

2018

Undergraduate research training environments: Impact on research self-efficacy, perceived utility of research, and willingness to engage in research post- graduation

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**Undergraduate research training environments: Impact on research self-efficacy,
perceived utility of research, and willingness to engage in research post-graduation**

by

Kaitlyn Burke

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Psychology

Program of Study Committee:
Loreto Prieto, Major Professor
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Marcus Crede

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2018

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ABSTRACT

Effective research training environments (RTEs) within graduate psychology degree programs have been shown to increase students' level of research self-efficacy (RSE). Higher levels of student RSE are likely associated with the greater perceptions of the utility of research skills and a greater willingness to engage in research-based activities in later professional work. Relations among the variables of RTEs, RSE, and continuing research-based activities have been well established among graduate psychology students, but the effect of RTEs in undergraduate psychology training has not yet been examined. The focus of students' perceived utility of their research skills post-graduation was a new addition to the literature in this area. Guided by Social Cognitive and Social Cognitive Career Theory, I examined the model of effective RTEs suggested by Gelso et al. (1996) and its effects on my variables of interest, within an undergraduate psychology student sample. Specifically, I examined a moderated mediation model involving RTE, RSE, perceived utility of research skills, and willingness to engage in future research. I found that RTEs in undergraduate training increased student RSE, and that student RSE significantly mediated the direct effect of RTE on students' willingness to engage in research in post-graduation employment. Students' perceived utility of their research skills in post-graduation employment did not moderate the indirect effect of student RSE. I discuss recommendations concerning the use of effective RTEs to enhance undergraduate psychology students' development and use of research-based skills in future work environments.

CHAPTER 1. INTRODUCTION

Strong research training environments (RTEs) are essential to developing psychology students' sense of confidence in acquiring and using research and statistical-based skills. Strong RTEs provide students with 'real world' understandings of how to use research and statistics skills, and they foster the critical thinking processes students will need within their chosen professional careers (American Psychological Association [APA], 2006; Bauer, 2007; Waehler, Kalodner, Wampold, & Lichtenberg, 2000; Wampold, Lichtenberg, & Waehler, 2002).

Effective RTEs allow students to engage in various types of course work and other learning experiences that bolster their self-efficacy and actual skills in the domains of research and statistics, and increase their willingness to persist in future research-based activities (cf. Bandura, 1977, 1997; Lent, Brown, & Hackett, 1994). Thus, effective RTEs can increase students' likelihood of being willing to enter careers that involve research-based tasks (cf. Lent et al., 1994).

Most of the research concerning RTEs has been done surrounding the training, acquisition, and use of research based skills acquired by trainees in doctoral level applied psychology programs (e.g., Bishop & Bieschke, 1998; Gelso et al., 1996; Hemmings & Kay, 2016; Kahn, 2001; Kahn & Miller, 2000; Kahn & Scott, 1997; Krebs, Smither, & Hurley, 1991; Mallinckrodt & Gelso, 2002; Mallinckrodt et al., 1990; Phillips & Russell, 1994; Royalty et al. 1986). However, only a fraction of college students within the undergraduate major in psychology will progress to graduate or doctoral level psychology training programs before entering the workforce and lifelong career paths (APA, 2011; National Center for Education Statistics [NCES], 2015). Despite this, little to no research has been done regarding the effect of RTEs on *undergraduate* psychology students and their resultant sense of efficacy toward

research-based activities; their perceived utility of the research skills they acquire during college; or their willingness to engage in research-based activities in their future employment settings. Rather, extant RTE literature focuses on these topics as they apply to graduate students in psychology and their acquisition and future use of research-based skills (e.g., Bishop & Bieschke, 1998; Gelso et al., 1996; Kahn, 2001; Kahn & Scott, 1997; Mallinckrodt, Gelso, & Royalty, 1990; Phillips & Russell, 1994; Royalty et al., 1986).

Highly related to RTEs, self-efficacy has been found to play an important role in psychology students' research training. Some scholars have noted that post-graduation, many psychology students do not demonstrate sufficient confidence, interest, or engagement in the research-based skills they are taught within their psychology training programs (Bieschke, 2006; Cassin, Singer, Dobson, & Altmeier, 2007; Gelso, 1993). When undergraduate psychology students lack confidence, engagement, and interest in research and statistical skills they tend to exhibit lower levels of efficacy toward, willingness to engage in, or perceived utility of research activities in future employment settings (Gelso, 1993; Schlosser & Kahn, 2007).

As self-efficacy within a domain predicts intention to engage and persist in future behaviors within that same domain (Bandura, 1977, 1997; Lent et al., 1994), the level of research self-efficacy (RSE) that students acquire during their undergraduate training should impact their level of confidence toward engaging in research activities both during their undergraduate training and beyond (c.f., Bishop & Bieschke, 1998; Gelso, Mallinckrodt, & Judge, 1996; Kahn, 2001; Kahn & Scott, 1997; Phillips & Russell, 1994).

Related to both RTEs and research self-efficacy, Social Cognitive Career Theory (SCCT; Lent et al., 1994) seeks to describe relationships among various within-person cognitive factors (e.g., self-efficacy beliefs, outcome expectancies, goals, actions), social-contextual factors (e.g.,

environmental supports and barriers), and intentions to pursue specific academic- or career-related activities. SCCT addresses how individuals' career and academic interests develop; how individuals consider career-related decisions; and how various within-person cognitive factors as well as social-contextual factors can lead to specific achievements and persistence in a chosen career-related path (Lent et al., 1994).

SCCT, based upon Bandura's (1986) Social Cognitive Theory and earlier self-efficacy theory (Bandura, 1977, 1997), suggests that efficacy-based outcome expectancies play an important role in understanding vocational interest development and goal pursuit (Lent et al., 1994). That is, individuals' interests are assumed to reflect areas in which they believe they can succeed, and this leads to the pursuit of career areas they believe will lead to positive outcomes. Once interests in a career area develop, individuals then form goals that reflect their intention to engage in the particular behaviors that will lead them to pursue those specific careers (Lent et al., 1994). Together, principles of general Social Cognitive Theory and Social Cognitive Career Theory can be used as a theoretical foundation to assess students' concrete sense of both the utility of the research-based skills they have learned in the undergraduate psychology major, as well as their willingness to engage in research-based activities in their future careers.

As in the extant research on RTEs, students' perceptions of the utility of their research-based skills and their willingness to engage in such activities post-graduation have largely been assessed within graduate- or doctoral-level trainees in professional psychology programs (e.g., Royalty et al., 1986; Szymanski et al., 1994,1998). Very few specific studies have tried to assess these perspectives among undergraduate students (cf. Royalty et al., 1986; Szymanski et al., 1994, 1998), and no measures exist to fully assess either perceived utility of research-based skills or students' willingness to engage in research activities post-graduation.

Generally, previous studies have suggested that doctoral students' perceived utility of research may increase as their research self-efficacy increases. However, perceived utility of research has not been examined separately from other outcomes such as research anxiety or interest in research (e.g., Royalty et al., 1986; Szymanski et al., 1998). Thus, the impact of research self-efficacy upon perceived utility of research in particular is unclear. Additionally, the little research that has explored this relation has sampled doctoral-level psychology students; this relation as it applies to undergraduate psychology students remains unexplored.

In terms of willingness to use research in future careers, no measures exist that assess this outcome or how this construct is related to RSE or RTEs among undergraduate psychology students. However, previous research has noted that strong research-based skills are one of the most highly valued applicant qualities by psychology graduate program admissions committees (Appleby et al., 1999). Further, critical thinking skills, which are fostered through research training (cf. Dunn, 2015; McGovern et al., 2010), are highly valued by general employers, even in careers that may not necessarily be directly related to psychology (Appleby, 2000; Kuther, 2013). Therefore, it is important to gauge undergraduate psychology students' willingness to engage in research in the future, given that skills taught in undergraduate research courses (e.g., critical thinking, an empirical approach to problem solving) are valued in the general workforce. This issue too has been largely ignored in the research literature to date.

In my study, I began to address this gap in the current literature by examining the role of the undergraduate RTE in building RSE in undergraduate psychology students. In turn, I examined how psychology undergraduates' sense of efficacy affects their perceptions of the utility of research skills and activities as well as willingness to engage in such activities in their post-baccalaureate careers.

CHAPTER 2. LITERATURE REVIEW

Research Training in Psychology

APA-accredited psychology programs that train doctoral students in applied areas of psychology (e.g., clinical, counseling, and school) have long held that their graduates should be well grounded in a “scientist-practitioner model” (SPM). The SPM emphasizes an equal focus on practical skills and research skills (Frank, 1984; Stoltenberg et al., 2000) as well as the integration of science and practice (Belar & Perry, 1992; Bieschke, 2006; Bieschke, Fouad, Collins, & Halonen, 2004). One implication underlying the SPM is that theory and empirical research should inform the application of psychological principles in professional settings. The reverse also holds: that is, that researchers should examine those research questions that will best guide evidence-driven practice relevant to the world of work (APA, 2006; Bauer, 2007; Bieschke et al., 2004; Meier, 1999; Stricker & Trierweiler, 1995). Although the goal of the SPM is not necessarily to train equal numbers of graduating scientists and practitioners (Belar & Perry, 1992), one general assumption of the SPM is that students in psychology degree programs adhere to the tenets of the SPM and subscribe to the notion of psychology as a science (Fouad et al., 2009). Thus, it is expected that graduates of these programs are prepared to enter a research or service professional career upon graduation with equal success (Frank, 1984). Another presumption within the SPM is that when students from psychology degree programs enter applied professional settings to work upon graduation, they will continue to value, see the need for, and participate in research-based activities, as they will have acquired an understanding of the importance of evidence-based approaches to their work (Gelso, & Fretz, 2001).

In reality, although the SPM aims to equally emphasize the importance of both research- and practice-related skills, and although graduates of SPM-based programs purportedly will

understand the value of integrating research and practice, many psychologists who move on to practice-based careers historically have not formally engaged in any research beyond their dissertations (Watkins, Lopez, Campbell, & Himmell, 1986). Indeed, research findings obtained from students in doctoral level scientist-practitioner programs indicate that these trainees often favor one end of the scientist-practitioner spectrum over the other, depending on personal interests (Bieschke, 2006; Frank, 1984; Leong & Zachar, 1991). Further, graduate students in professional psychology programs are often more interested in acquiring practice-related careers upon graduation (Cassin, Singer, Dobson, & Altmaier, 2007; Gelso, 1993). Research findings also indicate that individuals who work in applied professional settings rarely consume or make contributions to the research literature to the degree to which their academic counterparts do (Bieschke, 2006; Watkins et al., 1986). This may in part be due to the tendency for practitioners to claim that research is too challenging or intimidating to initiate (Lampropoules et al., 2002). Bieschke (2006) claims that applied psychology professions' lack of "scientifically-minded psychologists" suggests a trend away from the SPM mindset that has characterized the field of psychology and its approach to professional training since the recommendations issued by the Boulder conference (c.f., APA, 1949, 2006; Bieschke et al., 2004; Frank, 1984; Meier, 1999 Stricker & Trierweiler, 1995).

According to Bieschke (2006), five factors characterize those psychology program graduates who possess a scientifically-minded approach to the application of psychology: 1) they consume current scientific research and apply those findings to their professional work; 2) they produce research as well as consume it; 3) they critically evaluate both the process and outcome of their own and others' research studies; 4) they are aware of how sociocultural factors influence scientific and applied practices of psychology; and 5) they seek out and incorporate

critical feedback concerning their research and applied work from colleagues, stakeholders, and the public. The first three characteristics directly involve the consumption, application, and production of quality research, highlighting the value that the field of psychology places on evidence-driven practice (APA, 2006). As outlined by Bieschke, fostering competence in research among all psychology students is very important. Full integration of research into practice (and vice-versa) requires an ability to critically consume existing research and to conduct professional work in a scientific way; it also calls for professionals to conduct new, quality research to address trends or needs in the fields that utilize applied psychological principles.

Given the importance placed on integrative research skills within the field of psychology, it is important to examine ways in which psychology trainees acquire these skills. A natural way of exploring this issue is to examine the research training environment (RTE) in which these skills are developed. An understanding of factors that contribute to an optimal RTE can enable educators to more effectively foster competent research activity among graduates of psychology programs. Unfortunately, previous research focusing on doctoral RTEs (e.g., Bishop & Bieschke, 1998; Gelso et al., 1996; Hemmings & Kay, 2016; Kahn, 2001; Kahn & Miller, 2000; Kahn & Scott, 1997; Krebs, Smither, & Hurley, 1991; Mallinckrodt & Gelso, 2002; Mallinckrodt et al., 1990; Phillips & Russell, 1994; Royalty et al. 1986) does not account well for the majority of psychology students who conclude their studies in psychology with a bachelor's degree (APA, 2011; NCES, 2009). Though most psychology students do not enter graduate training programs or the applied psychological fields of counseling, clinical, or school counseling, research findings indicate that psychology baccalaureates often choose human services careers upon graduation (APA, 2011; Prerost, 1981). These careers involve the application of psychological

principles to address the emotional, social, and psychological needs of others (Bureau of Labor Statistics, 2016), just as doctoral-level positions do.

If baccalaureate psychology graduates seek to work in such settings upon graduation, it is important that effective training in integrative research skills occurs at the baccalaureate level. Quality RTEs should not be a feature unique to doctoral-level training programs. Thus, it is beneficial to explore the factors that contribute to effective RTEs for undergraduate students in order to see if the same factors that are applicable for graduate student populations are equally applicable among an undergraduate psychology student population. Of particular importance in the current study are RTE factors related to trainees' self-efficacy to engage in research-related activities after being immersed in a training program. As will be explicated below, self-efficacy is a critical determinant of actual future engagement in an activity. An analysis of undergraduate psychology RTEs and related research self-efficacy will clarify factors that make psychology undergraduates more likely to effectively engage in valuable research-related actions in their future careers.

Social Cognitive Theory

The primary theory underlying my research is Social Cognitive Theory (SCT; Bandura, 1986), which describes a process of learning that involves direct experiences, vicarious or observed experiences, and emotional arousal. SCT specifies expected effects these variables will exert upon students' confidence in achieving desired outcomes in a given domain. SCT provides a framework for predicting when individuals will engage in activities, based on their expectations regarding the nature and probability of the consequences of their actions (outcome expectancies) as well as their perceptions of their personal capability to complete a task (efficacy expectations).

Outcome expectancies. Outcome expectancies describe what individuals believe will happen should they engage in a particular activity (Bandura, 1977; 1986). These predictions include both the valence of expected consequences and the perceived likelihood that the consequences will occur. Predictions of what consequences may occur as the result of a particular behavior may be informed by individuals' past personal experience of engaging in the behavior, previous observation of another individual engaging in a similar behavior, or individuals' judgments of how capable they are of performing the behavior (Bandura, 1997).

Efficacy expectations. Efficacy expectations are defined as the beliefs an individual possesses in his or her ability to successfully complete a given task (Bandura, 1977; 1986; 1997). High self-efficacy to complete a task predicts a greater likelihood of engaging in a given task and higher expectancy for a desired outcome given successful performance of a given task. Conversely, lower self-efficacy predicts a greater level of avoidance of performing a given task and lower expectancies for a desired outcome given successful performance of a given task. Self-efficacy is also domain-specific and does not necessarily translate from one task activity to another (Bandura, 1977). Thus, individuals may feel confident in their capability to complete certain tasks (e.g., counseling) but less confident in their capability to complete others (e.g., research). For example, research and statistics are areas of psychology training programs that often evoke anxiety and perceptions of low self-efficacy among students, even among students who generally possess high self-efficacy in other academic domains (Onwuegbuzie & Wilson, 2003).

Self-efficacy, as an overall construct, is influenced by four different categories of experiences: mastery experiences, vicarious experiences, verbal persuasion, and emotional or physiological arousal (Bandura, 1977, 1994; Lent & Brown, 2013; Lent, Brown, & Hackett,

1994, 2000). Later on, each of these categories will be described in greater detail within the specific context of RTEs, to illustrate various ways that the RTE may inform trainees' judgments of their own research self-efficacy.

Social Cognitive Career Theory

SCT, with its emphasis on outcome expectancies and efficacy beliefs, informs Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994). In order to more specifically relate undergraduate students' RTE and its effect on their perceptions of the utility of research skills and their willingness to engage in research-related activities in later careers, I will outline theoretical elements from Social Cognitive Career Theory (SCCT; Lent et al., 1994) to add support for these constructs of interest and their operation within the framework of RTEs.

SCCT employs concepts of self-efficacy and specifically applies them to academic- and career-related interests, goals, and actions. SCCT is based upon the aforementioned premises of SCT and Bandura's determinants of self-efficacy. SCCT describes relations among various within-person cognitive factors (e.g., self-efficacy beliefs, outcome expectancies, goals), social-contextual factors (e.g., environmental supports and barriers), and intentions to pursue academic- or career-related activities. The theory addresses such questions as how individuals' career and academic interests develop; how and when individuals execute career-related decisions; and how individuals achieve performance outcomes, defined both as specific achievements and as persistence in a chosen career-related path (Lent et al., 1994).

In this model, both efficacy expectations (e.g., beliefs about one's capacity to perform well in a given academic major or career field) and outcome expectancies (e.g., beliefs about consequences that may result if one pursues a given academic major or career path) are related to academic and career decisions and are informed by individuals' learning experiences in a given

domain. These learning experiences can take the form of any of Bandura's (1977) determinants of self-efficacy (i.e., personal mastery experiences, vicarious experiences, verbal persuasion, emotional or physiological arousal). Self-efficacy and outcome expectancies, in turn, influence the formation of one's academic- and career-related interests, goals, and actions. Tangible performance outcomes (e.g., objectively evaluated displays of competence) and persistence in a chosen career-related path are assumed to result when interests are built, goals are set, and action is taken toward those goals (Lent et al., 1994).

Interest development. According to SCCT, self-efficacy is instrumental in the initial development of interest in an academic- or career-related field, as well as in the establishment of goals and ultimate pursuit of goal-directed behaviors. When individuals see themselves as competent at an activity and have had previous opportunities to demonstrate their competence to themselves and to others, they are more interested in pursuing that same activity again in the future (Lent 2013; Lent et al., 1994). A sense of self-efficacy is often built through prior engagement in the activity, coupled with feedback about the level of performance achieved; self-efficacy may also be strengthened when encouragement from important others (e.g., parents, teachers) encourage an individual to pursue certain tasks over others (Lent, 2013). Notably, these types of learning experiences reflect two of Bandura's (1986) determinants of self-efficacy: personal mastery experiences and verbal persuasion.

Within SCCT, outcome expectancies also play an important role in understanding interest development and goal pursuit (Lent et al., 1994). Outcome expectancies interact with self-efficacy beliefs to impact individuals' interest in and pursuit of a given activity. That is, individuals' interests are assumed to reflect work areas in which they believe they can succeed (i.e., areas in which individuals feel self-efficacious) and the pursuit of which they believe will

lead to positive outcomes (i.e., areas associated with positive outcome expectancies). For example, an individual may perceive that becoming a physician will lead to positive outcomes (e.g., prestige, high income, rewarding work), but may simultaneously feel incapable of performing the tasks necessary to become a physician (e.g., completing science courses, gaining admission to medical school). In this case, if an individual holds positive outcome expectancies and low self-efficacy beliefs when considering the career path of becoming a physician, that individual is unlikely to exhibit high interest in becoming a physician. Conversely, individuals who possess high self-efficacy beliefs but hold negative outcome expectancies related to a given career path, are also therefore unlikely to develop strong interests in that particular career path (Lent, Brown, & Hackett, 2000). For example, such an individual may feel confident in her ability to succeed at science courses, and gain admission to medical school, but she may simultaneously perceive negative outcome expectancies related to this given career path (e.g., demanding work hours that limit preferred life activities, high personal and legal responsibility for patients' lives and health).

As opposed to the above examples, a combination of matched *high* self-efficacy and *positive* outcome expectancies is hypothesized to increase the likelihood of developing interest in an area. Still, though, in the SCCT model a third factor comes into play as individuals develop career-related interests. Lent et al. (2000) emphasize that even in instances of high self-efficacy and positive outcome expectancies, individuals may be unlikely to display interest in a career goal if they perceive “insurmountable barriers” or “inadequate support systems” en route to their goals. Thus, also important in the SCCT model are environmental influences. Career interests, goals, and actions are not only a product of individuals’ self-efficacy and outcome expectancies but also a product of environmental influences (Lent et al., 1994, 2000). Environmental

influences include perceived supports and barriers that factor into individuals' decision-making processes and actions. According to SCCT, although environmental factors may not directly impact interests, they do directly impact both goal setting and action taking, as they influence individuals' perceived likelihood of success in pursuing a particular academic or career interest (Lent et al., 1994). In this way, environmental factors influence individuals' decisions in much the same way as outcome expectancies. Therefore, a distinction is made in the SCCT interest development model between environmental influences (i.e., perceived supports and barriers) and outcome expectancies. For example, individuals' subjective perception of barriers to entry or a hostile working environment in a given career field may reflect actual characteristics of that work environment, and these environmental realities may make an individual less likely to pursue that career field (Lent et al., 2000). This differs from negative outcome expectancies in that outcome expectancies reflect internally expected consequences (e.g., assuming one's family will disapprove of one's career choice), whereas environmental barriers result from subjective appraisals of objective features present in a career environment (e.g., interpreting a lack of female engineers in an industry as a sign of sexism in the workplace).

Goal formation. According to SCCT, individuals are likely to develop interests in those academic- and career-related activities that are associated with high self-efficacy beliefs, positive outcome expectancies, and adequate perceived environmental supports. Once interests in a work area develop, individuals then form goals that reflect their intention to engage in future behaviors that will help them pursue those interests (Lent et al., 1994). At the goal-setting stage of career decision-making, self-efficacy and outcome expectancies continue to exert their influence. These two factors impact the goal-setting process both directly (e.g., high levels of both lead to the setting of realistic, achievable goals that in turn lead to desired outcomes) and indirectly via

interests (e.g., higher interest in an area will lead to greater intentions to engage in domain behaviors and setting realistic, achievable goals to engage in those behaviors; Lent et al., 1994). Goal setting then leads to choice actions (i.e., taken to implement identified goals), where efficacy and outcome expectancies also exert an influence upon choice actions, as individuals expect to succeed and assume that positive outcomes will result from their choices.

Behavioral pursuit of interests. At the end of an SCCT interest-goal-action chain lie performance outcomes, which include specific work-related achievements or failures (Lent et al., 1994; Lent & Brown, 2013). These performance outcomes become new learning experiences (i.e., personal mastery experiences, cf. Bandura, 1977) which are processed by individuals in an ongoing feedback loop. If a choice action in a given career path leads to success, self-efficacy will increase and outcome expectancies will become more positive, thus further increasing interest, goal-setting behavior, and engagement in choice actions (Lent & Brown, 2013). Conversely, choice actions that lead to perceived failure will decrease self-efficacy and/or will result in more negative outcome expectancies, potentially decreasing interest and future engagement in similar activities.

As illustrated, the SCCT model of career-related interest development and choice behavior provides a framework for understanding specific mechanisms through which efficacy and outcome expectancies operate on interests, goals, and choice actions to influence performance outcomes in any given career path. SCCT also incorporates environmental influences as an explanatory variable in the formation of these interests, goals, and actions. Thus, the SCCT framework is an ideal model to represent the importance of RSE among students in psychology education and training. It will help to explain how students' levels of RSE impact their perspectives on the utility of their research skills and their development of interest-goal-

action-performance outcome chains surrounding research-based activities (i.e., their willingness or intention to engage in such activities) in their chosen post-graduation career path. It will also help to explain how the context in which students are trained (i.e., the environmental supports and/or barriers present in a students' RTE) can shape these all-important RSE beliefs.

Research Self-Efficacy

Research self-efficacy is the specific belief an individual has in his or her ability to successfully complete research-related tasks (Bieschke, 2006; Forester, Kahn, & Hesson-McInnis, 2004). Research-related tasks may include anything from reviewing a body of research literature, to designing an appropriate research study, to analyzing data, to presenting research findings in a written or oral format (Bieschke, Bishop, & Garcia, 1996). Research self-efficacy operates in conjunction with research-related outcome expectancies, as well as environmental influences of the RTE, as indicated by the SCCT interest-goal-action framework. Like any domain-specific efficacy belief, research self-efficacy can be positively impacted by the four types learning experiences outlined in SCT and SCCT: personal mastery experiences, observed vicarious experiences, appropriate verbal persuasion, and positive emotional or physiological arousal (cf. Bandura, 1997; Lent et al., 1994).

Personal mastery experiences. Mastery experiences are the most powerful determinant of self-efficacy, as they represent individuals' previous successful participation in a given task, thus providing concrete information to individuals about their actual ability to perform that task (Bandura, 1977). Generally, past successes in a given domain are interpreted by individuals as proof that they are capable of competently performing in that domain. Therefore, past success increases expectations of future success in a given domain. Likewise, past failures may be

interpreted as proof of incompetence and thereby decrease expectations of future success and increase expectations of future failure.

Repeated successes (or failures) in a domain have an additive effect on self-efficacy; the more one succeeds (or fails) at a task, the stronger and more ingrained his or her expectations of future success (or failure) becomes. In the SCCT framework, these experiences can impact both the initial formation and the maintenance of efficacy beliefs and interests (Lent, 2013). Once higher levels of self-efficacy are established through repeated experiences of personal success or mastery, subsequent failures have less of a negative impact on self-efficacy than they would if self-efficacy was less ingrained or just beginning to form (Bandura, 1977).

In the specific context of research activities, research mastery experiences occur when students successfully complete research-related tasks. Because past success in a domain increases expectations of future success in that domain (Bandura, 1977), the nature of students' early research experiences hold implications for students with little research experience. If students have numerous positive research experiences early on in their educational career and training, they will be more likely to approach future research with positive outcome expectancies and will be more likely to seek out additional research experiences (cf. Lent & Brown, 2013).

Illustrating this, Hemmings (2012) conducted qualitative interviews of academicians from various disciplines in order to explore sources of research confidence among faculty who were just beginning their careers. Hemmings found that previous publication experiences instilled greater research confidence among academicians. This source of research confidence among early career academicians highlights the importance of research personal mastery experiences in increasing research self-efficacy. Similarly, among undergraduate psychology students, personal mastery experiences in the form of positive research experiences have been

suggested to increase undergraduates' sense of research self-efficacy in qualitative studies of the benefits of undergraduate research mentoring (e.g., Landrum & Nelsen, 2002; Lei & Chuang, 2009; Van Vliet et al., 2013). As social cognitive theory predicts, in the realm of RSE, personal mastery experiences appear to most strongly positively influence individuals' level of research self-efficacy.

Vicarious experiences. Vicarious experiences, like mastery experiences, require successful completion of a given task, but not by the individual in question; vicarious experiences involve witnessing another person (i.e., a model similar to the observer) successfully completing a given task. Vicarious experiences do not provide individuals with direct information about their own capabilities to complete a task. However, vicarious experiences are still useful for individuals' estimation of their own capabilities, as vicarious experiences allow individuals to see how someone similar to them successfully completes a given task and allows them to assess whether or not they possess the same capabilities to perform a similar task in a successful fashion (Bandura, 1977; 1986).

Characteristics of the observer's model determine how informative a particular vicarious experience is regarding the observer's capabilities. If the model is similar to an individual in important ways (e.g., a novice researcher observing another novice researcher with a similarly perceived skill level) and demonstrates competence when completing a task, the observer watching the model will be more likely to infer that they are also capable of completing the same task. If the model is highly dissimilar to the observer (a novice researcher observing a highly experienced faculty researcher), the modeling effect on efficacy is reduced. The presence or absence of similar peer models in a training context (e.g., a RTE) can also convey messages about whether an individual would feel welcome or accepted in a given career context (e.g., a

lack of female role models in an engineering program may lead a female student to perceive sexism or a hostile work environment); thus, the amount and quality of vicarious experiences offered in an academic training program may also theoretically impact one's outcome expectancies in a career area (cf., Lent, 2013).

In the context of RTEs, vicarious research experiences involve students observing peer or faculty models completing research-related tasks. Hemmings (2012) found that in addition to personal mastery experiences, another determinant of early career academicians' research confidence is avoiding isolation while completing research, as research work in isolation provides individuals with fewer opportunities to gauge their own abilities or increase their own self-efficacy by comparing themselves to peer models. Thus, incorporating a social component into the research experience serves as a valuable source of self-efficacy-boosting vicarious experiences.

Bartsch, Case, and Meerman (2012) demonstrated the positive effects of vicarious experiences on graduate students' self-efficacy in statistics courses. These authors found higher self-efficacy to successfully complete a statistics course among student participants who heard a peer model describe ways in which she overcame statistics-related anxiety to successfully complete the statistics course in which the participants were currently enrolled. Bartsch et al. argued that a major reason that students' statistics self-efficacy increased in this scenario was because the peer model was very similar to the participants in terms of skill level and pre-existing confidence to complete statistics-based tasks. Similarity between observer and model is vital if a vicarious experience is to be a valuable source of information about the observer's own abilities (cf. Bandura, 1977).

Verbal persuasion. Verbal persuasion refers to suggestions or encouragement by others that influence individuals' perceptions of their ability to succeed in a given domain. Verbal persuasion is a form of self-competency assessment that is neither based on direct experience nor the vicarious witnessing of and identification with the achievement experiences of a model. Therefore, self-efficacy arising from verbal persuasion is not as informative to individuals and their actual capabilities and therefore is not as stable or resistant to failures as is self-efficacy arising from vicarious or personal mastery experiences (Bandura, 1977; 1997).

Verbal persuasion influences research self-efficacy when students receive feedback concerning their research capabilities. For example, feedback from a faculty advisor who expresses confidence in a student's ability to complete research tasks will likely boost that student's self-efficacy to engage in research. However, these experiences will not build self-efficacy to nearly the same degree as will personal mastery experiences (cf. Lent & Brown, 2013).

Hemmings (2012) found that positive mentoring relationships were crucial in building research confidence among early career academicians. Further, Overall, et al. (2011) found that higher RSE is predicted by an advising relationship in which the advisor primarily provides autonomy support (i.e., feedback that motivates individuals to successfully complete research tasks on their own). Specifically, helping students to autonomously learn and carry out research tasks positively affected students' confidence with data collection and analysis, research-oriented writing, and research integration (i.e., activities such as generating research questions or synthesize one's own research results with an existing body of research literature). However, when advisors provided their students with directive assistance to complete research-related tasks, the only statistically significant effect found for advisor support was on increasing

students' confidence with data analysis research skills. Interestingly, when advisors primarily provided only a generally emotionally supportive environment for their students, statistically significant *negative* effects were seen in RSE in all areas of the above research skills examined. These results suggest that only certain types of advising methods effectively increase students' confidence in their research capabilities. Further, verbal persuasion that increases students' autonomous learning best increases research self-efficacy, more so than directive instruction or emotional support during the learning of research tasks. Clearly, feedback that demonstrates a mentor's belief in a trainee's research skills is a key component when developing research self-efficacy.

Emotional or physiological arousal. Emotional or physiological arousal is particularly influential in stressful situations (Bandura, 1977). Negative arousal (e.g., cognitive and/or physical indicators of stress and anxiety) surrounding a task typically leads individuals to decreased performance on a task. If an individual frequently experiences situations in which negative arousal leads to poor performance on a given activity, the mere presence of negative emotional or physiological arousal in new, similar situations will elicit expectations of failure (i.e., personal incompetence) and feelings of low self-efficacy, even before the individual has the opportunity to engage in the activity. In a similar manner, if positive arousal becomes associated with success, the presence of positive arousal will elicit expectations of success, higher self-efficacy, and greater willingness to engage in a given task. Within an SCCT framework, emotional or physiological arousal may also come into play in the formation of outcome expectancies, as outcome expectancies contain judgments about the valence of any potential consequences that may result when engaging in a given activity (Lent et al., 1994).

The emotional and physiological experiences students have when completing research-related tasks thus impacts their levels of research self-efficacy. If negative arousal is frequently experienced by students during research activities, these emotional states can lead to poor task performance. Further, research-related situations may eventually become associated with feelings of negative emotional or physiological arousal. Subsequently, this negative arousal will then elicit expectations of failure and feelings of low self-efficacy. Effective RTEs seek to foster as much positive emotional and physiological arousal surrounding research tasks as possible to increase students' self-efficacy when completing research tasks.

In support of this assertion, Hemmings (2012) reported that avoiding isolation while conducting research builds efficacy because it allows researchers to gain emotional support from others as they conduct research, and to celebrate achievements (or handle failures and setbacks) within an environment of emotional support from others. As positive arousal and positive physiological states become associated with research-related activities, individuals' self-efficacy to complete tasks within that domain will increase (cf. Bandura 1977, 1997) and they will influence outcome expectancies for later success, making individuals more likely to engage in research-related activities in the future (cf. Lent & Brown, 2013; Lent et al., 1994).

As aforementioned, the involvement of undergraduate students in research activities can lead to positive emotional arousal by increasing students' excitement about research, curiosity in new research topics, and interest in the research process (Kierniesky, 1984; Lei & Chuang, 2009; Palladino et al., 1982). These positive internal emotional evaluations are more likely to foster increased research self-efficacy among undergraduate students who have such positive experiences while being mentored by a faculty member or graduate student (cf. Bandura, 1977, 1997).

Measurement of research self-efficacy. The body of research surrounding RSE suggests that students who possess higher levels of research self-efficacy hold more positive assumptions about what will happen should they engage in research-related activities (i.e., research outcome expectations; Bishop & Bieschke, 1998); have increased research productivity (Hemmings & Kay, 2016; Kahn & Scott, 1997), and maintain a greater interest in research (Deemer, 2010; Kahn, 2000; Kahn & Miller, 2000; Phillips & Russell, 1994; West, Kahn, & Nauta, 2007).

Multiple scales have been developed to measure this important construct and to investigate its related outcomes. The most commonly used measure of research self-efficacy is the *Self-Efficacy in Research Measure* (SERM; Phillips & Russell, 1994) and its brief form (SERM-B; Kahn & Scott, 1997). Both the SERM and the SERM-B are self-report measures that assess the degree to which students feel confident in their abilities to complete various research-related tasks. These measures encompass the entire research process, including activities ranging from generation of research ideas, reviewing a body of research literature, designing a research study, collecting data, and writing up research results.

Phillips and Russell (1994), using a sample of 125 counseling psychology graduate students, found that scores on the SERM correlated with a measure of research productivity (i.e., a weighted scoring system used to quantify the amount and relative impact of research projects completed, $r = .45, p < .001$), as well as a measure of supportive RTEs as measured by Royalty et al.'s (1986) *Research Training Environment Scale* ($r = .39, p < .001$). Importantly, students who were more advanced in their graduate programs and had more research experiences reported higher SERM scores ($M = 197.3, SD = 40.2$) than did students who were just beginning their graduate programs ($M = 181.0, SD = 50.6$).

Kahn and Scott (1997) demonstrated similar links between SERM scores and indicators of research productivity ($r = .44, p < .05$), supportive RTEs ($r = .26, p < .05$), and students' year in program ($r = .27, p < .05$) in a national sample of 267 counseling psychology doctoral trainees. Kahn and Scott also found that SERM scores were correlated with general interest in research as assessed by Royalty et al.'s (1986) measure of research attitudes ($r = .31, p < .05$) and with the investigative interest subscale of the Holland vocational interest inventory ($r = .21, p < .05$).

As self-efficacy is expected to increase with personal mastery and vicarious experiences, and as higher self-efficacy in a domain is expected to predict greater interest and willingness to engage in domain-specific activities, the relations among SERM scores and RTE, research output, year in program, and research-related interests offer validity to the SERM as an appropriate measure of research self-efficacy.

Unfortunately, though it is the most used and best validated measure of research self-efficacy, items on the SERM and SERM-B are not particularly relevant to undergraduate students. Many items reference the completion of projects such as theses and dissertations, and projects of such magnitude are not commonplace in most undergraduate psychology training programs. Additionally, a handful of items are redundant in the sense that they ask about students' self-efficacy to complete the same task within the context of either a thesis or a dissertation project (e.g., Item 13 is "Writing the introduction and literature review for a dissertation," and item 20 is "Writing the introduction and literature review for a thesis"). As it would be difficult to modify the SERM for use with an undergraduate student population without deleting entire items (i.e., duplicate items that would become redundant after replacing "thesis" or "dissertation" with the more undergraduate-appropriate "research paper for a class project")

and potentially upsetting the underlying factor structure of the SERM, an alternative measure of research self-efficacy was used in the current study. The measure I selected for this study is the *Research Self-Efficacy Scale* (RSES; Bieschke et al., 1996; Greeley et al, 1989). The RSES has been shown to overlap conceptually and adhere to a similar factor structure when compared to the SERM (Forester et al., 2004), and it has been shown to predict interest in future research involvement (Bieschke et al., 1996; Lambie & Vaccaro, 2010).

Bishop and Bieschke (1998) found significant correlations between RSES scores and the research training environment ($r = .31, p < .01$), research outcome expectations ($r = .39, p < .01$), and interest investigative-type activities generally ($r = .29, p < .01$) and research specifically ($r = .45, p < .01$). Deemer, Martens, and Podchaski (2007) found similar correlations between RSES scores and research training environments ($r = .21, p < .05$) and interest in research ($r = .31, p < .01$). Additionally, RSES scores have been correlated with greater previous personal mastery experiences in the form of publication history ($r = .39, p < .01$; Lambie & Vaccaro, 2010) and number of years of research training completed ($r = .21, p < .05$; Deemer et al., 2007).

The RSES items do not need to be extensively adapted to use with an undergraduate student population as they address activities typical of both undergraduate- and graduate-level research projects. Given its similar content and underlying factor structure to the SERM (Bieschke et al, 1996; Forester et al., 2004; Phillips & Russell, 1994), its indicated validity as an adequate measure of research self-efficacy, and its greater relevance to my population of interest, the RSES will be an appropriate substitution for the SERM.

Research Training Environments

The RTE within which psychology students pursue their education can strongly impact their interest in and engagement with research-based activities both during their training and

their later careers (Bishop & Bieschke, 1998; Kahn, 2001; Kahn & Scott, 1997; Krebs, Smither, & Hurley, 1991; Mallinckrodt & Gelso, 2002; Mallinckrodt et al., 1990; Royalty et al., 1986).

Virtually all of the research done to date on the effects and outcomes associated with RTEs has focused on the training and education of doctoral-level professional psychologists. Within this area of study, several researchers have noted a link between satisfactory graduate-level RTEs, which encourage early and frequent involvement in positive research experiences, and subsequent research productivity (Hemmings & Kay, 2016; Kahn & Scott, 1997).

Satisfactory graduate RTEs have also been correlated with graduate students' interest in research or investigative-type activities (Gelso et al., 1996; Kahn, 2000, Kahn & Miller, 2000; Phillips & Russell, 1994).

Additionally, as RTEs within doctoral psychology programs impact graduate students' self-efficacy toward research (e.g., Bishop & Bieschke, 1998; Gelso et al., 1996; Kahn, 2000, 2001; Kahn & Scott, 1997; Phillips & Russell, 1994), Gelso et al. (1996) argue that the highest quality graduate RTEs allow students to engage in multiple types of experiences that foster their research self-efficacy, such as mastery experiences in the form of completed research projects; vicarious experiences in the form of seeing colleagues of similar skill level successfully complete research tasks; verbal persuasion in the form of encouragement from research advisors; and positive emotional arousal in the form of exciting and stimulating research experiences.

Factors positively impacting graduate RTEs. Gelso et al. (1996) identified nine factors of a graduate psychology program RTE that, when present, positively impact graduate students' research self-efficacy. These nine factors include: 1) faculty modeling of appropriate scientific behavior and attitudes; 2) positive reinforcement of scholarly activities; 3) early and minimally threatening student involvement in research; 4) teaching of relevant statistics and the logic of

research designs; 5) encouraging students to look inward for research questions and ideas; 6) emphasis on science as a partly social experience; 7) emphasis that all research studies are inherently imperfect; 8) teaching of varied approaches to research; and 9) demonstration of science-practice integration with a focus on completing research relevant to all types of professional settings. Gelso et al. noted that each of these nine factors uniquely impact graduate students' research self-efficacy. In the following section, I detail each element of the Gelso et al. (1996) model describing effective RTEs.

Faculty modeling of appropriate scientific behavior and attitudes. In high-quality graduate RTEs, faculty are actively involved in their own research projects and demonstrate an enjoyment of the research process. Additionally, they demonstrate excitement and enjoyment over discussing new research ideas with students, and they involve students in their projects as capable collaborators (Gelso et al., 1996).

Modeling research-related behaviors and attitudes can benefit graduate students as they work to build their confidence in conducting research. More importantly, encouraging students' involvement in research projects provides the opportunity for them to engage in personal mastery experiences which, in turn, will greatly impact students' research self-efficacy. Additionally, graduate students experience positive verbal persuasion when faculty express their confidence in graduate students' research skills and consider graduate students to be capable, responsible collaborators on research projects. Collaborative relationships among faculty and graduate students within the graduate RTE as described by Gelso et al. (1996) may provide confidence-boosting benefits similar to the benefits Hemmings (2012) found in professional mentor-mentee relationships among academicians. This may prove especially true when those faculty-student relationships encourage autonomous student involvement in research (cf. Overall et al., 2011).

Positive reinforcement of scholarly activities. High-quality graduate RTEs incorporate meaningful training activities and employ faculty who provide students with both formal and informal encouragement, support, and rewards for their research activities and scholarly accomplishments (Gelso et al., 1996). Positive reinforcement of scholarly activities can serve as a form of verbal persuasion, which can boost graduate students' research self-efficacy (cf. Bandura 1977; 1997). Encouragement and rewards (such as poster presentations and publications) can also produce positive emotional experiences surrounding the research process and thereby increase research self-efficacy (cf. Bandura, 1977, 1997).

Early and minimally threatening research involvement. In high-quality graduate RTEs, students are encouraged to participate in developmentally appropriate research activities beginning early on in their training (e.g., literature reviews, building data collection apparatus, writing up small sections of manuscripts). Ideally, these early research experiences will be exciting and interesting, not anxiety-provoking (Gelso et al., 1996). Student participation in research can serve as a personal mastery experience that increases research self-efficacy (cf. Bandura, 1977; 1997). Experiences that are minimally threatening may challenge students, but they do not completely exceed their capabilities. Accordingly, these experiences are more likely to lead to success than to failure, and therefore will heighten students' sense of RSE so that they are better able to handle more complex future challenges, or even occasional failures (cf. Bandura, 1977). Students can then begin to associate research activities with positive emotional and physiological arousal, and a willingness to persist despite failures or disappointments (e.g., non-significant findings, manuscript rejections; cf. Lent et al., 1994) and these associations can further increase their RSE (cf. Bandura, 1977; 1997).

Teaching relevant statistics and the logic of research design. High quality graduate RTEs teach statistics and research design content in ways that are developmentally appropriate and relevant to students' current knowledge levels. They also equally emphasize statistical competence along with the logic that underlies various research designs (Gelso et al., 1996). As students acquire knowledge and competencies that allow them to use more complex statistical procedures and research designs, students will feel more equipped to engage in wider varieties of research-related projects. When students approach a novel research task with an appropriate skill set to successfully complete the task, they are less likely to experience anxiety and negative physiological arousal. RTEs that scaffold learning and equip students with new knowledge in a developmentally appropriate manner will likely lead to less negative emotional and physiological arousal in research situations and increase research self-efficacy among students (cf. Bandura, 1977; 1997).

Encouraging students to look inward for research questions and ideas. In high-quality graduate RTEs, faculty encourage students to explore research topics that are personally meaningful to them; students are not required to study only faculty areas of interest (Gelso et al., 1996). By urging students to look inward and generate research questions that are personally interesting, faculty can create an expectation within students that research should be personally rewarding and exciting. This expectation can lead students to look forward to research activities and may decrease negative emotional and physiological arousal, thereby contributing to increased research self-efficacy (cf. Bandura, 1977; 1997).

Emphasis on science as a partly social experience. High quality RTEs provide students with research opportunities that have social opportunities (e.g., group involvements, sharing research findings, receiving feedback on projects) in order to emphasize the meaningful

collaborative professional relationships that can be fostered via the process of conducting research. These meaningful relationships include both peer relationships and advisor-advisee relationships (Gelso et al., 1996). Graduate students conducting research in isolation are less able to benefit from the vicarious learning experiences that can occur within group settings. When scientific research is regarded as a partly social experience, students have greater opportunities to witness others' successes and learn from them. Especially when scientific research occurs in peer groups in which all members are generally similar, these vicarious learning experiences will more positively impact students' research self-efficacy (cf. Bandura, 1977; 1997). Conducting research within a network of collaborative peers and advisors provides greater opportunities for support, both emotional and task-related; this support will likely decrease negative feelings and increase RSE via positive emotional and physiological arousal (Bandura, 1977; 1997). Hemmings' (2012) study supports these ideas in that early career academics noted that avoiding isolation during research activities was a key factor that increased their confidence in conducting research.

Emphasis on the inherent imperfection of research. High-quality graduate RTEs do not instill into students the idea of *perfect* research designs and studies; rather, they emphasize the fact that all studies inevitably possess shortcomings and cannot necessarily answer research questions completely. They encourage students to conduct meaningful, worthwhile studies rather than perfect ones (Gelso et al., 1996). By acknowledging the fact that all research studies have some shortcomings, high quality RTEs avoid placing unrealistic expectations on students as they conduct or participate in research. When this RTE component is combined with the component of teaching relevant statistics and the logic of research design, students are not only equipped with the knowledge necessary to complete research tasks but also realistic expectations of what

any given research study can reasonably achieve. Taken together, these two components provide graduate students with greater opportunities for success, leading to a lower likelihood that negative affect and failure will be associated with research tasks (cf. Bandura, 1977; 1997).

Teaching of varied approaches to research. In high quality graduate RTEs, no single approach to research is emphasized as the best or correct way to conduct research. Qualitative and quantitative methods alike are taught, utilized, and valued, and students are taught to understand the benefits and purposes of varied research approaches (Gelso et al., 1996). The teaching of varied approaches to research, similar to teaching students about the limitations of research, allows students to immerse themselves in research experiences without under- or overvaluing any particular design and method undertaken. Students approaching research activities from this point of view are less likely to experience negative emotional and physiological associations with research-related tasks (e.g., less likely to worry about being criticized for not choosing a 'preferred' research methodology), thereby increasing their research self-efficacy (cf. Bandura, 1977, 1997). Additionally, within a RTE that does not set unattainable standards of perfection, students have greater opportunities to engage in research activities that feel successful to them, and these personal mastery experiences will also strengthen their research self-efficacy (cf. Bandura, 1977, 1997).

Science-practice integration. High quality graduate RTEs utilize the SPM (Frank, 1984) to emphasize how research is relevant to practice and vice-versa. Faculty model the value of conducting research that possesses clinical relevance and students are encouraged to derive research ideas from their real life or clinical experiences (Gelso et al., 1996). RTEs that emphasize practical and personally meaningful applications of research are likely to allow students to personally invest themselves in their research activities rather than viewing research

and statistical skills as a domain that is entirely separate from their professional work. When students become personally invested in their research and can meaningfully connect research projects to other domains in which they are interested, they are likely to have positive emotional and physiological associations with research-related tasks, thereby increasing their research self-efficacy (cf. Bandura, 1977; 1997).

The Undergraduate Research Training Environment (URTE)

The American Psychological Association (APA; 2016), has set forth guidelines for the undergraduate psychology major. These guidelines concern undergraduate training environments and encourage the implementation of several comprehensive learning goals, each encompassing several specific learning outcomes. These comprehensive learning goals include: 1) Knowledge Base in Psychology, 2) Scientific Inquiry and Critical Thinking, 3) Ethical and Social Responsibility in a Diverse World, 4) Communication, and 5) Professional Development. Additionally, the APA (2008) has proposed several recommendations for the quality education of undergraduate psychology students, which provide guidance to educators as they develop psychology programs and courses. These principles call on faculty members and psychology departments to create an educational environment that encourages students to engage in independent, critical thinking.

A core recommendation underlying both the APA guidelines for the undergraduate psychology major as well as APA recommendations for quality education of undergraduate psychology is the notion of shaping undergraduate psychology students into “psychologically literate citizens” (APA, 2008, 2016; Dunn, 2015; McGovern et al., 2010). Students are assumed to have gained psychological literacy when they engage in empirical, scientific thinking as they attempt to consider and solve problems; as they analyze information in order to critically

evaluate different arguments or courses of action; as they take a creative and reasonably skeptical approach to problem-solving in order to examine multiple possible solutions to a problem; and as they can synthesize information from various sources to support conclusions they have drawn (Dunn, 2015; McGovern, 2010). Psychological literacy is not necessarily limited to the domain of psychology, as psychological literacy involves critical thinking skills that are applicable in many professional fields and career settings. For example, psychologically literate behaviors can involve selecting the best option from a list of potential medical procedures to treat an illness, by critically evaluating success rates and other relevant data about treatments rather than following one's 'instinct' (cf. McGovern et al., 2010). The type of thinking that psychologically literate citizens use as they approach questions mirrors the approach to formal psychological research that is commonly taught in undergraduate research methods courses (cf. Saville, 2008), which emphasizes a systematic approach to problem-solving, critical evaluation of information presented by a variety of sources, and synthesis of new and old information in support of a claim or conclusion.

The idea of psychological literacy (i.e., adhering to an empirical, scientific approach to problem-solving) clearly underlies APA learning Goal 2: Scientific Inquiry and Critical Thinking. This overarching learning goal consists of several specific and concrete learning outcomes, including: 1) using scientific reasoning to interpret psychological phenomena; 2) demonstrating psychology information literacy; 3) engaging in innovative and integrative thinking and problem solving; 4) interpreting, designing, and conducting basic psychological research; and 5) incorporating sociocultural factors in scientific inquiry (APA, 2016). Learning outcomes 1, 3, and 4 in particular describe an approach to critical thinking that strongly aligns with the notion of psychological literacy. Effective training in research methods and statistics is

an important and almost universally required component of undergraduate research training environments (Perlman & McCann, 1999; Stoloff et al., 2008) and is vital in accomplishing the learning goals put forth by APA (particularly Goal 2) in fostering psychological literacy among undergraduate psychology students. If undergraduate students are to master research methods and statistics as well as acquire psychological literacy, undergraduate research methods and statistics courses will ideally be taught in a way that allows not only mastery of course material but also an understanding of how course content applies to real world situations (cf., Hulsizer & Woolf, 2009; Saville, 2008).

In regard to research method and design courses, Saville (2008) recommends that courses cover a core handful of topics that teach content knowledge as well as applications of course material. For example, Saville recommends instructing students early in the semester about the characteristics of science and scientific inquiry; this aligns well with the broad educational goal of psychological literacy (cf. Dunn, 2015; McGovern, 2010). Additionally, Saville (2008) recommends that instructors incorporate discussions and comparisons of experimental versus non-experimental research designs, as well as large-N versus small-N designs. Saville further suggests teaching students about qualitative research designs, and the respective roles these methodologies play in advancing science, despite the fact that quantitative and experimental research designs are often presented as the ideal method of conducting psychological research. Finally, Saville encourages instructors to emphasize the relation between statistics and research methods and to help students understand ways in which research methods are integrated with knowledge gained in other courses, as well as to understand how research is applied in real-world settings.

Saville's recommendations for undergraduate research training align with Gelso et al.'s (1996) conceptualization of a quality graduate RTE, as both encourage instructors to discuss pros, cons, and contexts in which various research approaches are most useful (cf. Gelso et al., 1996). These approaches also discourage instructors from falsely claiming that any single research method is the best or only way to conduct meaningful psychological research (cf. Gelso et al., 1996). Finally, instructors are encouraged to emphasize the importance of contextualizing research methods within the framework of using such methods to address real-life problems in real-world settings. In this way, students will more clearly understand how science and practice are integrated with one another (cf. Gelso et al., 1996).

In regard to statistics courses, Hulsizer and Woolf (2009) discuss the importance of integrating statistics and research methods training as fully as possible; they note that students cannot fully understand either content area without understanding how they inform one another. One key recommendation Hulsizer and Woolf (2009) put forth is that statistics instructors use real, meaningful data in their illustrations of statistical procedures, as this may help students contextualize and more fully understand statistical procedures on a conceptual level.

Similar to Saville's (2008) research training recommendations, Hulsizer and Woolf's (2009) statistics training recommendations align with Gelso et al.'s (1996) conceptualization of a quality RTE. By contextualizing statistical procedures and using real data in their instruction, instructors can aid undergraduate students in understanding how statistics have been used to address real, meaningful, interesting questions. This can help students see how statistics, in the context of a research project, can help inform solutions to real-world problems (cf. Gelso et al., 1996).

High quality URTEs are likely to be an important element in fostering undergraduate RSE, just as high quality graduate RTEs are important in fostering graduate students' RSE. If early experience with research in graduate training programs is associated with higher continuing interest in research and higher levels of research self-efficacy (Love, Bahner, Jones, & Milsson, 2007), it is highly likely that early and positive involvement in research during undergraduate psychology training programs would also be associated with larger increases in research interest and research self-efficacy. In an SCCT framework, such early involvement would represent performance outcomes, which would be incorporated into the ongoing feedback loop that informs interest-goal-action chains (Lent, 2013; Lent et al., 1994).

In support of this idea, Freng et al. (2011) analyzed undergraduate student transcripts and found that both the early timing of research and statistics courses as well as students' final grades in these courses predicted their later grade point average (GPA) in upper level psychology courses. As well, qualitative studies examining the effectiveness of involving undergraduate students in research suggest that substantive participation, under the mentorship of faculty members (or graduate students), can increase undergraduate students' sense of their own research competence and self-efficacy; can help students to engage in future research; may enhance students' critical thinking skills; and may foster an interest in and excitement about conducting additional research (Lei & Chuang, 2009; Van Vliet, Klinge, & Hiseler, 2013; Kierniesky, 1984; Palladino et al., 1982). These positive outcomes of undergraduate research training and involvements are similar to the outcomes found in graduate research-related outcomes surrounding effective RTEs. However, the nature and impact of URTEs have not been systematically or quantitatively studied in the same way that graduate RTEs have been studied.

Undergraduate students' perceptions of URTE. In a survey of undergraduate psychology students, Stark-Wroblewski, Wiggins, and Ryan (2006) found a clear discrepancy between students' interest in various psychology specializations (e.g., school, clinical, counseling, forensic) and their knowledge of the level of research and statistical skills needed to actually work within those specialties. Gaither and Butler (2005) found that both psychology majors and non-majors enrolled in an introductory psychology course considered statistics to be an entirely separate discipline not heavily related to psychology, and these students expected an undergraduate program in psychology to primarily emphasize practical and applied experiences rather than research. Gaither and Butler also found that students expected graduate psychology admissions committees to favor practical and applied experiences over research and statistical skills. Such perceptions held by undergraduate psychology students are not in line with reality.

According to Appleby, Keenan, and Mauer (1999), research skills are one of the most highly valued factors taken into consideration by admissions committees for graduate programs in psychology. Appleby et al. found research skills were the third most valued applicant quality, after global factors such as work ethic and high general intellectual/scholarly ability. Out of all possible concrete skill sets obtained in an undergraduate psychology program, whether content-based or applied, research skills were most highly valued by graduate school admissions committees.

As well, despite the fact that many undergraduate psychology students believe that research and statistics are largely irrelevant to their future careers (Saville, 2008), employers have expectations of skill sets that psychology baccalaureates should possess upon graduation, and these skill sets involve critical thinking and research-design-related skills that are taught in effective undergraduate research and statistics courses (cf., Appleby, 2000; Kuther, 2013). On a

scale of 1 (unimportant) to 5 (extremely important), Appleby (2000) found that employers rated the broad category of “Information Gathering and Processing Skills” as generally to very important ($M = 3.97$) in their decisions to hire or not hire a psychology major. Specific skills within this category were also rated as important, including; “Plans and carries out projects successfully,” $M = 4.30$; “Thinks logically and creatively,” $M = 4.20$; and, “Gathers and organizes information from multiple sources,” $M = 3.40$). These skills align with the critical thinking and psychological literacy skills that, ideally, psychology baccalaureates should gain during their undergraduate research and statistics training (APA, 2008; 2016).

When hiring recent college graduates, many employers typically look to hire candidates who possess critical thinking and problem solving skills, more so than they look to hire graduates with specific majors (Hart Research Associates, 2013; National Association of Colleges and Employers, 2012). Kuther (2013) argues that an undergraduate education in psychology prepares students well for employment in a variety of jobs because a quality undergraduate psychology program will emphasize the empirical, scientific nature of psychology and foster valuable critical thinking and problem solving skills (cf., Dunn, 2015; McGovern, 2010) that are valued by employers across various job industries.

Despite an understanding among educators of undergraduate psychology majors that undergraduate research training is important, and despite formal recommendations from the APA that the scientific nature of psychology be a central focus in the training of undergraduate psychology majors, little research has been done to date to understand how components of quality RTEs prepare *undergraduate* psychology students for success and confidence in the use of research skills after graduation.

Measurement of RTEs

As previously discussed, the body of research surrounding RTEs indicates that students who perceive that their RTEs incorporated a greater number of Gelso et al.'s nine factors have demonstrated greater interest in research and self-efficacy toward research (Bishop & Bieschke, 1998; Kahn, 2000, 2001; Kahn & Scott, 1997; Krebs et al., 1991; Mallinckrodt & Gelso, 2002; Mallinckrodt et al., 1990; Phillips & Russell, 1994; Royalty et al., 1986). Because RTEs that effectively incorporate a greater number of the nine RTE factors are associated with higher levels of research interest and self-efficacy, they have also been shown to lead to a greater willingness of the part of students to engage in future research activity (cf., Lent et al., 1994). Therefore, a sound measure of RTEs as applicable to the undergraduate psychology student experience, which assesses the degree to which these students' RTEs meet the nine criteria described by Gelso et al. (1996), will enable a better understanding of the effect of RTEs on undergraduate psychology student research-related outcomes.

The most commonly used measures of graduate RTEs are the *Research Training Environment Scale - Revised* (RTES-R; Gelso et al., 1996) and its shortened form, the RTES-R-S (Kahn & Miller, 2000). Both the RTES-R and the RTES-R-S are self-report measures that assess the degree to which students feel their RTEs exemplify the nine ingredients of quality RTEs as laid out by Gelso et al. (1996). Students rate the degree to which various descriptive statements characterize the RTE they have experienced. Higher RTES-R scores have been associated with higher research self-efficacy ($r = .53, p < .01$) as measured by the *Self-Efficacy in Research Measure* (SERM; Phillips & Russell, 1994) as well as students' interest in, and perceived value, of research activities ($r = .41, p < .01$) as measured by the Royalty et al.'s (1986) *Attitudes Toward Research Measure*.

Measurement of undergraduate research training environments. To date, no model of recommended RTEs for undergraduate psychology students has been developed. The Gelso et al. (1996) model has been used to assess graduate level RTEs, and as currently outlined, is not fully translatable to an undergraduate training experience. For example, undergraduates are not typically expected to learn higher order research and statistical skills or complete large-scale research projects such as a thesis or dissertation. As well, undergraduate students generally focus less on conducting independent research activity and are less concerned about sheer research productivity than are students in graduate programs. However, the Gelso et al. (1996) model has been frequently used in research concerning the assessment of RTEs, and its associated measure, the Research Training Environment Scale-Revised (short form; RTES-R-S; Kahn & Miller, 2000) can be readily adapted for use in an undergraduate environment. In my study, to assess the quality of participants' URTE, the RTES-R-S items were adapted to the psychology undergraduate research training experience. These items still reflect the nine ingredients of a quality RTE as outlined by Gelso et al. (1996).

As aforementioned, the RTES-R-S is a shortened form of Gelso et al.'s (1996) 54-item measure. The full-length RTES-R, which uses six items to assess each of the nine components of the RTE, has demonstrated internally reliable subscale scores for each of the nine RTE elements: Faculty Modeling ($\alpha = .81$); Positive Reinforcement ($\alpha = .73$); Early Involvement ($\alpha = .73$); Relevant Statistics ($\alpha = .80$); Looking Inward ($\alpha = .82$); Science as a Social Experience ($\alpha = .76$); All Experiments Flawed ($\alpha = .57$); Varied Investigative Styles ($\alpha = .85$); and Wedding of Science and Practice ($\alpha = .82$). The RTES-R has also demonstrated an internally reliable total scale score ($\alpha = .90$), providing a global assessment of students' perceptions of their RTEs. Test-retest coefficients for subscales over a period of four to six weeks were, respectively, .84, .79,

.85, .88, .82, .87, .74, .86, and .86. The test-retest coefficient for total RTES-R scale scores across that same period of time was .94 (Gelso et al., 1996).

To assess construct validity of the RTES-R, Gelso et al. (1996) correlated total RTES-R scores with scores on Royalty et al.'s (1986) *Attitudes Toward Research Measure*, a brief measure that assesses students' general interest in and value assigned to research activities ($r = .41, p < .01$) as well as Phillips and Russell's (1994) *Self-Efficacy in Research Measure*, a 33-item measure that assesses students' confidence in their ability to complete specific research-related tasks ($r = .53, p < .01$). Discriminant validity was achieved by demonstrating a low correlation between RTES-R scores and Leong and Zachar's (1991) *Scientist-Practitioner Inventory* subscale measuring interest in practitioner activities ($r = .08$).

The RTES-R-S. With respect to the validity of the RTES-R-S, Kahn & Miller (2000) reported that the short form subscale scores correlated significantly (and in theoretically expected ways), with O'Brien et al.'s (1996) 23-item *Research Attitudes Measure* ($r = .49, p < .01$); Leong and Zachar's (1991) *Scientist-Practitioner Inventory* scientist subscale ($r = .47, p < .01$); and the investigative interest subscale of the *Holland Vocational Interest* inventory investigative-type subscale ($r = .34, p < .01$). As for discriminant validity, RTES-R-S scores were not highly correlated with Leong and Zachar's (1991) *Scientist-Practitioner Inventory* subscale which tap the work tasks of a practicing psychologist ($r = .15$). The relations among the RTES-R-S, measurements of RSE, interests in scientific activities, and non-interest in practitioner tasks are comparable to the relations found when using the full version of the RTES-R (cf. Gelso et al., 1996).

Kahn & Miller (2000) found an internal consistency coefficient of .87 for the RTES-R-S, indicating an adequate reliability of the shortened RTES-R-S in comparison to the RTES-R.

These authors strongly recommend using the briefer, full scale RTES-R-S in research settings where a short measure of a global RTE is desired.

Adaptation of the RTES-R-S. As the RTES-R-S was designed for use with psychology graduate students, any items referring explicitly to graduate school in psychology or activities referring to involved with such training (e.g., clinical work) were reworded to be relevant to the undergraduate RTE present in a collegiate psychology program. For example, “Students in this program are rarely taught to use research findings to inform their work with clients” became “I have rarely been taught to use research findings to inform my work in the real world”; and “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” became “I have the feeling, based on my undergraduate training in psychology in this department, that any research I do needs to be completely original and revolutionary for it to be acceptable” (See Appendix for the adapted RTES-R-S).

Other Outcomes Associated with Research Self-Efficacy and the RTE

Though research self-efficacy is a valuable construct to explore on its own, it becomes particularly informative to explore when it is associated with other more tangible outcomes. An ultimate goal of implementing quality RTEs and building research self-efficacy is to train students who are able and willing to engage in research-based activities post-graduation (APA, 1949, 2006; Bieschke et al., 2004; Frank, 1984; Gelso & Fretz, 2001). Therefore, it is important to examine how RTEs and research self-efficacy are related to trainees’ perceptions of the value of research, as well as their intentions to engage in future research-based activities in their chosen career paths.

Perceived utility of research skills. One important outcome associated with high levels of self-efficacy to engage in an activity is perceiving that activity as valuable. In SCCT terms, the perceived value or utility of a given activity may be understood as a type of outcome expectancy (cf., Lent, 2013; Lent et al., 1994). Within the context of academic- and career-related interest and goal development, activities are considered more valuable and worth pursuing when individuals perceive that they may lead to some desired outcome (Lent, 2013). Such outcomes may include psychological benefits like personal fulfillment or validation from important others, and they may also include relatively more tangible, career-related outcomes such as desirable job offers, level of financial compensation, high prestige, future opportunities for advancement, etc.

The RTE in which psychology students are trained may play an important role in the development of these positive research-related outcome expectancies. In particular, the “science-practice integration” ingredient that is present in quality RTEs (Gelso et al., 1996) will help to highlight the importance of research in future career settings. Both undergraduate and graduate training programs that effectively follow a scientist-practitioner model will inform students of the practical benefits of having solid research and statistics skills, by emphasizing how important it is for applied practitioners/non-researchers (i.e., most graduates of psychology training programs; APA, 2011; Bieschke, 2006; NCES, 2009; Watkins et al., 1986) to nevertheless be competent and willing to engage in research-based skills to inform their work in their future careers (Frank, 1984; Gelso & Fretz, 2001). Thus, an effective RTE will help trainees see how important and valuable research skills will be in their future careers. In this way, quality RTEs should be associated with higher perceived utility of research-based skills. Further, as will be discussed below, perceived utility of research may impact individuals’ willingness to engage in

research-based activities in their future careers. Therefore, a comprehensive measure of students' perceived utility of research skills may help predict whether undergraduate psychology students are likely to pursue or avoid particular career paths based on their outcome expectancies.

Measurement of perceived utility of research skills. To date, few measures include an assessment of trainees' perceived utility of research skills in their future careers. Those that do exist tend not to assess this variable independently; rather, they include items tapping other research-related outcomes such as anxiety over, or interest in, research (cf. Royalty et al., 1986; Szymanski et al., 1998).

Royalty et al. (1986) included only one item in their four-item *Attitudes Toward Research Measure* that addresses students' perceived utility of research: "I place a high value on the place of research in my future career." A measure by Szymanski et al. (1998), the *Research Instruction Outcomes Tool* (RIOT), uses a three-item subscale to assess perceived utility, in addition to other subscales addressing research anxiety and confidence in research ability. The three items in their perceived research utility subscale are: "Doing research can help me evaluate my professional practice," "Reading research literature can help me to influence policy decisions," and "Doing research can help me to improve my professional practice." Both Royalty et al.'s (1986) and Szymanski et al.'s (1998) measures were developed to evaluate changes in research-related outcomes in response to graduate-level research training. However, the perceived research utility items contained within these measures are vague and focus on careers in professional psychology, and as such, these measures likely do not capture the full breadth of this construct as applied to psychology baccalaureate career choices. Specifically, these measures do not adequately assess individuals' general sense of whether their research skills are useful, valuable,

or important in *any* career path they may choose, or whether their research skills contribute to them being well-rounded potential employees.

As most undergraduate students in psychology do not go on to attend graduate training in psychology that would lead to applied or scientific psychological careers (APA, 2011; NCES, 2009), but research findings show that future employers highly value research-based skills (Appleby, 2000; Kuther, 2013; Dunn, 2015; McGovern et al., 2010), items that can tap perceived utility of research-based skills in a broad, general fashion non-specific to professional psychology careers, would be most useful in measuring undergraduate students' perceived utility of research skills.

As no in-depth measure currently exists to capture undergraduate students' perceptions of the utility of their research-based skills in future careers, I developed a 16-item, Likert scale measure to assess this construct. Item development was guided by a base of research found regarding those research oriented attributes that employers generally find most attractive in potential employees, as well other sources reporting on the work duties associated with typical vocational choices of psychology undergraduates as well as the anticipated skill sets identified by employers they expect psychology undergraduate employees to possess (cf. APA, 2008, 2016; Appleby et al., 1999; Appleby, 2000; Bureau of Labor Statistics, 2016; Dunn, 2015; Hart Research Associates, 2013; National Association of Colleges and Employers, 2012; Kuther, 2013; McGovern et al., 2010; Saville, 2008).

Willingness to use research skills in future careers. The greater the perceived benefit of engaging in an activity – in this case, future involvement in research- or statistics-based activities – the greater the likelihood an individual will choose to pursue that activity in new settings in the future (Lent et al., 1994). In other words, when research activities are associated

with more positive outcome expectancies (i.e., when there is greater perceived utility/value of research skills), it is expected that individuals will be more willing to engage in that activity in a future academic or work setting. In a field where many trainees find research and statistics skills intimidating or challenging (Lampropoules et al., 2002), it is especially important to understand how outcome expectancies impact career choices and how they interact with levels of self-efficacy. Positive outcome expectancies may serve as a motivator even when self-efficacy is relatively low, although they have limited power in the complete absence of self-efficacy (Lent, 2013).

In the SCCT framework, perceived utility of research-based skills should be related to trainees' levels of research self-efficacy. Specifically, utility (i.e., an outcome expectancy) is expected to interact with self-efficacy levels when trainees are deciding whether or not to pursue research activities in the future (cf. Lent, 2013; Lent et al., 1994). Theoretically, higher research self-efficacy will be associated with greater likelihood of pursuing research activities when positive research-related outcome expectancies (e.g., perceived utility) are also high. However, outcome expectancies, in the form of perceived utility, are not expected to fully mediate the relationship between self-efficacy and future engagement, as research self-efficacy will still exert an influence on future engagement (i.e., it will likely foster interest in the area of research; cf. Deemer, 2010; Kahn, 2000; Kahn & Miller, 2000; Lent, 2013; Phillips & Russell, 1994). Thus, individuals with higher research self-efficacy can be expected to engage in future research at higher rates than will individuals with lower research self-efficacy, regardless of levels of perceived utility.

Looking at this relation between variables through another perspective, if positive outcome expectancies are strong enough, individuals may be more likely to engage in an activity

despite lower levels of self-efficacy, as they may be motivated by the positive outcomes that are expected to result should they pursue that activity (Lent, 2013). However, if one's self-efficacy is very low, these positive outcomes may seem unattainable: while the valence of the outcome expectancy is positive, the likelihood of that outcome occurring seems low (cf., Lent et al., 1994). Therefore, perceived utility of research skills is expected to increase the likelihood that individuals will engage in future research-related activities, even at low levels of research self-efficacy. However, overall, when individuals possess low levels of research self-efficacy, they will generally be less likely to engage in future research activities, as compared to their peers with higher levels of research self-efficacy. This is because self-efficacy often informs outcome expectancies, as described above, and because self-efficacy serves as a mediator between interests (as influenced by a learning context or training environment) and actual pursuit of an activity (Lent, 2013; Lent et al., 1994). An appropriate measure of willingness to use research skills in future careers can help illuminate the nature of the relations among RTEs; research self-efficacy; research-related outcome expectancies in the form of perceived utility of research; and willingness or intention to pursue research activities in the future.

Measurement of willingness to use research skills in future careers. As no such measure exists concerning undergraduates' willingness to engage in research-based activities post-graduation, I created such a measure for use in my study. This 14-item, Likert scale measure was developed so as to generalize to a broad base of vocational undertakings common to the majority of psychology undergraduates. Item development was guided by perspectives toward future research-based activities that should be associated with effective RTEs outcomes and those attitudes that should be linked to undergraduate students who possess high levels of self-efficacy and established research-based SCCT interest-goal-action chains surrounding professional duties

within chosen post-graduation career paths (cf. Bandura, 1977, 1997; Gelso et al., 1996; Kahn & Scott, 1997; Lent, 2013; Lent et al., 1994, Phillips & Russell, 1994).

The Current Study

The training of psychology students in research and statistical skills, methodical problem identification, the integration of data, the consideration of evidence-driven solutions, and critical thinking are fundamental learning goals of psychology pedagogy (APA, 2016). The purpose of these goals is to instill in students an understanding both that psychology is a science and that the discipline relies on empirical research methods to understand phenomena.

The value of empirical research as a way to understand phenomena is imparted to psychology students within the context of a research training environment (RTE). High quality RTEs, as defined by Gelso et al. (1996), allow psychology students to engage in various types of course work and other learning experiences that bolster their self-efficacy in the domain of research and statistics. This process helps to foster positive, enduring research-related attitudes within students. According to principles of SCCT, high quality RTEs can also be expected to enhance students' perceived utility of research skills and increase their willingness to continue engaging in research-based activities both during and beyond their formal research training. This is expected to occur when RTEs foster both high self-efficacy and positive outcome expectancies associated with research involvement (cf., Lent, 2013; Lent et al., 1994). Such positive research-related attitudes are a key outcome of psychology education (APA, 2016).

SCT (Bandura, 1977, 1986) and SCCT (Lent et al., 1994) are well-established theories through which the learning and development of research and statistical skills by psychology students can be understood. These theories suggest that as students' level of self-efficacy increases within the research-related domain, their intention to engage and persist in research-

related activities in their future career activities will also increase. SCCT in particular outlines ways that outcome expectancies and efficacy beliefs inform goal-directed attitudes and behaviors. Gelso et al.'s (1996) definition of high quality RTEs is predicated on processes that enhance students' self-efficacy toward conducting and consuming research, and this increased confidence brings a critical, research-minded approach to examining questions of interest in their future work and careers.

Unfortunately, no scholars, to date, have applied Gelso et al.'s (1996) model of effective RTEs to undergraduate psychology training. Much is unknown about the undergraduate RTE and its effects on the research self-efficacy of undergraduate psychology students. Also unknown is the extent to which URTEs can bring undergraduate students to see the utility of research-based skills or increase students' willingness to use such skills in their chosen post-baccalaureate careers.

In my study, based on previous findings in the SCCT literature, as well as previous findings concerning the effects of quality RTEs on the self-efficacy of graduate students, I attempted to add to the current literature by examining the mediation effect of student research self-efficacy on the direct relation of students' perceived quality of their URTE and their willingness to use research-related skills in their post-graduation work. In tandem, I also examined the moderating effect of student perceptions of the utility of their research skills in post-graduation employment on the indirect effect of student research self-efficacy. I took this specific approach to examine whether my variables of interest related to one another in expected ways according to SCCT, and to examine whether they related to one another similar to findings previously obtained using graduate student samples. The moderated mediation model I used is presented in Figure 1.

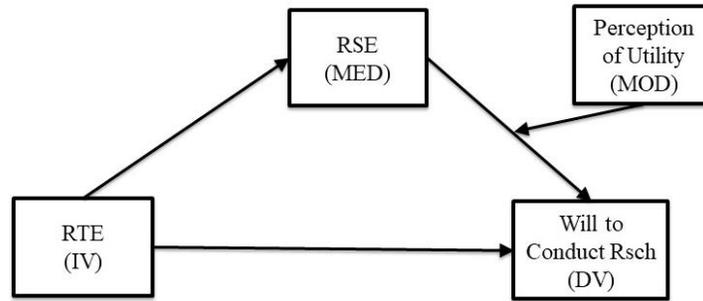


Figure 1. Moderated Mediation Model

Procedurally, I first conducted a test of mediation (RTE -> RSE -> WURFC) to establish the ability of RSE to mediate the direct relation between RTE and WURFC. I then conducted a test of moderated mediation to establish the ability of URFC to moderate the indirect effect of RSE on the direct relation between RTE and WURFC.

CHAPTER 3. METHOD

Procedure

My study was approved by the Iowa State University Institutional Review Board (see first page of approval form, Appendix L). To generate a participant pool, I obtained a list of email addresses from the Iowa State University Registrar's Office for all currently enrolled Iowa State University undergraduate students who identified as psychology majors or minors during the 2017-2018 academic year. I sent out initial and follow-up email invitations to these students to participate in my research (see Appendix A and B) during the Fall 2017 and Spring 2018 semesters. I also offered participants the opportunity to enter a random drawing to win one of three \$25 gift cards to an online retailer, Amazon (see Appendix K). Based on the results of a power analysis, in order to determine a small effect size in the data (.15), at .95 power (.05 error probability), I sought a sample size of 138 participants (G*Power 3.1.9.; Faul, Erdfelder, Lang, & Buchner, 2007). I obtained a final usable sample of $n = 148$.

The recruitment email informed participants of all human subject rights and contained informed consent information and a URL for students to access research materials on Qualtrics™, a firewalled online survey platform. A link to an anonymous survey was embedded in the email. The first page of the research materials was an informed consent document that participants were required to endorse before commencing the survey (see Appendix C). After agreeing with the terms of the informed consent document, participants completed a demographic survey, the Research Training Environment Scale – Revised – Short Form (RTES-R-S; Kahn & Miller, 2000), the Research Self-Efficacy Scale (RSES; Bieschke et al, 1996; Greeley et al., 1989); the Utility of Research in Future Careers (URFC; Burke & Prieto, 2017); and the Willingness to Use Research in Future Careers (WURFC; Burke & Prieto, 2017)

measures (see Appendix D, E, F, G, and I respectively). Participants were then directed to a debriefing page thanking them for their participation and providing them with information about entering a drawing for one of three Amazon gift cards (see Appendix K).

Participants

The total return of data records was 224, but due to attrition, I was left with 148 usable cases. Participants ranged in age from 18 to 38 ($M = 20$, $SD = 2.33$). Eighty-nine percent of the sample identified as female. Seventy-six percent identified as European American (White), 6% as Latino/a American (Hispanic), 5% as Bi/Multi-Racial, 4% as Asian American, 4% as African American (Black), 3% as International (e.g., Indian, Korean, Malaysian), and 1% as American Indian or Alaskan Native.

Ten percent of the sample identified as freshmen, 29% as sophomores, 26% as juniors, 33% as seniors, and 2% as “other” (i.e., five years of post-secondary education). Eighty-six percent of the sample identified as psychology majors, and 13% identified as psychology minors. The remaining participants ($n = 3$) identified as a biology and psychology double major, an English and psychology double major, and a history education major (with 18 credit hours of psychology courses). Total semesters to date spent as a psychology major or minor ranged from 1 to 10 semesters ($M = 3.77$, $SD = 1.9$). Reported total number of psychology classes completed to date ranged from 0 to 33 ($M = 6.92$, $SD = 4.86$), and reported total number of psychology classes currently in progress ranged from 0 to 7 ($M = 2.12$, $SD = 1.32$). Thirty-eight participants (23% of the sample) identified themselves as transfer students, and these students reported taking anywhere from 0 to 7 psychology courses ($M = 1.89$, $SD = 1.65$) during their enrollment at a previous institution. Current grade-point average for all psychology courses completed at Iowa State University ranged from 2.0 to 4.0 ($M = 3.46$, $SD = 0.44$). Participants’ pre-existing interest

in research, as assessed by scores on the item “I have always enjoyed research and statistics, even before coming to college,” ranged from 1 (disagree) to 5 (agree; $M = 2.58$, $SD = 1.34$); the sample mean corresponded with the qualitative anchor of “Disagree.”

Measures

Revised research training environment scale – short form. The revised *Research Training Environment Scale – Revised – Short Form* (RTES-R-S; Kahn & Miller, 2000) is derived from the 54-item revised *Research Training Environment Scale - Revised*; RTES-R; Gelso et al, 1996). The RTES-R-S is a self-report measure consisting of 18 items that assesses the level of perceived quality of their RTEs (Gelso et al., 1996). Participants rate the degree to which they agree with various statements describing their RTE, using a five-point Likert-type scale, with 1 (*Disagree*) and 5 (*Agree*) as polar anchors, similar to the rating used in the original measure. Half of the items are reverse-scored. *Higher* scores on the RTES-R-S indicate students' perception that they have been exposed to *higher quality* RTEs.

The RTES-R-S uses two items per RTE element and includes one positively phrased and one negatively phrased item from each of the initial nine RTES-R subscales to provide a balanced reverse-scored response set similar to the initial measure. The RTES-R-S produces total scores with a possible score range of 18-90, and it is intended to yield full scale scores that provide a global measure of RTE quality. For my statistical analyses, I averaged the scores on all items to obtain a full-scale average score ranging from 1-5; thus, reported RTES-R-S scale scores align with the Likert-type rating system used to answer individual items.

Confirmatory factor analyses (CFAs) conducted by Kahn & Miller (2000) indicated that the best fit for the eighteen items was a model using a single factor assessing global perceptions of an RTE. The measure assesses two dimensions of RTEs: instructional (i.e., elements relevant

to the instruction of content knowledge) and interpersonal (i.e., elements relevant to trainees' relationships to faculty and other trainees). Kahn and Miller did not provide detailed CFA results, although they did report that in the single factor form, item loadings were high, with a median factor loading of .63. This single-factor solution provided a good fit to the data (CFI = .96).

Kahn & Miller correlated full-length RTES-R scores with shortened RTES-R-S scores and found a correlation of $r = .96$. They also found the reduced subscale scores, representing each of the nine RTE ingredients, internally reliable (Faculty Modeling, $\alpha = .81$; Positive Reinforcement, $\alpha = .73$; Early Involvement, $\alpha = .73$; Relevant Statistics, $\alpha = .80$; Looking Inward, $\alpha = .82$; Science as a Social Experience, $\alpha = .76$; All Experiments Flawed, $\alpha = .57$; Varied Investigative Styles, $\alpha = .85$; and Wedding of Science and Practice, $\alpha = .82$). The total scale score was also highly internally reliable ($\alpha = .90$). These findings support the validity of the RTES-R-S as a global measure of student perceptions of the RTE. The full RTES-R-S, with modified phrasing, is included in Appendix E.

Research self-efficacy scale. The *Research Self-Efficacy Scale* (RSES; Bieschke et al., 1996; Greeley et al., 1989) is a self-report measure consisting of 49 items that assess psychology doctoral students' sense of self-efficacy to engage in research-related tasks. The RSES has been shown to overlap conceptually with the SERM (Forester et al., 2004), a well-validated measure of research self-efficacy (e.g., Kahn & Scott, 1997; Phillips & Russell, 1994). RSES subscales have been shown to predict interest in future research involvement (Bieschke et al., 1996). Full scale RSES scores have previously been significantly correlated with previous research experience and amount of research training, research outcome expectations, and interest in research (Bishop & Bieschke, 1998; Deemer et al., 2007; Lambie & Vaccaro, 2010).

RSES items require participants to rate their degree of confidence in their ability to successfully accomplish various research tasks by using a 0-100 rating scale that is broken into 10-point increments, with 0 (*No Confidence*) and 100 (*Complete Confidence*) as polar anchors. For the purpose of clarity, I modified the RSES scoring system such that the 0-100 scale with 10-point increments became a 0-10 scale with 1-point increments. *Higher* scores on the RSES indicate a *greater* sense of research self-efficacy.

The RSES consists of four subscales: Early Tasks, Conceptualization, Implementation, and Presenting the Results (Bieschke et al., 1996). The Early Tasks subscale consists of 5 items (addressing initial preparatory tasks such as brainstorming areas in the psychology to read about and locating articles or references); the Conceptualization subscale consists of 16 items (addressing conceptualization and organization of research questions); the Implementation subscale consists of 20 items (addressing the design and execution of a robust research plan as well as the analysis of data); and the Presenting the Results subscale consists of 8 items (addressing the organization and written or oral presentation of research findings). Each subscale, as well as the total RSES score, has a possible score range of 0-100, achieved by averaging responses to all items (Bieschke et al., 1996). In my study, using my modified RSES scoring system, the RSES has a possible score range of 0-10.

Bieschke et al. (1996) found the following internal reliability estimates for the four subscales: Early Tasks, $\alpha = .75$, Conceptualization, $\alpha = .92$, Implementation, $\alpha = .96$, and Presenting the Results, $\alpha = .91$, and a full scale score reliability of $\alpha = .96$. These authors found that three of the four subscales (Early Tasks, Conceptualization, and Implementation) accounted for unique variance in the prediction of interest in future research involvement; however, the Presenting the Results subscale did not. Bieschke et al. made no firm recommendations about

whether the RSES is intended to generate full scale scores or whether subscale scores should be used as predictors of research-related outcomes. As I made no *a priori* hypotheses about RSES subscales uniquely explaining variance in my outcome variable (willingness to use research in future careers), I used full scale RSES scores as a global measure of research self-efficacy. The RSES, with its modified scoring scale, can be found in Appendix F.

Utility of research in future careers. The *Utility of Research in Future Careers* (URFC) measure, created by Burke & Prieto (2017), assesses the extent to which participants believe research and statistical skills acquired during their undergraduate education are valuable and useful to their future professional work (see Appendix G). The URFC contains 16 self-report items employing a five-point Likert scale, with 1 (*Disagree*) and 5 (*Agree*) as polar anchors. Ten of the items are reverse-scored. The URFC has a possible score range of 16-80. *Higher* scores on the scale indicate participants' *greater perceived utility* of research and statistical skills in their future careers. For my statistical analyses, I averaged the scores on all items to obtain a full-scale average score ranging from 1-5; thus, reported URFC scale scores align with the Likert-type rating system used to answer individual items.

I conducted an exploratory factor analysis (EFA) on URFC items to provide an empirical factor structure that was most effective for analyses. Conceptually, the URFC items were designed to group into a single factor; an EFA procedure is the most robust way to test this prediction (cf. Tabachnick & Fidell, 2016) given that there is no *a priori* factor structure to force items into a single factor during analysis. Item loading weights of .40 or greater that load principally on only one factor were retained (cf. Tabachnick & Fidell, 2016). Although EFA is a highly conservative analysis, this procedure will ensure the presence of a single factor solution in

the data as well as the significant contribution of individual item variance to any resultant single factor index. A revised version of the URFC, informed by the EFA, is included in Appendix H.

Willingness to use research in future careers. The *Willingness to Use Research in Future Careers* (WURFC) measure (see Appendix I), created by Burke & Prieto (2017), assesses individuals' willingness to select and work in careers that call for the use of a broad range of research-related activities and duties. The WURFC is a 14 item self-report measure that employs a five-point Likert scale, with 1 (*Disagree*) and 5 (*Agree*) as polar anchors. The WURFC has a possible score range of 14-70. *Higher* scores on the scale indicate *greater* willingness to engage in research-based skills within the context of a future profession. For my statistical analyses, I averaged the scores on all items to obtain a full-scale average score ranging from 1-5; thus, reported WURFC scale scores align with the Likert-type rating system used to answer individual items.

I conducted exploratory factor analysis (EFA) procedures on the WURFC items (similar in rationale and procedure as described above for the URFC) to provide an empirical factor structure most validly used in analyses. A revised version of the WURFC, informed by the EFA, is included in Appendix J.

Research Hypotheses

Based on extant literature and my research questions of interest, I have declared the following hypothesis to examine:

Correlational

1. Student perceived levels of RTE quality will be statistically significantly positively related to student levels of research self-efficacy.

2. Student perceived levels of RTE quality will be statistically significantly positively related to students' perceptions of the utility of their research skills in future careers.
3. Student perceived levels of RTE quality will be statistically significantly positively related to student willingness to use research skills in future careers.
4. Levels of student research self-efficacy will be statistically significantly positively related to student perceptions of the utility of their research skills in future careers.
5. Levels of students' research self-efficacy will be statistically significantly positively related to student willingness to use research skills in future careers.
6. Students' perception of the utility of their research skills in future careers will be statistically significantly positively related with their willingness to use research skills in future careers.

Moderated Mediation

7. Student research self-efficacy will mediate the direct relation between students' reported RTE quality and their level of willingness to use research skills in future careers. The indirect effect of student research self-efficacy will strongly reduce the magnitude of the direct relation between RTE and student willingness to use research skills in future careers (RTE -> RSE -> WURFC).
8. Students' perception of the utility of their research skills in future careers will moderate the indirect effect of student research self-efficacy on the direct relation between student perceived levels of RTE quality and their willingness to use research skills in future careers. Specifically, the indirect effect of student self-efficacy on their willingness to use research skills in future careers will be stronger at higher levels of students' perceived utility of their research skills in future careers, than at lower levels of perceived utility.

CHAPTER 4. RESULTS

Power Analysis

I conducted a post-hoc power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) to determine the statistical power available using my obtained sample size ($n = 148$). On the initial test for a mediation effect, Mediation Power (Kenny, 2017) determined, to detect an effect size of 0.15 at $p < .05$, the post-hoc power of my test was .21. G*Power determined, to detect an effect size of 0.15 at $p < .05$, that the critical value for F tests rested at 2.43, offering a power coefficient of .97.

Data Cleaning

Data were examined prior to analyses for missing data points. Initially, 224 participants provided responses. However, attrition and missing data were significant issues in my study. A total of fifty-nine (59) participants endorsed either no items whatsoever, or they only endorsed initial items concerning demographic variables and did not complete any of the study measures of interest. These cases were removed from the dataset.

To address missing data points, the average of extant subscale scores was imputed into blank items in cases in which participants had responded to at least 80% of a given subscale. Seven participants failed to endorse only one or two items across study measures: five of these failed to respond to a single item on the RSES, one failed to respond to two items on the RSES, and one failed to respond to one item on the WURFC. In each of these cases, these missing values were replaced with extant subscale averages.

Of the participants who responded to items beyond the demographic questionnaire, one participant failed to respond to any items on the WURFC but responded to the RTES-R-S, the RSES, and the URFC. Three participants failed to respond to any items on the URFC and the

WURFC but responded to the RTES-R-S and the RSES. Seven participants failed to respond to any items of the RSES, the URFC, and the WURFC but responded to the RTES-R-S. One participant responded to all items in the RTES-R-S and only the first five items of the RSES, which comprise the entire “Early Tasks” subscale of the RSES, but failed to respond to the rest of the RSES or to the URFC or the WURFC. In all of these cases, blank items were left as missing cases, to retain power and conserve the data on the measures these participants did endorse.

Data cleaning procedures resulted in a usable sample size of 148 participants, which resulted in a modest reduction of sample size and degrees of freedom for certain analyses.

Analysis Procedures

For all analyses, I used the Statistical Package for the Social Sciences (SPSS; 2016, version 24.0). Specific to the moderated mediation analysis, I used the Hayes PROCESS module (2015, version 2.15) for SPSS (analysis model #14) for analysis. The PROCESS module employs bootstrapping techniques in order to determine existing confidence intervals and dispersion parameters within the data, through high frequency repeated sampling of the data. Bootstrapping is a powerful method for testing the effects and relations of an intervening variable and the relation of independent and dependent variables (MacKinnon et al., 2004; Williams & MacKinnon, 2008). The confidence intervals determined by bootstrapping techniques are used to indicate whether the indirect effects of intervening variables are within or outside of the direct relations of independent and dependent variables (e.g., Shrout & Bolger, 2002). I employed 5000 repeated samplings of the data to obtain final confidence intervals; the presence of a statistically significant moderation or mediation effect is evidenced by a confidence interval that does not include zero.

Exploratory Factor Analyses

I conducted exploratory factor analyses (EFAs; principal components analysis) on items within the URFC and WURFC measures, to provide an empirically-based factor structure was most effective to use for these measures in analyses. All EFA analyses employed a Varimax rotation. Eigenvalues greater than 1.0 (Kaiser rule), the retention of items with loading weights at .40 or greater on only one factor (cf. Tabachnick & Fidell, 2016), and an examination of scree tests, were all used to determine best factor solutions.

URFC. The EFA of the items from the *Utility of Research in Future Careers* measure (see Appendix G) initially suggested a three-factor solution that accounted for 62.26% of the variance in the 16 URFC items; specifically, the three factors accounted for 46.57%, 9.36%, and 6.33% of the variance, respectively. The factor structure converged after five iterations. The eigenvalue for the first factor was 9.48, for the second factor was 1.91, and for the third factor was 1.29. Scree plot analysis also suggested the presence of three distinct factors prior to the asymptote. According to the observed rescaled loading weights, 13 items loaded strongly on the first factor, with negligible cross-loading weights on the other factors. However, three items (#7, #8, and #13) had strong cross-loadings on both the first factor and either the second or third factors. One item (#14) had a strong cross-loading on both the second and third factors. Given these results, this three-factor solution was not optimal. Extracted factors and their respective item loading weights are shown in Table 1.

Table 1

Utility of Research in Future Careers (URFC) Exploratory Factor Analysis (EFA) Factor Loadings and Weights

Item	Factor 1	Factor 2	Factor 3
1. Dislike objectivity	.40	.18	-.21
2. Will never use in real life	.87	.14	.02
3. Valuable	.61	.10	.23
4. Worthwhile	.67	.21	.28
5. Waste of time	.73	.20	.14
6. Should not have to learn	.81	.16	-.07
7. Want to learn to like	.53	.31	.51
8. For people who like math	.52	-.43	-.13
9. A pain	.75	-.21	-.13
10. Want to remove from training	.81	.06	.03
11. Understand why one must learn	.45	.34	-.08
12. No use in career	.77	.26	-.04
13. Do not like	.69	-.54	-.14
14. Easy to understand	.08	-.60	.68
15. Removed from chosen career	.81	-.01	-.17
16. Important	.65	.21	.28

A second EFA was conducted with items 7, 8, 13, and 14 removed. This EFA yielded a one-factor solution that accounted for 55.66% of the variance in the 12 remaining URFC items.

The eigenvalue for this factor was 7.98. According to the observed rescaled loading weights, all

12 items loaded strongly on the single factor. The extracted factor and its item loading weights are shown in Table 2. This final version of the URFC is included in Appendix H, and was used in all analyses for my study.

Table 2

*Revised Utility of Research in Future Careers (URFC) Exploratory Factor Analysis (EFA)
Factor Loadings and Weights*

Item	Factor 1
1. Dislike objectivity	.43
2. Will never use in real life	.87
3. Valuable	.60
4. Worthwhile	.69
5. Waste of time	.75
6. Should not have to learn	.83
9. A pain	.73
10. Want to remove from training	.81
11. Understand why one must learn	.49
12. No use in career	.80
15. Removed from chosen career	.81
16. Important	.67

WURFC. The EFA on the *Willingness to Use Research in Future Careers* items (see Appendix I) initially suggested a two-factor solution that accounted for 66.67% of the variance in the 14 items; specifically, these two factors accounted for 56.27% and 10.40% of the variance, respectively. The factor structure converged after three iterations. The eigenvalue for the first

factor was 9.33 and for the second factor was 1.73. Scree plot analysis suggested the presence of two distinct factors prior to the asymptote. According to the observed rescaled loading weights, 11 of the items loaded strongly the first factor with negligible cross-loadings. However, three items (#2, #13 and #14), loaded strongly the first factor and also showed strong cross-loadings on the second factor. Given these results, this two-factor solution was not optimal. Extracted factors and their respective item loading weights are shown in Table 3.

Table 3

*Willingness to Use Research in Future Careers (WURFC) Exploratory Factor Analysis (EFA)
Factor Loadings and Weights*

Item	Factor 1	Factor 2
1. Develop ideas to address a problem	.63	.24
2. Locate and read existing research	.52	.51
3. Critically evaluate existing research	.66	.17
4. Integrate info from multiple sources	.52	.37
5. Design a study	.82	-.24
6. Carry out a study	.81	-.39
7. Perform descriptive statistics	.80	-.33
8. Perform inferential statistics	.79	-.39
9. Summarize results	.86	.14
10. Write a report	.80	.14
11. Identify and understand limitations	.81	.22
12. Understand fit with broad research base	.80	.33
13. Make decisions based on results	.64	.44
14. Suggest practical solutions	.63	.43

I conducted a second EFA, with items #2, #13, and #14 removed. The second EFA on the remaining 11 WURFC items again suggested a less than optimal two-factor solution. The factor structure converged after three iterations. The eigenvalue for the first factor was 8.60 and for the second factor, 1.41. The two factors accounted for a total of 70.21% of the variance in the items; specifically, the two factors accounted for 60.31% and 9.90% of the variance, respectively. Scree plot analysis suggested the presence of two distinct factors prior to the asymptote. According to the observed rescaled loading weights, all items continued to load most strongly on the first factor, but cross-loadings meeting the retention criterion (.40 or greater) were observed for items #1, #8, and #12. Extracted factors and respective item loading weights are shown in Table 4.

Table 4

Revised Willingness to Use Research in Future Careers (WURFC) Exploratory Factor Analysis (EFA) Factor Loadings and Weights

Item	Factor 1	Factor 2
1. Develop ideas to address a problem	.62	.41
3. Critically evaluate existing research	.65	.20
4. Integrate information from multiple sources	.50	.30
5. Design a study	.84	-.06
6. Carry out a study	.84	-.24
7. Perform descriptive statistics	.82	-.38
8. Perform inferential statistics	.81	-.43
9. Summarize results	.86	.23
10. Write a report	.79	.15
11. Identify and understand limitations	.80	.36
12. Understand fit with broad research base	.78	.45

In order to retain as many items as possible and based on the twice observed pattern of items loading most strongly on the first extracted factor, a third EFA was run. This EFA still removed items 2, 13, and 14 as suggested by the initial EFA, but retained the observed new cross-loading items 1, 8, and 12, and forced them to fit on one factor.

This third, forced-fit EFA of the revised WURFC indicated a one-factor solution, which accounted for 58.73% of the variance. The eigenvalue for this single factor was 6.46. According to the observed rescaled loading weights, all items loaded strongly on this single factor. The extracted factor and its item loading weights are shown in Table 5.

Table 5

Revised Willingness to Use Research in Future Careers (WURFC) Forced Fit Exploratory Factor Analysis (EFA) Factor Loadings and Weights

Item	Factor 1
1. Develop ideas to address a problem	.67
3. Critically evaluate existing research	.68
4. Integrate information from multiple sources	.54
5. Design a study	.82
6. Carry out a study	.80
7. Perform descriptive statistics	.78
8. Perform inferential statistics	.76
9. Summarize results	.88
10. Write a report	.80
11. Identify and understand limitations	.84
12. Understand fit with broad research base	.82

This final version of the WURFC is included in Appendix I, and was used in all analyses for my study.

Descriptive Data

The sample means, standard deviations, and ranges for all study measures are presented below in Table 6.

Table 6

Sample Means, Standard Deviations, and Ranges of Study Measures

Items	<i>M</i>	<i>SD</i>	Range	Scale range
1. RTES-R-S	3.78	0.56	1.56-4.78	1-5
2. RSES	6.41	1.49	1.88-10.00	0-10
3. URFC	3.98	0.78	2.00-5.00	1-5
4. WURFC	3.85	0.87	1.45-5.00	1-5

Note. RTES-R-S = Revised Research Training Environment Scale – Short Form; RSES = Research Self-Efficacy Scale; URFC = Utility of Research in Future Careers; WURFC = Willingness to Use Research in Future Careers

RTES-R-S. The average sample score on the research training environment measure was 3.78 (above the scale midpoint and toward the “*Agree*” anchor). This mean indicates that participants in this sample endorsed perceptions that they have been exposed to moderate- to high-quality undergraduate research training environments. In other words, they perceived that their research training environments and experiences involved a relatively high number of the elements characterizing a quality RTE.

RSES. The average sample score on the research self-efficacy measure was 6.41 (above the scale midpoint and toward the “*Complete Confidence*” anchor). This mean indicates that participants in this sample endorsed moderate to strong confidence in their abilities to engage in a broad range of research-related tasks.

URFC. The average sample score on the perceived utility of research measure was 3.98 (above the scale midpoint and toward the “*Agree*” anchor). This mean indicates that participants in this sample endorsed moderately high levels of the perceived utility of their research skills in their future careers.

WURFC. The average sample score on the willingness to engage in future research measure was 3.85 (above the scale midpoint and toward the “*Agree*” anchor). This mean indicates that participants in this sample endorsed moderately high levels of willingness to engage in various research-related activities in their future careers.

Inter-correlations of Study Measures

Correlational analyses were used to test my first six hypotheses, to explore whether variables affected by student perceptions of the quality of their RTE demonstrated relations in an undergraduate psychology student sample similar to those found in previous research with graduate psychology student samples (e.g., Bishop & Bieschke, 1998; Gelso et al., 1996; Kahn, 2000, 2001; Kahn & Scott, 1997; Phillips & Russell, 1994). First-order correlations and instrument alpha coefficients among study measures are presented below in Table 7.

Table 7

Inter-correlations and Alpha Coefficients of Study Measures

Scale	1	2	3	4
1. RTES-R-S	.83			
2. RSES	.31**	.97		
3. URFC	.27*	.22*	.91	
4. WURFC	.16	.31**	.55**	.93

Notes. *Significant at $p < .01$. **Significant at $p < .001$. Alpha coefficients are on the diagonal. RTES-R-S = Revised Research Training Environment Scale – Short Form; RSES = Research Self-Efficacy Scale; URFC = Utility of Research in Future Careers; WURFC = Willingness to Use Research in Future Careers

Hypothesis one: Correlation of RTE quality and research self-efficacy. As hypothesized, levels of RTE quality endorsed by undergraduate psychology students were significantly positively correlated with endorsed levels of research self-efficacy ($r = .31, p < .001$). This was a low to moderate relation, indicating that as undergraduate students perceive their training environments as effectively incorporating a greater number of Gelso et al.'s (1996) ingredients of an effective RTE, their endorsed levels of research self-efficacy increased.

The magnitude of this relation was modest compared to relations between RTEs and self-efficacy previously demonstrated among graduate student samples using other measures of research self-efficacy (e.g., $r = .53, p < .01$; Gelso et al., 1996). This finding indicates that RTE and research self-efficacy relate to one another to a lesser degree using an undergraduate psychology student sample than they do with graduate psychology student samples.

Hypothesis two: Correlation of RTE and perceived utility of research skills. As hypothesized, levels of RTE quality endorsed by undergraduate psychology students were significantly positively correlated with their levels of perceived utility of research skills in future educational or career experiences ($r = .27, p < .01$). This was a low to moderate relation, indicating that as undergraduate students perceive their training environments as effectively incorporating a greater number of ingredients of an effective RTE, their endorsed levels of the perceived utility of their research skills increased.

The magnitude of this relation was modest compared to RTE/general attitudes toward research relations previously demonstrated among graduate student samples using other measures of attitudes toward research (e.g., a correlation of $r = .49, p < .01$; O'Brien et al., 1996). This finding indicates that RTE and attitudes toward research relate to one another

similarly, though to a lesser degree, in an undergraduate psychology student sample than they do in graduate psychology training programs.

Hypothesis three: Correlation of RTE and willingness to use research in future careers. The hypothesis that levels of RTE quality endorsed by undergraduate psychology students would be significantly positively correlated with their levels of willingness to use research in their future careers was not supported ($r = .16, p = .06$). However, this relation strongly trended toward significance, and despite general specifications that a statistically significant direct effect must initially be present between independent and dependent variables as a predicate for mediation tests on such a direct relation (see Baron & Kenny, 1986), I regarded this existing relation as statistically significant enough to demonstrate any potential indirect effects brought about in this direct relation as a function of an intervening variable.

Hypothesis four: Correlation of research self-efficacy and perceived utility of research in future careers. As hypothesized, endorsed levels of research self-efficacy among undergraduate psychology students were significantly positively correlated with their levels of perceived utility of research skills in future careers ($r = .22, p < .01$). This was a low magnitude relation, indicating that as undergraduate students endorse higher levels of research self-efficacy, their endorsed levels of the perceived utility of their research skills in future careers increased.

The magnitude of this relation was modest compared to research self-efficacy/general attitudes toward research relations previously demonstrated among graduate student samples using other measures of attitudes toward research (e.g., a correlation of $r = .31, p < .05$; Kahn & Scott, 1997). This finding indicates that research self-efficacy and attitudes toward research relate to one another similarly, though to a lesser degree, in an undergraduate psychology student sample than they do in graduate psychology student samples.

Hypothesis five: Correlation of research self-efficacy and willingness to use research in future careers. As hypothesized, endorsed levels of research self-efficacy among undergraduate psychology students were significantly positively correlated with their levels of willingness to use research in their future careers ($r = .31, p < .001$). This was a low to moderate relation, indicating that as undergraduate students endorse higher levels of research self-efficacy, their willingness to engage in research in their future careers increased.

Hypothesis six: Correlation of perceived utility of research and willingness to use research in future careers. As hypothesized, students' endorsed levels of perceived utility of research skills in future careers were significantly positively correlated with their levels of willingness to use research in their future careers ($r = .55, p < .001$). This was a moderate relation, indicating that as undergraduate students endorse higher levels of the utility of their research skills in future careers, their willingness to engage in research in future careers increased.

Mediation Analysis

A mediation analysis was used to test my seventh hypothesis, which predicted that student research self-efficacy would mediate the direct relation between students' reported quality of their RTE and their level of willingness to use research skills in future careers. In this analysis, RTES-R-S scores were entered as the independent variable, WURFC scores were entered as the outcome variable, and RSES scores were entered as the mediator. The LLCI and ULCI range for the indirect effect was .0470 - .2925, and did not include zero, indicating SE mediated the direct relation between students' reported RTE quality and their level of willingness to use research skills in future careers. My seventh hypothesis was supported. The results of this mediation analysis are presented in Table 8.

Table 8

Research Self-Efficacy As a Mediator of RTE and Willingness to Use Research in Future Careers

Predictor	<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>F</i>
<u>Step 1 (RSES as DV)</u>				<.001	.09	14.47
Constant	3.25	.83	3.89	<.001		
RTES-R-S	.83	.22	3.80	<.001		
<u>Step 2 (WURFC as DV)</u>				.06	.02	3.58
Constant	2.91	.51	5.75	<.001		
RTES-R-S	.25	.13	1.89	.06		
<u>Step 3 (WURFC as DV)</u>				<.001	.10	8.32
Constant	2.35	.51	4.59	<.001		
RSES	.17	.05	3.57	<.001		
RTES-R-S	.10	.13	.80	.42		

Notes. RSES = Research Self-Efficacy Scale; RTES-R-S = Revised Research Training Environment Scale – Short Form; WURFC = Willingness to Use Research in Future Careers

Moderated Mediation Analysis

A moderated mediation analysis was used to test my eighth hypothesis, which predicted that the found indirect effect of student self-efficacy on their willingness to use research skills in future careers will be stronger at higher levels of students' perceived utility of their research skills in future careers, than at lower levels of perceived utility.. In this analysis, RTES-R-S scores were entered as the independent variable, WURFC scores were entered as the outcome variable, RSES scores were entered as the mediator of the RTES-R-S > WURFC relation, and URFC scores were entered as the moderator of the RSES > WURFC relation. The LLCI and

ULCI range of the index of moderated mediation was -.1855 and .0574, and did contain zero, indicating no moderating effect of students' perceived utility of their research skills in future careers on the indirect effect of student self-efficacy on the direct relation between students' reported RTE quality and their level of willingness to use research skills in future careers. My final hypothesis was not supported. The results of this moderated mediation analysis are presented in Table 9.

Table 9

Perceived Utility of Research As a Moderator of Research Self-Efficacy on RTE and Willingness to Use Research in Future Careers

Predictor	<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>F</i>
RTES-R-S on WURFC				<.01	.35	19.26
Constant	-.11	1.43	-.08	.94		
RTES	-.07	.12	-.63	.53		
RSES	.31	.21	1.45	.15		
URFC	.86	.34	2.54	.01		
RSES X URFC Interaction	-.04	.05	-.87	.39		

Note: RTES-R-S = Revised Research Training Environment Scale – Short Form; WURFC = Willingness to Use Research in Future Careers; RSES = Research Self-Efficacy Scale; URFC = Utility of Research in Future Careers

CHAPTER 5. DISCUSSION

The purpose of my study was to explore the impact of undergraduate psychology research training environments (RTEs) on the research self-efficacy, perceived utility of research skills in future work environments, and students' willingness to engage in research activities in future work environments. I explored whether these variables related to one another in expected ways, according to principles of social-cognitive theory (SCT; Bandura, 1986; 1993), social-cognitive career theory (SCCT; Lent, 2013; Lent et al., 1994), and previous literature demonstrating these effects in graduate student samples.

My study served to extend the body of research to research training environments for undergraduate psychology students that has previously found strong impacts of RTEs on doctoral-level psychology students. Despite the fact the majority of psychology undergraduates do not continue on to graduate training (APA, 2011; NCES, 2015), they are expected to receive adequate training in research and statistics skills (APA, 2008; 2016). Moreover, employers in a variety of job industries expect psychology baccalaureates to possess a solid foundation of research and critical thinking skills upon graduation (Hart Research Associates, 2013; National Association of Colleges and Employers, 2012). Therefore, undergraduate psychology students' confidence with, and willingness to engage in, research-based skills post-graduation has real-world consequences for the types of career opportunities for which they will be qualified.

I applied an established model of effective graduate-level psychology RTEs developed by Gelso et al. (1996) to an undergraduate psychology sample, to begin addressing this gap in the literature by examining whether undergraduate research training environments in psychology adequately prepare students to confidently and willingly engage in research-based skills post-graduation.

Below, I will briefly summarize the main findings of my study, and then discuss implications for future research and undergraduate education research training in psychology.

Summary of Findings

Key Variables of Interest. On average, participants reported that they had experienced moderately high quality RTEs during their undergraduate training to date, and they reported moderate to high levels of research self-efficacy as a function of their perceived quality of these research environments. Students also endorsed moderately high levels of the perceived utility of their research skills in future work environments, as well as moderately high levels of willingness to engage in various research activities in future work environments. Generally, inter-correlations among these four variables of interest reflected those found in the literature on doctoral-level RTEs, and supported my SCCT-based hypotheses, but demonstrated lesser magnitudes of correlation.

Although student research self-efficacy was found to mediate the relation between RTE quality and willingness to use research in future work environments, students' perceived utility of their research skills in future work environments was not found to moderate the indirect effect of student research self-efficacy.

The Importance of Research Self-Efficacy

SCT and SSCT indicate self-efficacy strongly impacts individuals' engagement with a task. Specifically, when individuals feel efficacious in completing a given task, they will be more inclined to initiate future engagement in that task, and to persist at that task in the face of setbacks or failures (Bandura, 1986). Within academic and employment contexts, SCCT predicts that self-efficacy in a given domain is key in shaping individuals' career-related interests, such that individuals will be more interested in pursuing a career if they feel confident in their abilities

to complete the tasks that characterize that career (Lent et al, 1994). Overall, my results indicate research self-efficacy exerts an important, primary influence on students' willingness to use acquired research-based activities in their future work environments, even more so than the perceived quality of the RTEs that contributed to their research efficacy. In support of SCCT tenets, research self-efficacy does appear to influence students' goal-directed behavior regarding the future use of their research skills, just as this has been shown to occur in samples of doctoral-level psychology trainees.

The Importance of Willingness to Use Research Skills

Self-efficacy does not operate in isolation, and is presumed to operate in conjunction with outcome expectancies and environmental factors to influence academic- and career-related interests. However, self-efficacy is often regarded as the primary or strongest determinant of domain interests (Lent, 2013). Once interest in a skill domain develops, individuals are more likely to set meaningful goals and take concrete actions to engage in these domain activities. With respect to research and statistical skills, self-efficacy has consistently been related to students' interest in conducting research in the future (e.g, Bieschke et al., 1996; Bishop & Bieschke, 1998; Deemer et al., 2007; Kahn & Scott, 1997; Lambi & Vaccaro, 2010; Phillips & Russell, 1994) and this growing interest, presumably, increases their actual engagement in research activities in future academic or employment settings. Participant level of research self-efficacy was significantly positively correlated with their level of willingness to engage in research activities in future work environments. If this willingness is related to students' *interest* in research activities, willingness may serve as a proxy or even predictive variable of their future engagement in research, mapping onto the typical SCCT interest-goal-action chain (cf. Lent, 2013) via elements of interests or *intended* actions (i.e., goals).

The Importance of the Utility of Research Skills

I investigated individuals' perceptions of how useful they believed their acquired research to be in their future work environments. Given URFC scores were significantly positively correlated with participants' willingness to engage in research in future work environments, this suggests that students' perceived usefulness of their acquired research skills is an important element in shaping undergraduate psychology students' interest in being willing to engage in research activities post-graduation.

The relation between perceived utility and willingness to use research skills in future work environments was strong in magnitude, suggesting that in my sample, students' perceived utility of their acquired research skills may be quite influential in the formation of interests and goals to engage in research in future work environments, perhaps even acting as an outcome expectation of sorts. The results of my moderated mediation analysis, however, did not show the ability of student perceptions of the utility of their research skills in future work environments to moderate the indirect effect of student research self-efficacy on their willingness to use research skills in future work environments. However, SCCT does not predict that efficacy and outcome expectancies will *interact* with one another as they influence interests, but the theory clearly does state the importance of having *both* high efficacy beliefs *and* strong, positive outcome expectancies in order to develop interest in a given activity or career (Lent et al., 1994; Lent 2013). My findings indicate that students' perceived utility of their research skills in future work environments merits further exploration as an explanatory variable on career choice-related behavior, perhaps even in the absence of intrinsic interest or motivation.

The Role of RTEs

Research utilizing Gelso et al.'s (1996) model of graduate-level psychology RTEs as shown the higher the quality of a RTE, the more research self-efficacy and higher interest in conducting future research will be among doctoral psychology students (e.g., Gelso et al., 1996; Kahn & Scott, 1997; Phillips & Russell, 1994). I sought to find if the Gelso et al. elements of quality RTEs translated well for use in an undergraduate psychology student sample, and if the quality of undergraduate RTEs would yield similar effects student research self-efficacy and higher interest in using research skills post-graduation.

I found that students' perceived quality of their RTE was significantly positively correlated with their research self-efficacy as well as a higher perceived utility of their research skills in future work environments. These findings mirrored the relations among RTEs, research self-efficacy, and interest in conducting future research previously demonstrated among doctoral-level psychology students. Interestingly, students' perceived quality of their RTEs only trended toward significance with their willingness to engage in research in future work environments. This finding contrasts with research utilizing doctoral student samples that have shown that high quality RTEs are consistently and significantly associated with increased interest in future research.

However, my results demonstrated that the research self-efficacy associated with students' perceived quality of their RTEs was more important in determining their willingness to engage in research in future work environments. These above findings make sense, given that high-quality RTEs provide students with numerous positive learning experiences that align with Bandura's (1986) four determinants of self-efficacy (cf., Gelso et al., 1996), which ultimately are hypothesized to increase trainees' willingness to engage in research-related behaviors in the

future. Moreover, students' perceived quality of their RTE was also correlated with their perceptions of the utility of their research skills in future work environments. This also makes sense, as quality RTEs should emphasize teaching students about ways that research skills can inform applied work within careers (Gelso et al., 1996). Overall, my findings support the application of the Gelso et al. model of quality RTEs to undergraduate research training in psychology.

Implications for Future Research

Investigators should seek to replicate and clarify my findings, particularly across differentially ranked Carnegie institutions to compare the effects of RTE quality on research-related outcomes across institutional types, to ensure the elements of high quality RTEs are similar across institutional types different from the doctoral granting institutions in which Gelso et al. tested the validity of their model.

Additionally, given the low magnitude relation trending toward statistical significance found between students' perceived quality of their RTE and their willingness to use their research skills in future work environments, researchers may want to employ the full RTES instrument in future investigations. The full measure may be able to account for certain elements in RTEs that were not tapped in the short version, and thereby potentially increase the relational magnitude of RTE quality to student willingness to use their research skills in future work environments, as previously found in samples of graduate students.

Future research should explore additional variables that may be coming into play within the broader conceptual framework that I specified in this study. Expansion of this conceptual framework may allow investigators to examine potential interaction effects among environment-related RTE variables (e.g., student-professor rapport, number and depth of research skills

acquired or research opportunities offered within an RTE) to explore their effects on student research self-efficacy and how these variables fit within the SCCT framework concerning career-related choice behavior.

Related to this, participants' currently anticipated career goals may have impacted relations among RTE quality, self-efficacy and willingness to use their research skills in future work environments. Researchers could in the future assess students' current career goals to determine if these lead to (in)correct estimates by students as to the levels of skills they might need for their chosen post-graduation career paths. An under- or over-estimation of the research skills required for a given career might artificially inflate (or deflate) student research efficacy and their willingness to use their research skills in future work environments. Given the majority of psychology baccalaureates choose to enter human services careers upon graduation (APA, 2011; Prerost, 1981), these careers can involve the application of psychological principles to address the emotional, social, and psychological needs of others (Bureau of Labor Statistics, 2016), just as the employment sites of doctoral-level applied psychologists do. Having psychology students accurately understand what research skills future work environments will require of them can best help them to assess realistic targets for learning, and better estimate their level of efficacy and competency in performing those tasks. This is especially true given that undergraduate psychology students have been shown to be misinformed as far as the skills needed for many of the career choices they entertain (Green, McCord, & Westbrook, 2005). Addressing these issues concerning students' career goals may also shed some light on the true role that RTEs play in establishing career interests and intentions among undergraduate psychology students.

Implications for Undergraduate Training of Psychology Students

As undergraduate education in psychology is the first (and, frequently, the final) stage in students' higher education training, undergraduate training is foundational to any further educational foray (graduate school) or the world of work. As such, the undergraduate RTE is arguably the most important stage of training to investigate and understand. Indeed, my findings indicate that undergraduate RTEs are indeed an important construct worth exploring further. My study provides initial evidence that the nine-ingredient RTE structure proposed by Gelso et al. (1996) can be applied to undergraduate students and that psychology RTEs appear to similarly impact research self-efficacy, perceived utility of research, and willingness to engage in future research across both graduate and undergraduate student samples. Given these findings, educators of undergraduate psychology students should incorporate assessments of the quality of their departmental RTE and individual laboratory RTEs into end-of-semester course and instructor evaluations. An ongoing, systematic assessment of the degree to which quality RTEs are being implemented across the curriculum of a psychology department could provide useful feedback at both the instructor and departmental levels, and lead to an improvement of the quality of research training for undergraduate psychology students. Enhanced research training for undergraduates would also increase the ability of psychology departments to meet APA's (2016) guidelines regarding desired knowledge and skill outcomes for the undergraduate psychology major.

Because most psychology undergraduates do not go on to pursue advanced degrees that require the completion of major research projects like a thesis or dissertation, undergraduate-level psychology instructors would also do well to make their students aware of how valued and expected critical thinking and research skills are to their future employers. Information on this

reality delivered within general orientation or “introduction to the major” courses could highlight specific ways in which students will be expected to use the research-based skills they will be taught in various job industries post-graduation. This would broaden students’ understanding of research techniques as not just a set of skills used to complete class projects or publish an article in a journal, but rather a way of thinking about the world that will allow them to make critical, well-informed decisions in their professional lives. This type of a focus on research as a useful, general professional skill could extrinsically motivate students’ learning by increasing their perceived utility of their research skills in post-graduation work environments, but could also potentially foster an intrinsic valuing of, and interest in, utilizing their critical thinking and research skills throughout their lives.

Limitations

Sample. I used a convenience sample of psychology majors and minors from a large, public, Midwestern R1 research university, therefore my findings may not be generalizable to other samples of psychology students from small, private, or non-research-oriented institutions. At R1 universities, faculty engagement with research is institutionally prioritized (Carnegie Classification of Institutions of Higher Education, 2017) and this emphasis on research may have impacted the quality of the RTE at this institution in a systematic way. Within my sample, the students may have been consistently trained by faculty who highly value research and can effectively convey this value to their undergraduate students. The data gathered in my study paint only a preliminary picture of how the quality of RTEs is influenced by the designation of a university as an R1 institution.

Another issue of import concerns the relatively low levels of pre-existing interest in research that were found in my sample. The SCCT model of career-related choice behaviors

assumes that individuals possess a certain level of pre-existing interest in a task when they are considering whether or not they would like to engage in goal-directed behaviors involving that task. Asking my sample to reflect upon their willingness to engage in behaviors that they reported being previously uninterested prior to exposure to their RTE could have affected their report of overall willingness ratings to use their research skills in future work environments. This variable is one that researchers will want to better control for in future investigations

Measures. Some of the items included in the *Revised Research Training Environment Scale – Short Form* presume that respondents have been exposed to various training experiences and opportunities. However, some of these items are unlikely to be universally experienced by respondents at various stages of their undergraduate research training. For example, college freshmen are less likely than college seniors to have personal experience working in a faculty research lab; subsequently, questions related to research collaboration with faculty may not have been applicable to my entire sample. In this case, participant responses to some RTES-R-S items may have reflected their *assumptions* about how well their RTE may incorporate various opportunities, rather than reflecting the quality of *actual experience* with these opportunities. Investigators should inquire as to whether undergraduate students have actually been exposed to the situations they are being asked to assess.

The *Research Self-Efficacy Scale* assumes that research self-efficacy is a formative construct; that is, the greater the number of research-related tasks students have experienced and feels competent to conduct, the greater their sense of overall research self-efficacy. However, research self-efficacy may also serve as a *reflective* construct; that is, a greater overall sense of research self-efficacy leads individuals to believe that they can competently conduct research-related tasks to which they have not yet been exposed. In the future assessment of research self-

efficacy, investigators should inquire about undergraduate students' *previous experience* with the different tasks listed in the research self-efficacy inventories, as well as assessing their self-efficacy to engage in various research tasks in the future. Comparing trends in exposure and efficacy responses may shed light on whether research self-efficacy behaves as more a formative or a reflective construct.

The measures I developed for this study, the *Utility of Research in Future Careers* and *Willingness to Use Research in Future Careers*, were intended to serve as single-factor, global measurement tools that can assess these important research-related outcomes. Exploratory factor analyses (with item trimming) indicated that the *Utility of Research in Future Careers* measure had a stable, single factor structure with strong reliability. The *Willingness to Use Research in Future Careers* measure, even with item trimming and observed high internal reliability, required a forced-fit solution on to a single factor, given that a small number of items cross-loaded strongly on a second emergent factor.

Overall, these measures demonstrated adequate construct validity and reliability, but the *Willingness to Use Research in Future Careers* measure, requiring a forced-fit solution to be reduced to a single factor, is in need of refinement. Conceptually, items on the WURFC address different phases of a research project, from conceptualization of an idea to implementation of a design to synthesis of results. It is unclear whether different subsets of research-based skills are differentially impacted by RTEs. Also of note is the possibility that the *Willingness to Use Research in Future Careers* measure could tap multiple elements in the SCCT interest-goal-action chain. Clarification by researchers in future investigations of the position within the SCCT interest-goal-action chain of the variable of students' willingness to use research skills in future work environments is necessary.

Due to the cross-sectional design of my study, I did not assess participants' *actual* engagement with research-based activities post-graduation. Instead, I assessed their perceptions of their *willingness* to do so post-graduation. Longitudinal or follow up designs that assess students' actual career-related engagement in research behaviors are needed to adequately address this important variable.

Last, and related, I assessed students' research self-efficacy, which does not equate with their actual level of competency in executing research-based skills. Researchers should, in future investigations, examine the relation between students' research self-efficacy *and* their actual competency in executing research-based skills, in terms of their effect on students' willingness to use research skills in future work environments.

Conclusions

In short, the Gelso et al. (1996) model of quality RTEs is worth investigating further with undergraduate samples, as the quality of RTEs appears to be directly associated with student research self-efficacy and students' perceived utility of their research skills in future work environments. By applying this well-established model of RTEs to undergraduate education, educators and researchers can begin to understand the nuances of how to enhance undergraduate research training in psychology and adequately prepare psychology undergraduate students for their chosen careers post-graduation. An ideal undergraduate psychology program will offer numerous opportunities for solid and rewarding research experiences and appropriate learning challenges that will equip trainees with valuable professional skills. Further, enhanced undergraduate RTEs will also serve to inculcate sound research and statistical skills into those undergraduates who move on to study in graduate-level psychology training programs, and allow them to become well-balanced and skilled scientist-practitioners.

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APPENDIX A

INITIAL EMAIL: CALL FOR PARTICIPANTS

(sent to psychology majors and minors who are on the email list provided by the Registrar's Office)

Subject: Request for Psychology Majors and Minors to Participate in Research Study.

Hello!

My name is Kaitlyn Burke and I am a doctoral student in Counseling Psychology at Iowa State University. I am conducting a study under the guidance of Dr. Loreto Prieto to better understand how undergraduate psychology programs affect students' attitudes toward psychological research as well as their confidence in their ability to conduct research-related tasks. We hope that his study may advance our knowledge of best practices for educating and training undergraduate students in psychology.

You will have *full and complete* anonymity if you participate in this study.

You **must** meet the following criteria to participate in this study:

1. Must be 18 years of age or older
2. Must currently be registered as a Psychology major or minor at Iowa State.

This study has been approved by the Iowa State University Institutional Review Board (IRB), and all human subjects' rights will be observed.

This survey will take no longer than 20 minutes to complete. If you are interested in participating in this research study, please click the following link:

(Qualtrics link here)

If you have any questions about the materials or the study, please feel free to contact me at ksburke@iastate.edu (515-294-8794) or my advisor, Dr. Loreto Prieto, at lprieto@iastate.edu (515-294-2455). If you have questions about your rights as a research participant, please email or call the Iowa State University Institutional Review Board (IRB@iastate.edu; 515-294-4566).

Thank you!

Kaitlyn Burke, B.S.
Counseling Psychology Doctoral Student
Psychology Department
Iowa State University

APPENDIX B

FOLLOW-UP EMAIL: CALL FOR PARTICIPANTS

(sent to psychology majors and minors who are on the email list provided by the Registrar's Office)

Hello!

My name is Kaitlyn Burke and I am a doctoral student in Counseling Psychology at Iowa State University.

A few weeks ago, I sent an email to all psychology majors and minors on the ISU campus to invite them to participate in my study. If you have already participated; thank you for your time! If you have not yet participated in the study, I hope you will read on and please consider participating!

To date, participation in this study has not been as high as needed, so I wanted to send this follow up to psychology students, to encourage more participation.

As an incentive, we are also offering to participants an opportunity to enter a drawing for three separate \$25.00 gift certificates to Amazon.com!

You will have *full and complete* anonymity if you participate in this study.

You **must** meet the following criteria to participate in this study:

1. Must be 18 years of age or older
2. Must currently be registered as a Psychology major or minor at Iowa State.

This study has been approved by the Iowa State University Institutional Review Board (IRB), and all human subjects' rights will be observed.

This survey will take no longer than 20 minutes to complete. If you are interested in participating in this research study, please click the following link:

(Qualtrics link here)

If you have any questions about the materials or the study, please feel free to contact me at ksburke@iastate.edu (515-294-8794) or my advisor, Dr. Loreto Prieto, at lprieto@iastate.edu (515-294-2455). If you have questions about your rights as a research participant, please email or call the Iowa State University Institutional Review Board (IRB@iastate.edu; 515-294-4566).

Thank you!

Kaitlyn Burke, B.S.
Counseling Psychology Doctoral Student
Psychology Department
Iowa State University

APPENDIX C

INFORMED CONSENT DOCUMENT

Title of Study: Research Self-Efficacy among Undergraduate Psychology Students

Investigators: Kaitlyn Burke, BS (PI); Loreto Prieto, PhD (Supervising Faculty Advisor)

This is a research study. Please take your time in deciding if you would like to participate.

Introduction

The purpose of this study is to better understand how undergraduate psychology programs affect students' attitudes toward psychological research as well as their confidence in their ability to conduct research-related tasks.

You are being invited to participate in this study because you are an undergraduate student who is registered as either a major or a minor in psychology at Iowa State University. You should not participate if you are under age 18 or if you are *not* currently registered as a major or a minor in psychology at Iowa State University.

Description of Procedures

If you agree to participate, you will be provided with access to research materials, via a link to an online Qualtrics survey, placed within the invitation to participate that has been emailed to you. Your responses to the survey will be confidential, no identifying information will be collected, no IP or other computer addresses will be obtained, and all data will be reported on only in group form. You will have full and complete anonymity in completing this study.

You will be asked to complete a series of items assessing your feelings about your psychology education at Iowa State University; your confidence in your ability to conduct research-related tasks; and your attitudes toward conducting psychological research.

Risks or Discomforts

We do not anticipate this study will cause participants any discomfort whatsoever. If you should feel any discomfort answering any specific items in the study, you may skip them. Additionally, you may end your participation in the study at any point without penalty. Listed below are several resources that you can utilize if you feel discomfort during or after your participation in this study.

- Thielen Student Health Center (ISU: 515-294-5801)
- Student Counseling Services (ISU: 515-294-5056)
- Central Iowa Psychological Services (Ames: 515-233-1122, Des Moines: 515-222-1999)

Benefits

There will be no direct benefits to you by participating in the study. However, we hope to gather information that could help researchers better understand best practices for educating and training undergraduate students in psychology.

*Costs and Compensation

You will not be compensated or have any costs from participating in this study, however, as an incentive, you will have the option of entering a drawing for one of three \$25.00 gift certificates to Amazon.com. If you are chosen as a winner, you will need to complete a form to receive payment. Please know that payments may be subject to tax withholding requirements, which vary depending upon whether you are a legal resident of the U.S. or another country. If required, taxes will be withheld from the payment you receive.

Participant Rights

Participating in this study is completely voluntary. You may choose not to take part in the study or to stop participating at any time, for any reason, without penalty or negative consequences. You can skip any questions that you do not wish to answer by using the forward arrow buttons at the bottom of each page on the Qualtrics survey.

Confidentiality

Research records and data will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy study records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: 1) no information that could directly identify you will be solicited; 2) electronic research materials (data) will be stored in a locked file cabinet in the locked lab of the supervising faculty member; and 3) all raw data will be stored on encrypted computers. If the results are published, your identity will remain confidential; no individual will be identified in any research report, as all data will be described in group form.

Questions

You are encouraged to ask questions at any time about this study.

- For further information *about the study*, contact Kaitlyn Burke at ksburke@iastate.edu (515-294-8794) or Dr. Loreto Prieto at lprieto@iastate.edu (515-294-2455).
- If you have any questions *about the rights of research subjects*, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115.

.....

Participant Signature

By checking the “Yes, I agree to participate” box, I am confirming that I have read and fully understood the informed consent form, that I am currently registered as a psychology major or minor at Iowa State University, and that I am at least 18 years of age. I voluntarily agree to participate in this study. If I have questions, I have been given the time to contact the researchers and obtain answers. By checking the “No, I do not agree to participate” box, you will immediately end your participation in this study. We strongly recommend that you print his form for your records.

Yes, I agree to participate.

No, I do not agree to participate.

*Section was added between initial and follow-up calls for participants

APPENDIX D

DEMOGRAPHICS AND ACADEMIC INFORMATION

Demographics

Sex Male _____ Female _____ Other (please indicate) _____
Age _____

Cultural Affiliation (mark your primary identity)

_____ American Indian or Alaskan Native	_____ Asian American
_____ African or African American (Black)	_____ Hawaiian or Other Pacific Islander
_____ Hispanic/Latino American	_____ European American (White)
_____ Middle Eastern American	_____ International (indicate nationality)
_____ Bi/Multi-racial	_____ Other (indicate) _____

Academic Information

Year in School Freshman _____ Sophomore _____ Junior _____
 Senior _____ Other _____

Degree area

_____ Psych Major (BA/BS) _____ Psych Minor _____ Other (indicate) _____

_____ For how many semesters have you had a major/minor in psychology?

_____ Number of **psychology** classes completed (*not* counting this semester)?

_____ Number of **psychology** classes you are currently taking this semester?

_____ Current GPA for *all completed* psychology courses completed at ISU

Are you a transfer student (e.g., community college, other 4-year school)? **Yes No**

_____ If *yes*, how many psychology courses did you complete at that school?

Please indicate, using the scale below, the extent to which you agree with the following statements:

1	2	3	4	5
Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree

1. I have always enjoyed research and statistics, even before coming to college.

APPENDIX E

RESEARCH TRAINING ENVIRONMENT SCALE – SHORT FORM (RTES-R-S)

Below is a series of statements concerning the research training *you have received here in your undergraduate psychology program at Iowa State University*. Respond to these items with *only* your ISU experiences in mind.

Read the following definitions *carefully*.

When responding to the following items, “*research*” includes the following activities *completed either individually or in a group*:

1. Designing and/or conducting research projects in a psychology class or in a psychology professor’s lab;
2. Preparing papers or critical reviews of psychology literature in a psychology class or in a psychology professor’s lab;
3. Conducting program evaluations or needs assessments in a psychology class or in a psychology professor’s lab;
4. Authoring and/or making presentations at local, regional, or national psychology conferences;
5. Participating as a member of a psychology research team engaged in any of the above activities; and
6. Advising the psychology research projects of others.

Based upon the above definition of “*research*,” respond to the following statements **in terms of your undergraduate psychology program experiences here at ISU**. It is important to answer each item, even if some of the items are difficult to answer.

Use the scale below to respond to the following items:

1	2	3	4	5
Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree

- *1. Many of our ISU psychology faculty do not seem to be very interested in doing research.
2. The ISU psychology faculty does what it can to make research requirements in classes and labs as rewarding as possible.
3. My psychology professors, in courses and in lab work, understand and accept that any piece of research will have its methodological problems and shortcomings.

4. I have felt encouraged during my undergraduate training in psychology to find and follow my own personal research interests.
- *5. Statistics courses in the psychology curriculum at ISU are taught in a way that is insensitive to current knowledge as a student.
6. The psychology faculty do a good job, in general, of showing me how statistics are actually used in psychological research and the real world of work.
7. I have a sense that being on a research team in the psychology department can be fun, as well as intellectually stimulating.
- *8. The psychology faculty use an extremely narrow range of research methods.
- *9. Generally, I do not have an intellectually stimulating and interpersonally rewarding relationship with the psychology faculty who teach me about research or who have me conduct research with them in their labs.
- *10. It is unusual for me, in the psychology department, to collaborate on research with more advanced undergraduate students, graduate students, or psychology faculty on research projects.
- *11. I have the feeling, based on my undergraduate experience in psychology, that any research I do needs to be completely original and revolutionary for it to be acceptable.
12. The psychology faculty seem interested in understanding and teaching me about how research can be related to the real work world.
- *13. Most psychology faculty do not seem to really care if I am genuinely interested in research.
14. During psychology coursework, I have been taught a wide range of research methods (e.g., qualitative, quantitative, field, and laboratory approaches).
- *15. In the psychology department, I feel that my research ideas are squashed during the process of working with psychology faculty members, so that the finished project no longer resembles my original idea.
16. In the psychology department, students are encouraged to start thinking about research from the moment they enter the psychology major.
- *17. In the psychology department, I have rarely been taught to use research findings to inform my work in the real world.
18. The psychology faculty show excitement about conducting research and scholarly activities.

*Reverse-scored item

APPENDIX F

RESEARCH SELF-EFFICACY SCALE (RSES)

Using the following scale, rate the degree of confidence you have in your ability to successfully perform each of the following tasks.

0	1	2	3	4	5	6	7	8	9	10
No Confidence			Moderate Confidence				Complete Confidence			

1. Follow ethical principles of research.
2. Brainstorm areas in the psychology literature to read about.
3. Conduct a computer search of the psychology literature in a particular area.
4. Locate hard copies of articles/references in the library.
5. Find needed articles that are *not* available in the library.
6. Evaluate journal articles in terms of their theoretical approach, experimental design and data analysis techniques.
7. Participate in generating collaborative research ideas.
8. Work interdependently in a research group.
9. Discuss research ideas with peers.
10. Consult senior researchers for ideas.
11. Decide when to quit searching for articles based on obtaining sufficient materials for research/writing.
12. Decide when to quit generating ideas based on your review of the literature.
13. Synthesize current literature.
14. Identify areas in need of research, based on reading the psychology literature.
15. Develop a logical rationale for your particular research idea.
16. Generate research questions.
17. Organize your research ideas in writing.
18. Effectively edit your writing to make it logical and succinct.
19. Present your research ideas orally or in written form to an adviser or group.
20. Utilize criticism from reviews of your research ideas.
21. Choose an appropriate research design.

22. Choose methods of data collection.
23. Be flexible in developing alternative research strategies.
24. Choose measures of dependent and independent variables.
25. Choose appropriate data analysis techniques.
26. Obtain approval to pursue research (e.g., from a Human Subjects committee, Animal Subjects committee, etc.).
27. Obtain appropriate participants/general supplies/equipment for research.
28. Train assistants to collect data.
29. Perform experimental research procedures.
30. Ensure data collection is reliable across trial, rater, and equipment.
31. Supervise research assistants.
32. Attend to all relevant details of data collection.
33. Organize collected data for analysis.
34. Use computer software to prepare text (word processing).
35. Use computer software to generate graphics.
36. Use computer software for data analysis.
37. Develop computer programs to analyze data.
38. Use an existing computer package (e.g., SPSS, SAS, R) to analyze data.
39. Interpret and understand statistical output.
40. Organize a manuscript according to appropriate professional format and standards.
41. Report results in both narrative and graphic form.
42. Synthesize results with regard to current psychology literature.
43. Identify and report the limitations of a study.
44. Identify implications for future research.
45. Design visual presentations (posters, slides, graphs, pictures).
46. Orally present results to your research group or department.
47. Orally present results at a regional/national meeting or conference.
48. Defend research results to a critical audience.
49. Write a manuscript for publication.

APPENDIX G

UTILITY OF RESEARCH IN FUTURE CAREERS (URFC)

Please indicate your level of agreement with each of the following statements, using the scale below:

1	2	3	4	5
Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree

- *1. I am a subjective person, so the objectivity of research and statistics feels strange to me.
- *2. I wonder why I have to do research and statistics when in actual life I will never use them.
- 3. Even though my future is about ideas, research and statistics are still valuable to me.
- 4. Research and statistics are worthwhile.
- *5. I feel research and statistics are a waste of time.
- *6. I lived this long without knowing research methods and statistics, so I should not have to learn them now.
- 7. I want to learn to like research and statistics.
- *8. Research and statistics are for people who have a natural leaning toward math.
- *9. Conducting research and doing statistics is a pain I could do without.
- *10. I wish the research methods and statistics requirements would be removed from the psychology major..
- 11. I understand why someone in studying psychology needs skills in research and statistics.
- *12. I do not see why I have to learn research methods and statistics; they will have no use in my career.
- *13. I cannot tell you why, but I just do not like conducting research and doing statistics.
- 14. Research and statistical figures are easy for the average person to understand.
- *15. Emotional and social skills are so important in my future profession that I do not want to clutter my thinking with something so removed from that as research and statistics.
- 16. Even if I never end up using research methods and statistics, I still think it is important to take research methods and statistics courses.

 *Reverse-scored item

APPENDIX H

REVISED UTILITY OF RESEARCH IN FUTURE CAREERS (URFC)

Please indicate your level of agreement with each of the following statements, using the scale below:

1	2	3	4	5
Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree

- *1. I am a subjective person, so the objectivity of research and statistics feels strange to me.
- *2. I wonder why I have to do research and statistics when in actual life I will never use them.
- 3. Even though my future is about ideas, research and statistics are still valuable to me.
- 4. Research and statistics are worthwhile.
- *5. I feel research and statistics are a waste of time.
- *6. I lived this long without knowing research methods and statistics, so I should not have to learn them now.
- *7. Conducting research and doing statistics is a pain I could do without.
- *8. I wish the research methods and statistics requirements would be removed from the psychology major..
- 9. I understand why someone in studying psychology needs skills in research and statistics.
- *10. I do not see why I have to learn research methods and statistics; they will have no use in my career.
- *11. Emotional and social skills are so important in my future profession that I do not want to clutter my thinking with something so removed from that as research and statistics.
- 12. Even if I never end up using research methods and statistics, I still think it is important to take research methods and statistics courses.

*Reverse-scored item

APPENDIX I

WILLINGNESS TO USE RESEARCH IN FUTURE CAREERS (WURFC)

Using the scale below, rate the following statements. Do not think about whether you are good at doing the activity; rather, indicate **how willing you are to do each activity as a part of your future career**.

1	2	3	4	5
Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree

In my future career, I would be willing to...

1. Develop research ideas to address an existing problem.
2. Locate and read existing research articles concerning an existing problem.
3. Critically evaluate the quality of existing research in an area.
4. Integrate information from multiple sources in the research literature.
5. Design a research study.
6. Carry out a research study.
7. Perform basic statistical analyses (e.g., means, std deviations, correlations, etc.).
8. Perform more precise statistical analyses (e.g., T-tests, ANOVAs, regressions, etc.).
9. Summarize your research results.
10. Write a report of your research results.
11. Identify and understand limitations of your research.
12. Understand how your research fits with other research in an area.
13. Use research results to make more informed decisions concerning an existing problem.
14. Suggest practical solutions concerning an existing problem, based on research findings.

APPENDIX J

REVISED WILLINGNESS TO USE RESEARCH IN FUTURE CAREERS (WURFC)

Using the scale below, rate the following statements. Do not think about whether you are good at doing the activity; rather, indicate **how willing you are to do each activity as a part of your future career.**

1	2	3	4	5
Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree

In my future career, I would be willing to...

1. Develop research ideas to address an existing problem.
2. Critically evaluate the quality of existing research in an area.
3. Integrate information from multiple sources in the research literature.
4. Design a research study.
5. Carry out a research study.
6. Perform basic statistical analyses (e.g., means, std deviations, correlations, etc.).
7. Perform more precise statistical analyses (e.g., T-tests, ANOVAs, regressions, etc.).
8. Summarize your research results.
9. Write a report of your research results.
10. Identify and understand limitations of your research.
11. Understand how your research fits with other research in an area.

APPENDIX K

INSTRUCTIONS FOR ENTRY INTO RAFFLE FOR AMAZON GIFT CARD

Qualtrics page appearing at the end of research materials***Participant Interest in Drawing***

_____ Yes, I would like to learn about the drawing (you will be directed to instructions and information to participate in the drawing).

_____ No, I am not interested in the drawing (or, you can simply close your web browser).

Next Qualtrics page for those who responded "Yes" to having an interest in the drawing**Information on Drawing Entry and Protection of Drawing Information*****Drawing Procedures***

Entry in the drawing is a *completely* separate process than completing research materials you just finished. The instructions below show a code and procedure to use to validly enter the drawing. This is a general code and is not unique to any participant. This drawing procedure ensures that the email address you use to enter the drawing (which is all that is necessary for you to provide) **will not be connected in any way to the research materials you have completed.**

Instructions to Enter Drawing

Drawing participants need to email the faculty supervisor at (lprieto@iastate.edu) with a request to be entered into the drawing, **and use the code "KBLP123" as the subject header for the email.** You are *strongly* encouraged (although it is not required) to use a non-ISU email address at which you can be later contacted if you win. **We also strongly recommend that any and all identifying information in your entry email be deleted (e.g., use no names, addresses, phone numbers, academic information, or signature blocks).**

After all data has been collected, three individual participants will be randomly selected to win a prize of a \$25.00 gift certificate to Amazon.com. The winners will be chosen by use of a random number scheme. **The selected winner will be allowed two calendar weeks after notification of winning to respond to the faculty supervisor and complete necessary paperwork.** Upon notification of winning (done via an email from Dr. Prieto with an attached Research Participant Receipt Form [RPRF]), each winner will be required to fill out and return to Dr. Prieto an original copy of a completed and signed RPRF in order to receive her or his prize. Then, the prize will be mailed (via USPS return receipt mail) to the winner at an address s/he specifies. **If within the two week period after notification of winning (as determined by email time stamps), there is no response from, a tardy response from, or no return to Dr. Prieto of a completed and signed RPRF, a new winner will be chosen by random number and the initially chosen winner will be deemed as unresponsive and disqualified.**

The odds of winning depend on the number of drawing entrants and cannot be determined ahead of time; however, it is possible that the odds of winning could be as high as 50 to 1.

Protection of Drawing Entrants' Information

Participants in the drawing will have their email addresses stored within a file that is wholly separate from any and all research materials concerning this study. Once an email address entry is recorded in the general entry file, the entry email itself will be deleted. The email addresses of drawing participants will be held strictly confidential, on a password-protected and encrypted computer. Absolutely no retention or storage of emails in the lab of the supervising faculty member will occur. There will be **absolutely no way** for anyone to link the email address of any drawing entrant to any of the research materials in the study. Once all winners have been confirmed, submitted a completed and signed RPRF, sent their prize, and the proper USPS return receipt sent to the faculty supervisor, the entire file of entrant email addresses will be deleted.

Details About the Research Participant Receipt Form (RPRF)

The winners of the drawing will be contacted via the email addresses they provided to report a valid entry code and request to enter the drawing. **An official and original Iowa State University Research Participant Receipt Form (RPRF), asking for the winner to acknowledge by her/his name and signature the reception of the gift certificate must be completed for the winner to obtain the prize.** This RPRF will be sent via email attachment to the participant when s/he is notified of being the winner. Details concerning the RPRF can be found at: <http://www.controller.iastate.edu/controller/overview.pdf>

The winners will complete the necessary information, sign the RPRF, and return it to Dr. Loreto Prieto by campus mail at an address he will provide in the notification of winning email. Upon Dr. Prieto's reception of the signed RPRF, the gift certificate will be mailed to the winner at a campus mail or valid USPS address s/he provides. The RPRF itself will be treated in a strictly confidential manner and upon reception will be immediately submitted to the Iowa State University Controller's Office. A copy of the RPRF will also be kept in locked storage in a locked filing cabinet, in the locked lab belonging to the faculty supervisor, separate from any research records concerning this study, for 5 years as required by ISU policy and the American Psychological Association's ethical code. The Department of Psychology, ISU Controller's Office, ISU Institutional Review Board, or any other ISU entity allowed under applicable policies or law, may have access to your completed RPRF for accounting or quality assurance purposes.

This drawing portion of the project has been approved by the Iowa State University Institutional Review Board (IRB). If you have any questions about the drawing please feel free to contact Dr. Prieto at (lprieto@iastate.edu; 515-294-2455). If you have questions about your rights as a research participant please email or call the Iowa State University Institutional Review Board (IRB@iastate.edu; 515-294-4566). If you have questions about the RPRF, please contact Ms. Kathy Dobbs at the ISU Controller's Office (kadobbs@iastate.edu; 515-294-6653).

APPENDIX L

INSTITUTIONAL REVIEW BOARD APPROVAL FORM

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
3420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566

Date: 9/19/2017

To: Kaitlyn Burke
W112 Lagomarcino Hall

CC: Dr. Loreto Prieto
W218 Lagomarcino Hall

From: Office for Responsible Research

Title: Research Self-Efficacy Among Undergraduate Psychology Students

IRB ID: 17-444

Study Review Date: 9/19/2017

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
 - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
 - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.