, in fact, differ across the productivity subgroups (F = 3.19, p = .016). Given that result, I decided to incorporate the implied interaction between age and productivity into the final analysis of Career Goals by categorizing age into three subgroups (to allow the nonlinearity between age and career goals to express itself in the model), and using it as a factor (or grouping variable) rather than as a covariate.

The test for the homogeneity of regression assumption was repeated for the analysis of Career Goals, to include both productivity and the three age subgroups (23-31, 32-41, and 42-
The second test indicated that there were also violations of the homogeneity assumption; specifically, the relationship of year in school to the Career Goals scores differed in the three age subgroups (\( F = 3.05; p = .05 \)). Given that result, I decided to dichotomize year in school and incorporate it as a third grouping variable in the analysis. In order to preserve statistical power, year in school was dichotomized (years 1-2 and years 3-9)—not divided into three subgroups like age—because year in school did not exhibit a nonlinear relationship to Career Goals. The homogeneity of regression test had to be repeated once again for gender. The purpose of this third test was to determine whether the relationship of gender to Career Goals varied significantly across the three levels of productivity and age, and also across the two levels of year in school. The results from this test indicated that the homogeneity of regression assumption was met for gender (age: \( F = 0.41, P = .66 \); year in school, \( F = .02, p = .88 \); and productivity \( F = 1.13, p = .33 \)). Given that result, the final analysis of the Career Goals scores was conducted as a three-way ANCOVA with productivity, age, and year in school serving as grouping factors, and gender serving as a covariate. The General Linear Model (GLM), full factorial model was selected as the method to test for differences among groups on the grouping factors, for all of the following analyses.
For Career Goals, no significant differences were found among the three levels of productivity, either alone or in combination with any of the other factors included in the model (age and year in school). Age was statistically significant ($F(2, 115) = 4.98, p = .01$). As observed in the tests for linearity, the pattern of the Career Goals means across the three age groups displayed a pattern of nonlinearity. The middle age subgroup, (32-41) reported significantly greater mean scores on Career Goals than did the 23-31 ($p = .01$) and 42-59 age groups ($p = .01$). Effect size for Career Goals was eta squared $= .08$. Table 2 shows the means, standard error of the mean, and confidence intervals by age group on the Career Goals measure.

Table 2: Career Goals Composite Scores

<table>
<thead>
<tr>
<th>Categorized Age</th>
<th>Mean</th>
<th>SE/Mean</th>
<th>95% Confidence Interval Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>23-31</td>
<td>2.28</td>
<td>.305</td>
<td>1.68</td>
<td>2.89</td>
</tr>
<tr>
<td>32-41</td>
<td>3.69</td>
<td>.399</td>
<td>2.90</td>
<td>4.48</td>
</tr>
<tr>
<td>42-59</td>
<td>2.21</td>
<td>.337</td>
<td>1.54</td>
<td>2.88</td>
</tr>
</tbody>
</table>

The other outcome variable implicated in a nonlinear relationship to a covariate was RTE- Instructional. For this outcome measure, the homogeneity of regression assumption was met (age: $F = .6, p = .77$; year in school, $F = 1.23, p = .30$; and gender, $F = 2.85, p = .06$). As such, RTE- Instructional was analyzed in a one-way ANCOVA, with productivity as the
grouping factor and age, gender, and year in school as covariates.

Productivity was significantly related to RTE- Instructional (F (2, 127) = 3.52, p = .03). Specifically, the moderately productive group was found to be significantly higher on this outcome measure than the most productive group (4.02 vs. 3.70). Also, as noted earlier, age displayed a significant nonlinear relationship to RTE- Instructional (F (1, 127) = 4.44, p = .04); see Figure A. Table 3 shows the means, standard error of the mean, and confidence intervals for categorized productivity scores on RTE-Instructional. Effect size (eta squared) for RTE- Instructional was .13.

Table 3: RTE-IN Scores by Productivity Group

<table>
<thead>
<tr>
<th>Productivity</th>
<th>Mean</th>
<th>SE/Mean</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest Group</td>
<td>3.89</td>
<td>.077</td>
<td>3.74 4.04</td>
</tr>
<tr>
<td>Moderate Group</td>
<td>4.02</td>
<td>.087</td>
<td>3.85 4.20</td>
</tr>
<tr>
<td>Highest Group</td>
<td>3.70</td>
<td>.083</td>
<td>3.54 3.86</td>
</tr>
</tbody>
</table>

Having completed the analyses of RTE-IN and Career Goals, I turned my attention to the remaining four outcome variables. I tested the homogeneity of regression assumption for this set of variables. If this assumption was met, I would proceed to analyze the four outcome variables in a one-way MANCOVA. However, there was evidence of violation of the homogeneity of
regression assumption. Specifically, for Outcome Expectations, the effects of all three covariates differed across the productivity subgroups (age, $F = 3.61, p = .03$; year in school, $F = 3.11, p = .05$; and gender, $F = 3.78, p = .03$). Given that fact, I incorporated the implied interactions into the ultimate analysis of this outcome by dichotomizing age and year in school, and using these two dichotomies, along with gender, as factors in a four-way ANOVA of the Outcome Expectations scores. Once again, in the interest of preserving statistical power by maintaining the fewest possible variables and keeping cell sizes as large as possible, I did not use three categories for either age or year in school since neither variable showed any nonlinear relationship to this outcome measure.

The only significant effects in this analysis involved the "main effect" of productivity ($F (2, 111) = 5.71, p = .00$) and a two-way interaction between productivity and gender ($F (2, 111) = 3.16, p = .05$). Since productivity is implicated in a higher order interaction, I did not interpret its main effect. Rather, I conducted tests of simple main effects (i.e., tests of whether the three productivity subgroups differed from one another on Outcome Expectations for each of the two gender subgroups). The tests of simple effects indicated that there are such differences for males ($F (2, 111) = 7.13, p = .00$) but not for females ($F (2, 111) = 0.40, p = .68$). Among males, pairwise
comparisons among the mean Outcome Expectations scores for the three productivity subgroups indicated that the lowest productivity subgroup reported significantly higher mean scores on Outcome Expectations than did the high productivity subgroup ($p = .00$). Effect size for ROEQ was .03. Backtransforming (antilogging) and reverse scoring these transformed values indicated that the low productivity group’s mean score on Outcome Expectations is 4.9 (out of maximum 5.0), and the high productivity group’s mean score is 4.28.

The homogeneity of regression assumption was also violated for the IRQ outcome. Here, both year in school and gender were implicated, indicating that the relationships between these two covariates and IRQ differed significantly across the three productivity subgroups (year in school, $F = 3.39; p = .04$; gender $F = 3.07, p = .05$). Given these results, I decided to dichotomize year in school and used it, and gender, as additional factors along with productivity in a three-way ANCOVA in which age would serve as the covariate. Because I was incorporating year in school and gender as additional factors, I had to conduct a second homogeneity of regression assumption test to determine whether age’s relationship to the IRQ now differed not only across the three productivity subgroups but also across the year in school and gender subgroups as well. This test indicated that there was no evidence that the
relationship between age and IRQ differed across the subgroups of any of the three factors (year in school, F = 0.71, p = .40; gender, F = 0.35, p = .55, and productivity, F = 0.15, p = .86). Therefore, the analysis of the IRQ outcome was conducted as a three-way ANCOVA with age as the covariate.

In this analysis, there was one significant effect, at year_2. Individuals in their first two years of school had significantly lower mean Interest in Research scores (1.70) than those who have been in school longer (2.26), (F (1,121) = 10.39, p = .002).

With regard to the remaining two outcomes, RTE Interpersonal and Research Self-Efficacy, the homogeneity of regression tests found no violations (RTE Interpersonal: age, F = 0.11, p = .89; year in school, F = 1.93, p = .15; and gender, F = 0.79, p = .46; Research Self-Efficacy, age, F = 0.10, p = .90; year in school, F = 1.21, p = .30; and gender, F = 0.17, p = .85.) Therefore, the final analysis of these two outcomes was conducted as a one-way MANCOVA in which productivity was the grouping factor and age, year in school, and gender were covariates.

In this analysis, productivity was significant (F = 4.05), (4, 254), p = .003). I conducted two univariate tests, to determine whether the significant productivity differences involved only one or both of the outcome variables. The productivity
differences involved only one of the two variables, RTE-Interpersonal ($F = 6.69$, $(2, 128)$, $p = .002$). No significant differences were noted across productivity groups for research self-efficacy. Effect size for research self-efficacy was $\eta^2 = .12$.

Pairwise comparisons were conducted among the three productivity groups’ mean scores on RTE Interpersonal. The mean for the lowest productivity subgroup was significantly higher than the highest productivity subgroup (mean: 3.94 vs. mean: 3.61, $p = .008$). Also, the moderate productivity subgroup’s mean RTE-Interpersonal score is significantly greater than that of the high productivity subgroup (mean: 4.08 vs. mean: 3.61, $p = .001$; ES = .16). Effect size for RTE Interpersonal was .08.

Table 4 shows the correlations between the study variables.
### Table 4: Intercorrelations Among Study Variables

<table>
<thead>
<tr>
<th>Study Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Research Productivity</td>
<td>-</td>
<td>.109</td>
<td>-.208*</td>
<td>-.114</td>
<td>.218*</td>
<td>.314**</td>
<td>-.241**</td>
</tr>
<tr>
<td>2. Career Goals</td>
<td>-</td>
<td>.038</td>
<td>.222**</td>
<td>.037</td>
<td>.030</td>
<td>-.280**</td>
<td></td>
</tr>
<tr>
<td>3. RTE Interpersonal</td>
<td>-</td>
<td>.828**</td>
<td>.017</td>
<td>.286**</td>
<td>-.059</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. RTE Instructional</td>
<td>-</td>
<td>.038</td>
<td>.239**</td>
<td>-.074</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Research Self-Efficacy</td>
<td>-</td>
<td>.056</td>
<td>-.439**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Outcome Expectations</td>
<td>-</td>
<td>-.313**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Interest in Research</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01.

Research self-efficacy, research outcome expectations, interest in research, and interpersonal elements of the research training environment correlate significantly with productivity; however, all of the correlations were low to moderate. Career goals and instructional elements of the research training environment did not correlate significantly with productivity. The low to moderate correlations between productivity and the outcome variables provide some explanation for the limited amount of significant differences between productivity groups in this study.
The Interpersonal and Instructional elements of the research training environment showed a significant, strong positive correlation ($r = .83$). This is not surprising, as the two variables are factors that derived from an instrument that measures perceptions of one broad construct, the research training environment. Given the strong positive correlation, it is likely that these two factors are not truly independent. In the present study, the two factors were tested separately to account for theoretical differences in the effects of instructional and interpersonal elements on the research behavior of students.

Finally, it is interesting to note that all of the study variables correlate significantly with research interest, except for elements of the research training environment. Consistent with previous studies (e.g., Bieschke & Bishop, 1998; Kahn & Scott, 1997), one would expect the research training environment to correlate with research interest. Please note that the items on the Interest in Research Questionnaire were scored with a Likert-scale that presented "1" as "very interested" and "5" as "not at all interested" in various research tasks. All other study measures are interpreted in the opposite manner, e.g., low scores indicating low levels of endorsement of the construct being measured. Thus, the negative correlations between
research interest and other study variables, in Table 4, are actually indicative of positive relationships.

Figure A: Curvilinear Relationship between Career Goals and Age

In sum, no significant differences were found between productivity groups for scientist-practitioner career goals, research interest, or research self-efficacy. The moderate productivity group scored significantly higher on research training environment− Instructional and Interpersonal factors. The lowest productivity group scored significantly higher than the highest productivity group on research training environment− Interpersonal (males and females), and research outcome expectations (males only). In addition, students in their first
two years of doctoral work reported significantly greater research interest than students beyond the second year. Age was significantly related to scientist-practitioner career goals, with students in the middle age group (32-41) reporting greater interest in research-oriented careers than students who were younger (23-31) or older (42-51).
Chapter V

DISCUSSION

The present study had two primary purposes. As the pioneer investigation of research productivity among rehabilitation doctoral students, one goal was to gather descriptive information about the student population. The information that was collected on social cognitive variables, perceptions of the research training environment, and research interest adds to the preliminary data on research behavior among rehabilitation doctoral students that was collected by Bieschke et al. (1995). The inclusion of measures of career goals and research productivity in the present study helped to produce a more complete picture of characteristics of rehabilitation doctoral students.

The second goal was to examine how research self-efficacy, research outcome expectations, perceptions of the research training environment, interest in research, and career goals are related to research productivity among rehabilitation doctoral students. Specifically, I aimed to identify differences on each of the outcome variables for students who reported different degrees of research productivity. Identification of variables that differ between these groups may provide useful information for rehabilitation educators who are interested in helping
students to not only appreciate the value of research, but to become more active researchers.

The following section provides an overview of the results for each of the outcome variables. First, implications for theory and research training are assessed as they relate to the results for each of the variables. Second, the limitations of the present study are discussed. Third, directions for future research are presented.

**Implications for Theory and Research Training**

**Interest in Research.** Scores on research interest were generally high for the entire sample (total sample mean= 2.07 out of 5.0, reversed Likert scale). As with other measures in this study, it is essential to consider the “social desirability” factor when interpreting research interest scores, particularly in a sample of doctoral students.

No significant differences in research interest were found between the three productivity groups (low= 1.7, moderate= 1.88, high= 2.3). Additionally, the effect size for research interest was relatively small (ES = .10). This finding supports what previous investigations have shown: that research interest alone is insufficient for stimulating research productivity. Consider, for example, Bieschke et al.’s (1998) study of research productivity among rehabilitation faculty members. Research interest predicted only 8% of the variance in research
productivity. Also, Kahn and Scott (1997) did not find support for their hypothesis that research interest and productivity are directly related. Other factors, such as elements of the research training environment, are needed to transform research interest into active participation in research activities. In keeping with social cognitive career theory, research self-efficacy and research outcome expectations co-operate to directly influence the formation of research interests. However, self-efficacy has also been indicated as a mediator variable between research interest and research productivity (e.g., Brown et al., 1996). The interactions of social cognitive variables and the formation of research interests (and subsequent productivity) warrants further exploration.

Interest in research was significantly higher for students in their first two years of doctoral work than those beyond the first two years. Given the nature of the model, it is not possible to determine whether this is a primary response (i.e., students enter graduate school with high research interest) or secondary response (i.e., activities in first two years of graduate school create high research interest, which then tapers off). However, graduate training programs can use this information to ensure that a wealth of research opportunities are available to students in their first two years of doctoral work. Consider one of Gelso’s (1979; 1993) propositions: early
involvement in research, in a minimally threatening way, will enhance students’ attitudes toward research. Early involvement in research activities may foster interest in research, which could lead to enhanced productivity if research interest continues to be high. Given the decline in research interest that was found for students beyond the second year of school, faculty members in doctoral training programs may wish to consider two concurrent goals: increasing research interest, and sustaining research interest among students.

**Research Training Environment—Interpersonal and Instructional.** Two components of the research training environment, as identified by Kahn and Gelso (1997), were analyzed separately in this study. The Interpersonal and Instructional elements of the research training environment have been hypothesized to differentially influence research productivity (e.g., Kahn & Gelso, 1997; Kahn & Scott, 1997). In the present study, both the Interpersonal and Instructional elements of the research training environment were significantly related to productivity, but in notably different ways.

**RTE—Instructional.** Respondents in the moderate productivity group reported significantly higher scores than those in the highest productivity group (mean= 4.02 vs. mean= 3.70). Similarly, persons in the lowest productivity group were more influenced by the Instructional component of the research
training environment (mean= 3.89) than persons in the highest group. This can be interpreted to mean that the highest producers are less influenced by the instructional elements of the research training environment, and are independently motivated to do research. Examples of the Instructional component of the research training environment include: (1) varied approaches to research, such as qualitative and quantitative models, are taught and valued, and (2) instructors acknowledge that all studies are flawed and limited in one way or another (Gelso, 1993). The influence of the Instructional elements of the research environment may be strongest for persons who are moderately productive, or may stimulate non-productive students to engage in research. Another possible explanation is that students who are highly productive had positive experiences with the Instructional component of their research training environments, and have become independent researchers who perceive themselves as less reliant on instructional activities.

The effect size for RTE-Instructional was eta squared = .13. Eta squared is an index of the proportion of explained variance (Grimm & Yarnold, 1995), when effect sizes are measured as mean differences. Cohen (1977) interpreted effect sizes that are measured via indeces that are squared (e.g., R squared and eta squared) in the following manner: 0.01 is small, 0.09 is
medium, and 0.25 or greater is large. The amount of variance accounted for by RTE- Instructional was the most of any outcome variable in the present study (equal to research self-efficacy).

Year in doctoral program displayed a significant nonlinear relationship to RTE- Instructional. Specifically, perceptions of the Instructional component of the research training environment were relatively stable for years 1-3 (mean = 4.1) but steadily declined for students in years 4-9. It is useful to consider that students beyond their fourth year may be less directly connected to the Instructional components (e.g., may have completed their coursework and are working or on internship) than their counterparts. Advanced students may also have been less susceptible to the “social desirability” factor and were more willing to respond to the survey with honest perceptions about their research training environments.

RTE- Interpersonal. Two significant differences were found for this variable. First, scores for lowest productivity group were significantly higher than scores for the highest productivity group (low= 3.94, high= 3.61). Second, scores for the moderate productivity group were significantly greater than scores for the high productivity group (moderate=4.08, high= 3.61). It is important to note that the mean differences, while significant, are not drastically different between groups.
Also, the effect size for this variable, ES= .08, warrants consideration.

Not surprisingly, RTE-Interpersonal was highly correlated with RTE- Instructional (r= .828). As with the Instructional component of the research training environment, it is likely that students in the highest productivity group are independently motivated to do research, and are less influenced (or perceive themselves to be less influenced) by elements of the research training environment than their counterparts. Of particular interest, however, is the fact that scores for both the lowest and moderate subgroups were higher than for the highest productivity subgroup. Examples of the Interpersonal component of the research training environment include: (1) faculty members model appropriate scientific behavior and attitudes, (2) student’s scientific activity is positively reinforced, and (3) the training environment emphasizes that science can be a partly social experience (Gelso, 1993). It is likely that the Interpersonal component—faculty modeling, positive reinforcement, research groups, faculty encouragement—has a strong influence on students’ research involvement and, ultimately, research productivity. Scores were only slightly different for students in the lowest productivity subgroup than those in the moderate productivity subgroup. The Interpersonal component could be the crucial link for motivating students who
are otherwise ambivalent about research to become active researchers.

A noteworthy finding for the Interpersonal variable is the significant correlation with research outcome expectations (.286). This resonates with a study by Bard et al. (2000). In the Bard et al. study, it was hypothesized that students’ outcome expectations scores (from data collected by Bieschke et al., 1995) were related to faculty modeling behavior, thus explaining why outcome expectations accounted for a significant percentage of student’s research interest compared to faculty’s outcome expectations. Bard and colleagues (2000) echoed other authors (e.g., Bieschke et al., 1995, Bishop & Bieschke, 1998; Gelso, 1993; Syzmanski et al., 1994) in stating that early involvement in research activities may foster greater long-term interest in research among students. Bard et al. concluded that it may be important for faculty members to encourage students to “look inward” for research ideas and to pursue research in accordance with their own interests. It is likely that the influence of faculty members may impact the degree to which students independently pursue research projects, and, subsequently, students’ beliefs about their own research capabilities. Thus, the Interpersonal components of the research training environment may be particularly important to students who are developing as researchers.
Research self-efficacy. Previous investigations of research behavior among graduate students have found a relationship between research self-efficacy and research productivity. Some studies have found this relationship to be direct (e.g., Brown et al., 1996; Phillips and Russell, 1994;), while others have observed research self-efficacy as a mediator variable between research interest and other variables, such as the research training environment (e.g., Kahn & Scott, 1997). According to social cognitive career theory (Lent et al., 1994), one would expect research self-efficacy to have a direct effect on career behavior; in this case, research productivity.

In the present study, research self-efficacy scores were not significantly different between productivity groups (low= 2.91, moderate= 2.66, high= 2.71). Effect size for self-efficacy was .13, which is small; yet, self-efficacy accounts for more of the variance in productivity than any other outcome variable in this study. In addition, research-self efficacy correlated significantly with research interest (-.439) and research productivity (.218), which supports previous studies that have linked self-efficacy to research interest and productivity (e.g., Bieschke et al., 1998; Bieschke et al., 1995; Kahn & Scott, 1997).

Though the lack of significant differences in self-efficacy between productivity groups is inconsistent with social
cognitive career theory, the absence of between-group differences provides potentially useful information to rehabilitation educators. First, productivity may be low even when self-efficacy is high. In keeping with social cognitive career theory, self-efficacy alone is not sufficient for changing behavior; research outcome expectations and other environmental factors would be expected to co-operate with self-efficacy to influence behavior. In this instance, it may be important to provide students with opportunities to develop research interests, which may lead to greater productivity. On the other hand, when research self-efficacy is low but productivity is high, the provision of positive reinforcement, coupled with independent, challenging research activities, may enhance students' research self-efficacy.

**Research outcome expectations.** One significant difference was found on outcome expectations scores. Males in the lowest productivity subgroup had significantly higher scores (mean = 4.9) than males in the highest productivity subgroup (mean = 4.28). This difference was not observed for females. It is important to note that the means on the Research Outcome Expectations Questionnaire were high for all productivity groups; low = 4.9, moderate = 4.65, high = 4.28. Thus, between-group differences on this variable should be interpreted cautiously, recognizing the negligible difference between “positive” and
“very positive” outcome expectations. It is also important to note the small effect size (ES= .03); outcome expectations accounted for only a small portion of the variance in research productivity. The small effect size in this study may be related to the type of analysis that was conducted on the Outcome Expectations variable (four-way ANCOVA); multiple grouping factors will reduce power and are undesirable when a sample size is small (Tabachnick & Fiddell, 2001).

Social cognitive career theory states that outcome expectations may have a direct effect on goal choices and actions (Lent et al., 1994). However, outcome expectations are also thought to co-operate with self-efficacy to influence interests and actions (Lent et al., 1994). In the present study, since research self-efficacy did not differ between productivity groups, it is not surprising that outcome expectations scores were mostly insignificant. In Bieschke et al.’s (1998) study of productivity among rehabilitation faculty, they found that outcome expectations predicted research interest but was not directly related to research productivity. Once again, it is likely that outcome expectations must co-operate with research self-efficacy to influence research productivity.

Social cognitive career theory guides the explanation for why males in the non-productive group scored higher on outcome
expectations than males in the high productivity group. While there is no theoretical basis for the gender-specific difference, consider one of the propositions of SCCT: self-efficacy and outcome expectations will be altered as a result of learning experiences (Lent et al., 1994). Students who have not engaged in research activities may hold exaggerated beliefs about the gains that will result from producing research. However, consider a graduate student who has published two articles and presented at a national conference (which, in the present study, would place him or her in the high productivity group). This student has experienced the challenging process of securing a publication, which includes the frustrations of revision and rejection. Yet, the "rewards," or gains, that result from publishing (e.g., obtaining a faculty position, prestige) may not be evident until after graduation. Thus, students who are productive researchers may understand the rigorous process of research better than their non-productive peers, while experiencing few tangible outcomes. This combination would result in more realistic research outcome expectations.

**Career Goals.** Career goals did not differ significantly between the productivity groups (low= 2.49, moderate= 2.62, high= 2.95). This can be interpreted to mean that students who are interested in clinically oriented careers were not
significantly more, or less, productive than their research-oriented counterparts. The average score on the measure of Career Goals was 2.65, which indicates a relative balance between students with clinically oriented career goals and those with research oriented career goals.

It is useful to examine the relative differences between groups on the measure of Career Goals. Students who reported the greatest research-oriented career goals were in the middle age group (age 32-41; mean CGS= 4.33), early in their doctoral work (years 1-2), and low-to-moderately productive. Students who were older (age 42-59) and more advanced (years 3-9) reported the greatest interest in pursuing a clinically-oriented career (mean CGS= 2.00). Further investigation regarding the motivations of students who enter rehabilitation doctoral programs would help the reader to understand this difference. One possibility is that students who are younger and less experienced may be influenced to a greater extent by elements of the research training environment, and less certain of their career paths. Students who are older and/or more advanced in school may have solidified their career goals and be less influenced by the elements of the research training environment that promote research activity.

The lack of significant differences between productivity groups for Career Goals is somewhat surprising. Previous
research has demonstrated a relationship between Investigative (i.e., science-related) career goals and research productivity (e.g., Kahn & Scott, 1997; Phillips & Russell, 1994).

Intuitively, one might expect that students who intend to pursue research-oriented careers would be more productive than those who are clinically oriented. However, consider the present finding in the context of the research training environment. Two of Gelso’s (1993) propositions for promoting a successful research training environment are: (a) science and practice can be merged effectively, and (b) in the latter part of graduate education, there is a focus on how scholarly activities may be accomplished in all types of practice settings. Students in a training environment that upholds these propositions may understand that conducting research is useful and feasible, even in applied settings. Thus, aspiring clinicians are as productive as aspiring academics or researchers. Considering the broad range of careers that are available to doctoral-trained rehabilitation professionals, if this theory holds true, this could be a very positive trend.

Limitations

In the present study, several limitations warrant attention. First, the results of this study should be generalized with caution. The sample size, while adequate, limits the generalizability of the findings. A larger sample
would provide a more comprehensive picture of research productivity among rehabilitation doctoral students.

A second limitation of the study is possible sample response bias. Sample response bias may be present in two ways. First, persons who chose to participate in the study may be more interested and/or involved in research activities than non-respondents, which would yield a negatively skewed sample. Second, self-reports of research interest and involvement among graduate students are susceptible to a "social desirability" factor. In the present study, for example, the tendency to respond positively was evidenced in research outcome expectations scores; the mean overall score was 4.5 (out of 5). A similar pattern of positive response is noted in Bieschke et al. (1995), in which outcome expectations scores were 3.69; negatively skewed. The tendency to respond positively was also noted on the Interest in Research Questionnaire, and the Research Self-Efficacy Scale. While participants were assured of confidentiality, some may have been reluctant to disclose feelings of incompetence toward research tasks, or negative perceptions of their research training environments.

A third consideration relates to the broader scope of generalizability of the results. Most studies of research productivity in the counseling professions have sampled counseling psychology doctoral students (e.g., Brown et al.,
1996; Galassi et al., 1986; Kahn & Scott, 1997; Krebs et al., 1991; Phillips & Russell, 1994). The present study makes a unique contribution to the rehabilitation literature that may not be generalizable to counseling psychology or other related fields.

Psychometric implications must be acknowledged. One of the instruments in this study, the Research Productivity Measure (RPM), was experimental. As reported in Chapter 3, the reliability of the RPM was adequate, and the method of scoring for the instrument is grounded in psychometric and theoretical rationale. However, further research on this instrument is necessary. In addition, the ROEQ-Revised (Bieschke, 2000) is a newly developed instrument and warrants further investigation.

Finally, the problems that were encountered when attempting to analyze the data as a one-way MANCOVA warrant acknowledgement. The data analysis was more complicated than anticipated, given the violations of the assumptions of homogeneity of regression and linearity. Thus, the results are difficult to interpret, and the relative absence of significant findings in this study may be attributable to the problems with data analysis. Analyzing the data with a different statistical model may produce a more accurate picture of the differences between productivity groups on each of the outcome variables.
Directions for Future Research

The findings of the present study spark several ideas for future research. First, it would be interesting to compare productivity between doctoral programs. The number of variables assessed in the present study made it difficult to conduct such a comparison. One possibility is to examine a smaller number of variables; for example, the research training environment (Interpersonal and Instructional components) and career goals, to examine programmatic differences in (a) career goals, (b) perceptions of the research training environment, and (c) student productivity. This would provide potentially useful information regarding students’ perceptions of the research training environment and actual productivity within programs, and between programs.

There is a paucity of longitudinal research in the area of research training among graduate students. Longitudinal research would provide a more comprehensive picture of career-related and research-related behavior of rehabilitation doctoral students. For example, a five-year follow-up to the present study would allow us to examine the following questions: (a) whether doctoral students who are active researchers continue to produce research after graduation, (b) whether participants reflect upon their research training environments with as much enthusiasm as during graduate school, and (c) the extent to
which participants’ occupations coincide with the career goals that they endorsed during graduate school.

Further investigations are also needed about the role of social cognitive variables (self-efficacy and outcome expectations) and gender differences in predicting and understanding research behavior. Increasingly complex models have been presented in the counseling psychology literature, linking self-efficacy and outcome expectations to research interest, the research training environment, and research productivity. Rehabilitation education will benefit from continuing to empirically test each of these variables in regards to research training of rehabilitation doctoral students.

Conclusion

Results of the present study offer a step toward understanding the factors that contribute to research productivity among rehabilitation doctoral students. Elements of the research training environment, in particular, were identified as being related to differing levels of productivity among students. Further examination of the relationship of social cognitive variables, specifically, research self-efficacy and research outcome expectations, is needed to provide a more complete picture of the intrapersonal factors that relate to research productivity. Continued exploration of more
sophisticated causal models, as are emerging in the counseling psychology literature, will provide greater insight to the variables that influence research productivity among doctoral students.
References


Dellario, D. J. (1996). In defense of teaching masters' level rehabilitation counselors to be scientist-practitioners. Rehabilitation Education, 10, 229-232.


November 10, 2000

Dear Rehabilitation Doctoral Student:

Greetings! You are invited to participate in a dissertation study related to research involvement among doctoral students in rehabilitation programs. The purpose of my dissertation is to investigate the factors that contribute to students’ participation in research activities. Your input is very valuable, given the limited number of doctoral students in our field. And, knowing that your TIME is also valuable, please accept this 15-minute GTE long-distance telephone card 📧 as a token of my appreciation!

The enclosed packet contains an informed consent form for you and one to return to me along with your completed packet. The questionnaires should only take about 25-30 minutes. All information will remain confidential.

I greatly appreciate your participation in this study and would be happy to send you the results upon completion.

Sincerely,

____________________________
Christine C. Bard, M.Ed.
Doctoral Candidate in Counseling Psychology
The Pennsylvania State University

Dissertation Advisors:
Kathleen J. Bieschke, Ph.D. and James T. Herbert, Ph.D.
APPENDIX B

CONSENT FORM

The general purpose of this study is to examine the factors that influence research involvement among students in doctoral level rehabilitation programs. You will be asked to complete several brief questionnaires containing items regarding your confidence in performing research-related activities, your attitudes and interest regarding research, and some general information about yourself. The survey should take approximately 25-30 minutes of your time.

You should experience no discomfort or risk to your physical or physiological well-being. Your participation is voluntary and you may withdraw at any time without penalty and/or refuse to answer any question that you find invasive or objectionable. If you decide that you do not want to participate, please send me a brief note to that effect on the consent form and return your packet in the stamped addressed envelope provided. Questions about your rights as a participant may be directed to the Office of Regulatory Compliance at The Pennsylvania State University, 212 Kern Graduate Building, University Park, PA, 16802; (814) 865-1776.

The information gathered from this study will remain confidential. Confidentiality will be ensured through: (a) the use of subject code numbers; (b) limiting access to subjects’ names and respective code numbers to the study’s investigators for data collection purposes; (c) securing questionnaires and data under lock and key; and (d) retaining only coded questionnaire packets without any record of subjects’ names following the collection of data. Reporting of the study’s results will be in terms of overall (group) findings; the data for individual subjects will not be reported.

Please sign below to indicate your willingness to participate in this study.

[Signature]

Please complete this detachable portion and return with your packet if you would like results of this study sent to you.

Name:

Address:

Correspondence may be addressed to:
Christine C. Bard, Adjunct Professor
Brooklyn College
2900 Bedford Avenue, 1106 James Hall
Brooklyn, NY 11210
E-mail: ccb120@juno.com
(718) 951-5774

Kathleen J. Bieschke, Ph.D.
Dissertation Chair
Associate Professor of CN PSY
327 CEDAR
University Park, PA 16802
(814) 865-3427
APPENDIX C

RESEARCH TRAINING ENVIRONMENT SCALE – REVISED

Gelso, Mallinckrodt, and Judge, 1996

Please note: We define research broadly. “Research” when used in this survey includes the following types of activities: designing and executing research projects, preparing manuscripts of a theoretical nature or a critical review of literature, conducting program evaluations or needs assessments, making presentations at professional conferences, participating as a member of a research team engaged in any of the above activities, and advising the research projects of others.

Directions: Please respond to the following statements in terms of the doctoral program in which you are currently receiving your training. (Note: If you are currently on internship, please rate the graduate program in which you were previously trained.) Consider each statement using the following scale:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Item</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>disagree</td>
</tr>
<tr>
<td>2</td>
<td>somewhat disagree</td>
</tr>
<tr>
<td>3</td>
<td>neutral</td>
</tr>
<tr>
<td>4</td>
<td>somewhat agree</td>
</tr>
<tr>
<td>5</td>
<td>agree</td>
</tr>
</tbody>
</table>

1. ______ In general, my relationship with my advisor is both intellectually stimulating and interpersonally rewarding. (If your advisor has been newly assigned or chosen, respond in terms of what you expect the relationship to be.)

2. ______ My graduate program rarely acknowledges the scholarly achievements of students.

3. ______ Many of our faculty do not seem to be very interested in doing research.

4. ______ The faculty does what it can to make research requirements such as the thesis and dissertation as rewarding as possible.

5. ______ The faculty here only seem to notice a few selected students in terms of reinforcing scholarly achievements.

6. ______ My graduate program provides concrete support for graduate student research (e.g., access to computers, travel money for making presentations, research supplies, or free postage for mailing surveys).

7. ______ I feel that my advisor expects too much from my research projects.

8. ______ There is informal sharing of research ideas and feelings about research ideas in my program.

9. ______ My advisor understands and accepts that any piece of research will have its methodological problems.
10. _____ Faculty members often invite graduate students to be responsible collaborators in the faculty members' own research.

11. _____ I was encouraged to get involved in some aspects of research early in my graduate training.

12. _____ Because of the diversity of research approaches among faculty members in my program, I would be able to find help learning about virtually any major research approach, e.g., field, laboratory, experiential, qualitative.

13. _____ In my graduate training program there are opportunities to be part of research teams.

14. _____ I have felt encouraged during my training to find and follow my own scholarly interests.

15. _____ My training program faculty tends to produce research that is not clinically relevant.

16. _____ The research climate here is one in which students can get in touch with their own curiosity and with the research questions they themselves want to ask.

17. _____ Many different research styles (e.g., field vs. laboratory) are acceptable in my graduate program.

18. _____ The faculty members of my graduate program enjoy discussing ideas.

19. _____ Much of the research we become involved of prior to the thesis is organized in a way that is highly anxiety provoking to students.

20. _____ Students in my program receive sound training in how to design and logically analyze research studies.

21. _____ I have gotten the impression in my graduate training that my research work has to be of great value in the field to be worth anything.

22. _____ The faculty in my graduate training program is involved in the conduct and publication of high quality research (or theory).

23. _____ Statistics courses here are taught in a way that is insensitive to students' level of development as researchers.

24. _____ We do not receive sound training in my program on applied, practical, and less traditional approaches to research.

25. _____ The statistics courses we take do a good job, in general, of showing students how statistics are actually used in psychological research.

26. _____ There is a sense around here that being on a research team can be fun, as well as intellectually stimulating.
27. _____ Students here are encouraged to at least begin thinking about one or more topics upon which they would like to conduct programmatic research (i.e., a series of studies in which one builds upon another).

28. _____ My graduate training program has enabled me to see the relevance of research to clinical service.

29. _____ The faculty members of my graduate program encourage me to pursue the research question in which I am interested.

30. _____ My advisor offers much encouragement to me for my research activities and accomplishments.

31. _____ Faculty members in my program use an extremely narrow range of research methodologies.

32. _____ In my research training, the focus has been on understanding the logic of research design and not just statistics.

33. _____ Some of the faculty teach students that during a phase of the research process, it is important for the researchers to "look inward" for interesting research ideas.

34. _____ Generally, students in my training program do not seem to have intellectually stimulating and interpersonally rewarding relationships with their research advisors.

35. _____ It is unusual for first-year students in this program to collaborate with advanced students or faculty on research projects.

36. _____ There seems to be a general attitude here that there is one best way to do research.

37. _____ I have the feeling, based on my training, that my thesis (or dissertation) needs to be completely original and revolutionary for it to be acceptable to the faculty.

38. _____ The faculty does not seem to value clinical experience as a source of ideas for research.

39. _____ We get high quality training here in the use of statistics in applied research, e.g., counseling research.

40. _____ I get the impression from my training that, although a single study does not revolutionize thinking in the scientific community, such a study can contribute a useful piece to an unfolding body of knowledge.

41. _____ This training environment promotes the idea that although parts of research must be done alone, other parts may involve working closely with other colleagues.

42. _____ Our statistics instructors are generally sensitive to students’ anxieties and feelings about statistics.
43. _____ Our faculty seems interested in understanding and teaching how research can be related to counseling practice.

44. _____ Most faculty do not seem to really care if students are genuinely interested in research.

45. _____ During our coursework, graduate students are taught a wide range of research methodologies, e.g., field, laboratory, survey approaches.

46. _____ During their first year in the program, students take a research course aimed at developing research skills, interests, and confidence.

47. _____ I feel that I need to choose a research topic of interest to my advisor at the expense of my own interests.

48. _____ There is a prevalent viewpoint in my training program that research findings can be used to improve clinical practice.

49. _____ Students in our program feel that their personal research ideas are squashed during the process of collaborating with faculty members, so that the finished project no longer resembles the student's original idea.

50. _____ Students here seem to get involved in thinking about research from the moment they enter the program.

51. _____ Students in this program are rarely taught to use research findings to inform their work with clients.

52. _____ The faculty members here are quite open in sharing their research with their students.

53. _____ The faculty members of my graduate program show excitement about research and scholarly activities.

54. _____ Much of the research we become involved in prior to the thesis is intellectually challenging and stimulating.
### Directions:
Think about your level of confidence in your ability to perform each behavior listed and place a number in the blank to the right of the item indicating the degree of confidence in your ability to successfully perform that behavior. Use the following scale to make your ratings.

<table>
<thead>
<tr>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
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<th>80</th>
<th>90</th>
<th>100</th>
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<tr>
<td>No Confidence</td>
<td>Moderate Confidence</td>
<td>Complete Confidence</td>
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</table>

1. How confident are you in your overall ability to complete a significant project? _____
2. Follow ethical principles of research. _____
3. Brainstorm areas in the literature to read about. _____
4. Conduct a computer search of the literature in a particular area. _____
5. Locate references by manual search. _____
6. Find needed articles that are not available in your library. _____
7. Evaluate journal articles in terms of the theoretical approach, experimental design, and research techniques. _____
8. Participate in generating collaborative research ideas. _____
9. Work interdependently in a research group. _____
10. Discuss research ideas with peers. _____
11. Consult senior researchers for ideas. _____
12. Decide when to quit searching for related research/ writing. _____
13. Decide when to quit generating ideas based on your literature review. _____
14. Synthesize current literature. _____
15. Identify areas of needed research, based on reading the literature. _____
16. Develop a logical rationale for your particular research idea. _____
17. Generate researchable questions. _____
18. Organize your proposed research ideas in writing. _____
19. Effectively edit your writing to make it logical and succinct.

20. Present your research idea orally or in written form to a group.

21. Utilize criticism from reviews of your idea.

22. Choose an appropriate research idea.

23. Choose methods of data collection.

24. Be flexible in developing alternative research strategies.

25. Choose measures of dependent and independent variables.

26. Choose appropriate data analysis techniques.

27. Obtain approval to pursue research (e.g., approval from Human Subjects Committee, Animal Subjects committee, special approval for fieldwork.)

28. Obtain appropriate subjects/general supplies/equipment.

29. Train assistants to collect data.

30. Perform experimental procedures.

31. Ensure data collection is reliable across trial, raters, and equipment.

32. Supervise assistants.

33. Attend to all relevant details of data collection.

34. Organize collected data for analysis.

35. Use computer software to prepare texts (word processing).

36. Use computer software to generate graphics.

37. Use a computer for data analysis.

38. Develop computer programs to analyze data.

39. Use an existing computer package to analyze data.

40. Interpret and understand statistical printouts.

41. Organize manuscript according to appropriate professional format and standards.

42. Report results in both narrative and graphic form.
43. Synthesize results with regard to current literature. 
44. Identify and report limitations of study. 
45. Identify implications for future research. 
46. Design visual presentations (posters, slides, graphs, pictures). 
47. Orally present results to your research group or department. 
48. Orally present results at a regional/national meeting. 
49. Defend results to a critical audience. 
50. Write a manuscript for publication. 
51. Please rate how confident you are in your overall ability to complete a significant research project.
APPENDIX E

REVISED RESEARCH OUTCOME EXPECTATIONS QUESTIONNAIRE

Bieschke & Bishop, 1994

Directions: Using the 5-point score provided, please indicate the degree to which you agree with each statement.

<table>
<thead>
<tr>
<th></th>
<th>1 Strongly Disagree</th>
<th>2 Agree</th>
<th>3</th>
<th>4</th>
<th>5 Strongly Agree</th>
</tr>
</thead>
</table>
1. Involvement in research will enhance my job/career opportunities. _____
2. People I respect will approve of my involvement in research. _____
3. Involvement in research will allow me to contribute to practitioners’ knowledge base. _____
4. Research involvement will lead to a sense of satisfaction. _____
5. Being involved in research will contribute to my development as a professional. _____
6. I believe research skills will be fruitful for my career. _____
7. My involvement in research will lead to meaningful contributions to the field. _____
8. My analytical skills will become more developed if I am involved in research activities. _____
APPENDIX F

INTEREST IN RESEARCH QUESTIONNAIRE

Bishop & Bieschke, 1994

Directions: Using the 5-point scale provided, please indicate the degree of interest you have in the activities listed as part of your professional career. Please remember that the term research encompasses both quantitative and qualitative approaches.

<table>
<thead>
<tr>
<th></th>
<th>Very Interested</th>
<th>Indifferent</th>
<th>Very Disinterested</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reading a research journal article.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Being a member of a research team (remember, the term research encompasses both quantitative and qualitative approaches).</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Conceptualizing a research study.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Conducting a literature review.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Developing funding proposals.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Having research activities as part of every work week.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Conducting research at site of counseling practice.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Taking a research design course.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Taking a statistics course.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Developing a data analysis strategy for a research study.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Analyzing data.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Discussing research findings.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Writing for publication/presentation.</td>
<td>_____</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Leading a research team.</td>
<td>_____</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX G

CAREER GOALS MEASURE- REVISED

Kahn and Scott, 1997

Please rank your top three preferences, in order, of settings where you are interested in working upon graduation:

_____ College/university (greater emphasis on research than teaching)
_____ College/university (greater emphasis on teaching than research)
_____ College Counseling Center
_____ Veteran’s Administration hospital
_____ Research facility
_____ Government agency (administrative or practitioner role)
_____ Government agency (research and/or program evaluator role)
_____ Industry (e.g., private sector rehabilitation)
_____ Community mental health center (e.g., counselor, psychologist)
_____ Private practice (e.g., counselor, psychologist)
_____ Full-time consultation
_____ Other setting: ____________________________
APPENDIX H

RESEARCH PRODUCTIVITY MEASURE

Bard, 2000

The following questions pertain to your research activities during your graduate training. Your responses should include articles, book chapters, or presentations in which you held any level of formal authorship.

1. Please indicate the number of empirical (data-based) articles that you have published or are in-press in scholarly journals:

2. Please indicate the number of empirical (data-based) research presentations that you have made at regional or national conferences:

3. Please indicate the number of non-empirical (e.g., theoretical) articles that you have published or are in-press in scholarly journals:

4. Please indicate the number of book chapters that you have published or are in-press:

5. Please indicate the number of non-empirical research presentations that you have made at regional or national conferences:

6. Please indicate the number of articles or book chapters, empirical or non-empirical, that you are actively preparing to submit for publication:

7. Please indicate the number of regional or national professional conferences you have attended:

Feel free to comment on any other research activities, or aspects of your research training environment that have been important to you:

Thank you very much for participating in this study!!
CHRISTINE CAROL BARD

EDUCATION:

The Pennsylvania State University 2001
Doctor of Philosophy in Counseling Psychology

Rutgers, The State University of New Jersey 1993
Master of Education in Counseling Psychology

Michigan State University 1992
Bachelor of Arts in Psychology

PROFESSIONAL EXPERIENCE:

Assistant Professor of Psychology Appointed 2001
Illinois Institute of Technology, Institute of Psychology

Adjunct Professor of Education 1999 – 2001
Brooklyn College (CUNY), School of Education

Psychology Intern 1998 – 1999
Pace University Counseling Center

Instructor of Education 1997 - 1998
The Pennsylvania State University, College of Education

PUBLICATIONS:


HONORS:

Rehabilitation Services Administration (RSA) Fellowship, 1995-1997
R. Mae Schultz Scholarship for Women in Education, 1997

PROFESSIONAL AFFILIATIONS:

American Psychological Association; American Rehabilitation Counseling Association; American College Personnel Association