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Career Self-Efficacy: Exemplary Recent Research and Emerging Directions

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This article discusses what the author views as exemplary work illustrating important directions in research on the applications of Bandura's self-efficacy theory to career theory, assessment, and counseling. The author begins with research on measuring career self-efficacy, following which research testing the postulated behavioral consequences of career self-efficacy expectations is discussed. Notable studies of the learning experiences postulated to lead to the development of strong expectations of efficacy are reviewed. Studies of the possible relationships of efficacy expectations to parallel measures of vocational interests are included. Finally, exemplary studies applying the theory to the career development of diverse groups, studies of interventions designed to increase career self-efficacy, and new research attempting to integrate self-efficacy theory with personality constructs are included. The article is not intended as a comprehensive review of this research but rather to provide highlights of some of the excellent work being done in this area.

Keywords: career self-efficacy, Bandura's self-efficacy theory, social cognitive career theory, career decision self-efficacy

In this article, I review a selection of what I believe to be exemplary research studies related to the exploration of career self-efficacy expectations. This area of career-related individual differences has gained a great deal of interest from both researchers and practitioners in the 25-plus years since it was introduced to vocational psychology in the article of Hackett and Betz (1981). A special issue of *Journal of Career Assessment (JCA)* in February 2006 contained many excellent review and empirical articles discussing different aspects of research on career self-efficacy. Among other conclusions, Gore (2006) noted that research on self-efficacy expectations is so popular that 11% of all articles published between 2001 and 2006 in *JCA*, *Journal of Counseling Psychology*, and *Journal of Vocational Behavior* included a reference to self-efficacy in their titles or abstracts.

In selecting articles to include herein, I used a number of criteria. A good theory, of course, must propose clear, measurable constructs and testable interrelationships among constructs. Bandura's (1977) original theory of self-efficacy expectations did exactly that. It proposed that four sources of efficacy information, or

background learning experiences, led to the development of self-efficacy for a given behavior or domain of behavior. Self-efficacy, in turn, influenced three major outcomes or criterion behaviors—approach versus avoidance (as “approach” is often conceptualized as “choice” in vocational or career behavior parlance), level of performance, and persistence. Thus, self-efficacy for a domain such as mathematics would be postulated to lead to choice (versus avoidance) of math coursework and college majors, to facilitate performance on math assignments and exams, and to lead to persistence in the face of obstacles or discouragement. Thus, the constructs to be measured include the sources of efficacy information, domain-specific self-efficacy expectations, and the outcomes of self-efficacy expectations. Relationships to be examined are those of learning experiences to self-efficacy and of self-efficacy to behavioral outcomes. Also examined will be studies of interventions using the four sources of efficacy information, as this is one of the most important and useful aspects of self-efficacy theory for career counseling and career interventions.

In addition, I will include work related to the relevance of self-efficacy theory to underserved groups. The first work on career self-efficacy theory (Hackett & Betz, 1981) was motivated by the observation that differential access to the sources of learning experiences could be helpful in understanding women’s continued underrepresentation in careers in the sciences, mathematics, and engineering as well as in other traditionally male-dominated career fields. Likewise, differential access to learning experiences may be relevant to the career choices and adjustment of people of color, lower socioeconomic status (SES) groups, and people with disabilities, among others.

Although my selection of studies began with those explicitly testing Bandura’s self-efficacy theory, I also included studies in the area of social–cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994, 2000) because many significant findings regarding career self-efficacy resulted from research based on that expanded theory. Specifically, the large and important body of research on the relationships of self-efficacy and interests and some discussion of the work on outcome expectations is included herein. Finally, I include recent work on the relationship of self-efficacy to personality. I did not include work on the related concepts of competency beliefs (e.g., Lent, Tracey, Brown, Soresi, & Nota, 2006; Tracey, 2002) nor research on counseling self-efficacy (e.g., Daniels & Larson, 2001; Larson & Daniels, 1998).

RESEARCH: MEASUREMENT ISSUES

To study a theory, we must first measure its constructs. The central concepts of the theory are behavior-domain-specific, so measures must be developed to assess the behaviors of interest (see Betz & Hackett, 2006; Lent & Brown, 2006). If we are interested in mathematics self-efficacy, for example, we need not only a measure of math self-efficacy but also measures of learning experiences relevant to the development of strong mathematics self-efficacy expectations and

indices of choice, performance, and/or persistence in math-related coursework, majors, and careers. Lent and Brown (2006) recently suggested four categories for organizing measures of self-efficacy itself. Content- or task-specific self-efficacy domains measured include science and engineering majors and careers (Lent et al., 2001; Lent et al., 2003), other academic disciplines such as social studies, art, and English (Fouad, Smith, & Zao, 2002), the six themes of Holland's theory (Lindley & Borgen, 2002), basic dimensions of vocational activity such as leadership and public speaking (Rottinghaus, Betz, & Borgen, 2003), research competencies in counseling psychology (Bieschke, 2006), and general academic self-efficacy (Gore, 2006).

Coping self-efficacy, Lent and Brown's (2006) second category, has been measured by Byars-Winston (2006) and by Lent et al. (2003). Process self-efficacy includes skills necessary for career exploration, decision making, and implementation, such as career decision self-efficacy (see Betz, Hammond, & Multon, 2005). Self-regulatory self-efficacy could refer to one's beliefs in one's abilities to organize and manage one's time and workload to facilitate success or career adaptability skills (see Griffin & Hesketh, 2005; Rottinghaus, Day, & Borgen, 2005).

The first noteworthy measurement study that I wish to mention is that of Forester, Kahn, and Hesson-McInnis (2004), who reported the results of confirmatory and exploratory factor analyses of three measures of research self-efficacy. This study represents several desirable features—examination of the psychometric quality (in this case, factor structure) of several measures of an appealing and potentially useful concept, appropriate and sophisticated analyses using a sample large enough to yield stable parameter estimates, and thus trustworthy findings, and well-described and conservative approaches to the various decisions required in factor analysis (e.g., number of factors to extract, method of rotation, and means of assigning items to factors).

Research self-efficacy has been of considerable interest, at least in part because it is relevant to the career outcomes of faculty and graduate students in psychology and other fields. Forester et al. (2004) studied three existing inventories, the Research Self-Efficacy Scale (Bieschke, Bishop, & Garcia, 1996), for which principal components analysis yielded four components; the Self-Efficacy in Research Measure (Phillips & Russell, 1994), which has four subscales; and the Research Attitudes Measure (O'Brien, Malone, Schmidt, & Lucas, 1998), for which principal components analysis yielded six components.

Forester et al. (2004) obtained a sample of 1,004 graduate students in applied psychology programs. They began with a confirmatory factor analysis (CFA) of each of the inventories separately, finding poor fit of each to its postulated factor structure. They then used exploratory factor analysis (EFA) to evaluate the structure of the combined total of 107 items (across the three inventories). Using well-established criteria for determining the number of factors to extract, they arrived at a four-factor structure in which 58 items (of the 107) loaded at least .50 on one and only one factor. The four resulting factors were: data analysis self-efficacy, research integration self-efficacy (e.g., literature reviews), data collection self-efficacy, and technical writing self-efficacy. The authors do not presume to suggest that these 58

items should be used instead of one of the existing instruments, and it is important to now use CFA to examine the generalizability of their structure. But the possible utility of the four-factor structure for both research and practical purposes is appealing. For a recent review of studies on research self-efficacy, see Bieschke (2006).

In a related vein, a recent study by Mullikin, Bakken, and Betz (in press) focused on the ultimate goal of examining whether the underrepresentation of women and people of color among tenure track faculty in medical schools could be partially because of lower research self-efficacy in comparison to White male faculty. They developed the Clinical Research Appraisal Inventory, which following item and factor analyses, included scales describing self-efficacy for eight areas of research tasks including study design and analysis, research funding, and presenting and reporting a study. Alphas for the eight scales ranged from .89 to .97. There were significant gender differences in favor of men on the "Study Design and Analysis," "Reporting and Presenting a Study," and "Conceptualizing a Study" scales, and scores increased linearly with academic rank from fellows to assistant professors to tenured faculty members in medical schools. There were no differences as a function of race or ethnicity, but there were only 69 faculty of color represented, so the generalizability of this finding must be considered an open question. This study is notable in extending self-efficacy theory to understanding and, eventually, interventions within an employed sample in an occupation in which serious concerns about the representation and progress of women and minorities remain.

Although the measurement of outcome expectations has received much less attention than has the measurement of self-efficacy per se (Fouad & Guillen, 2006; Swanson & Gore, 2000), it remains important as it is part of Bandura's social cognitive theory and is an integral part of SCCT. One series of studies commendable in its development of measures of outcome expectations, as well as measures of self-efficacy, interests, and choice goals, is the work of Fouad and Smith and their colleagues (Fouad et al., 2002; Smith & Fouad, 1999).

Smith and Fouad (1999) took a comprehensive approach to the measurement of outcome expectations by examining expectations for several different specific outcomes for each of four subject matter areas typically included in a high school curriculum (math/science, social studies, English, and art). Item examples are: "If I do well in my art classes, I will have more career opportunities"; "If I do well in science classes, I will be better prepared for the work world"; and "If I put a lot of work into my English/language arts classes, I will feel that I have accomplished something worthwhile." The number of items per subject matter ranged from 7 (English) to 10 (social studies). They also developed measures of self-efficacy, interests, and goals for the four subject matter areas. Psychometric evaluation of these four sets of scales began with CFA in which the fit of the data (based on 952 college students) to a model containing eight components (four constructs and four subject areas) was compared to other less complex models. Analyses indicated that fit for the eight-factor model was superior to that for other models examined. As

described in Fouad et al. (2002), the values of alpha for the four outcome expectations measures ranged from .81 (for both math/science and English) to .87 for art. The measures of self-efficacy, interests, and goals were also highly reliable.

Fouad et al. (2002) went on to examine four structural models, one for each subject matter area. In terms of self-efficacy, they found that it was related to interests and to outcome expectations. Its relationships to choice goals were indirect, through its relationship to interests and to outcome expectations, which were, in turn, related to choice goals. There were a few differences in paths for the four subject matter areas, but the main findings were consistent across them. These studies are exemplary in that they explicitly acknowledge and act on the requirement in self-efficacy research for parallel measures of the constructs. Furthermore, by developing measures for four different subject matter areas, comparisons of model fit as a function of subject matter were made possible.

RESEARCH: HYPOTHESIS TESTING

One major set of hypotheses examined involves the relationship of self-efficacy expectations to its postulated consequents of choice (“approach versus avoidance”), performance, and persistence. One noteworthy study is that of Lent et al. (2003) of choice goals and persistence for 328 students enrolled in an introductory engineering class. They measured engineering self-efficacy and outcome expectations and technical interests, and assessed choice of and persistence in an engineering major in the course of three academic semesters. Thus, from the standpoint of Bandura’s original theory, their outcome measures included both choice and persistence. They also examined a hypothesis from SCCT that environmental factors would influence choice actions directly versus influencing goals through the mediating variables of self-efficacy and choice goals. And they included a measure of coping efficacy that had been developed by Lent et al. (2001), wherein seven items (such as “cope with a lack of support from professors or your advisor”) had a value of alpha of .94 (.89 in the current study).

In path models where engineering self-efficacy and coping self-efficacy were used as indicators of a latent self-efficacy construct, self-efficacy was found to be significantly related to choice goals, both directly (with an effect size of .44), and indirectly through its relationship to interests, which were, in turn, related to choice goals. In this study, self-efficacy accounted for 38% of the variance in interests (the strong relationship of efficacy beliefs to outcome beliefs indicated that the former accounted for 58% of the variance in outcome expectations). Interestingly, self-efficacy was not related to persistence except through its relationship to choice goals, the latter of which were significant predictors of persistence. In other words, self-efficacy expectations were influential in whether or not students reported that they would persist in engineering, and it was that self-report of persistence that best predicted actual persistence. The environmental

factors (supports and barriers) influenced choice actions indirectly through their influence on self-efficacy expectations. In sum, this study strongly supports postulates of Bandura's theory in the importance of self-efficacy to choices (although not directly to persistence) and in the importance of environmental factors to self-efficacy expectations themselves.

Gore (2006) and his colleagues (Gore, Leuwerke, & Turley, 2006) reported the results of three studies to determine whether or not academic self-efficacy contributed incrementally to the prediction of college performance, as indicated by grade point average (GPA). The first study involved a CFA of the 20-item College Self-Efficacy Instrument (Solberg, O'Brien, Villarreal, Kennel, & Davis, 1993) in a sample of 257 students enrolled in their first college semester. CFA comparing three-factor and four-factor models reported by other researchers, along with a one-factor model, indicated superior fit for the three factor model—courses (college course self-efficacy, 7 items, with an alpha of .88), social self-efficacy (8 items, alpha = .86), and self-efficacy for roommate issues (4 items, alpha = .83). Using this three-factor measure, Gore et al. (2006) found that self-efficacy measures were significantly related to intentions to participate in behaviors related to that domain of self-efficacy—for example, course self-efficacy was related to greater expectations to participate in library activities, reading and writing, and quantitative and scientific projects. Social self-efficacy was related to expectations for using university facilities and joining campus clubs and organizations, and roommate self-efficacy was related to higher expectations for interaction with other students. When measured at the end of the first semester, but not at the beginning, course self-efficacy was related both to subsequent GPA and to retention at the end of the second year of school.

The second study (Gore, 2006) was designed to examine the incremental validity of academic self-efficacy beyond the traditional predictor of academic aptitude. In this study, 629 first-year students were sampled. Gore used hierarchical linear regression and reported that although American College Test (ACT) composite scores accounted for 6% to 7% of the variance in GPA across three semesters, College Self-Efficacy Instrument (CSEI) scores accounted for an additional 10% of the variance in first and second semester GPA when the self-efficacy measure was obtained at the end (but again not the beginning) of the first semester. When administered at the beginning of the semester, self-efficacy accounted for very little incremental variance. Results for persistence were suppressed by high base rates for retention (83% from the second to the third semester in Sample 1 and 74% in Sample 2, which was comprised of 7,956 students from 25 four-year colleges and universities). Even so, self-efficacy measured at the end of the first semester added to the prediction of persistence from the first to the second year.

The work of Gore and his colleagues is notable in that it was preceded by careful examination (through CFA) of the central measure of college self-efficacy, and that the measure of self-efficacy was then examined in relationship to all three of Bandura's (1977, 1997) postulated outcome measures—approach behavior, performance, and persistence. Furthermore, the importance of learning experiences

was suggested by their consistent findings that the predictive power of self-efficacy occurred for a measure taken at the end of the first semester but not at the beginning. For practical purposes, this suggests that interventions and support services the first quarter or semester of college may have particular importance in setting the “psychological stage” for a successful college experience.

LEARNING EXPERIENCES

One of the primary features of Bandura’s model is the specification of four sources of efficacy information, or learning experiences, leading to the development of self-efficacy expectations. It is these learning experiences—performance accomplishments, vicarious learning, social persuasion, and physiological arousal—that therefore should guide the development of efficacy-theory-based interventions. The original theoretical statement of Hackett and Betz (1981) was based on the postulate that women’s traditional gender-role socialization restricts their access to the four sources of efficacy information as they pertain to careers in traditionally male-dominated fields such as mathematics, engineering, and technology. Thus, these sources play a central role in both understanding the initial development of expectations of efficacy and in designing programs of intervention for low or weak self-efficacy expectations.

Given this postulated importance of learning experiences, surprisingly little attention has been paid to operationalizing them for research purposes. Some research has used measures of learning experiences for mathematics (Lent, Lopez, & Bieschke, 1991) and for social skills (Anderson & Betz, 2000), representing a limited range of behavioral domains for which the role of learning experiences could be studied. The study of Schaub and Tokar (2005; see also Schaub, 2004) represents a significant advance in its development of an inventory to measure the four learning experiences for each of the six Holland theme areas.

The primary focus of the study of Schaub and Tokar (2005) was on the extent to which learning experiences and self-efficacy expectations mediated the relationship of personality to Holland interests. They used the Learning Experiences Questionnaire (LEQ), an inventory developed by Schaub (2004). The inventory consists of five items representing each of the four learning experiences for each of the six Holland themes, for a total of 120 items. The values of coefficient alpha in this study were reported as ranging from .73 (C) to .89 (R) for the total scores (cumulated across the four types of information within each Holland theme).

However, Williams and Subich (2006) found that many of the individual LEQ scales had less-than-adequate levels of reliability. Values less than .70 were reported for performance accomplishments for Conventional and Social, vicarious learning for Artistic, Social, Enterprising, and Conventional, social persuasion for Artistic and Conventional, and physiological arousal for Artistic and Conventional. Alphas for the Conventional subscales were all less than .70, and

for Artistic, they were less than .70 for all but Performance Accomplishments. Because these were relatively short scales (five items each), it may be that some scale lengthening could lead to adequate levels of reliability. Furthermore, evidence for scale validity was also presented (see the discussion of the Williams and Subich study in the Diverse Groups section).

Schaub and Tokar (2005) also measured self-efficacy for the six themes using the Skills Confidence Inventory, Holland interests using the general occupational themes (GOTs) from the Strong, and measures of outcome expectations (from Gore & Leuwerke, 2000) for the six Holland themes. Path analyses indicated that the LEQ total scores were strongly related to self-efficacy in those domain areas, with path coefficients ranging from .70 (C) to .93 (A). Learning experiences were related to outcome expectations only for Realistic and Social, but were indirectly related to outcome expectations through the mediating variable of self-efficacy for all but Realistic. This study not only, then, provided an inventory measuring learning experiences for the six Holland themes but also provided additional strong evidence for the postulates of Bandura's theory. The research supported the left (antecedent) side of Bandura's model—that is, the relationship of learning experiences to self-efficacy and the relationship of self-efficacy to interests in all six Holland areas except Enterprising (in which the relationship of Enterprising efficacy to Enterprising interests was completely mediated by outcome expectations).

RELATIONSHIPS OF EFFICACY AND INTERESTS

One topic that has long been of special interest to researchers has been the relationship between parallel measures of self-efficacy and interests. Interest-confidence correlations are typically in the range of .40 to .50: for example, .53 in the Lent et al. (1994) meta-analysis and .46 in the Lent et al. (2005) sample of engineering students at both historically Black colleges and universities (HBCUs) and White universities.

Rottinghaus, Larson, and Borgen (2003) performed a comprehensive meta-analysis of 53 independent samples in which the correlations between parallel measures of interests and self-efficacy were examined. Rottinghaus et al. found that the average interest–efficacy correlations differed depending on the behavioral domain in question. Correlations ranged from .50 (Enterprising) to .68 (Investigative) across the six Holland themes and were .62 (art), .73 (math), and .69 (science) for three academic disciplines. Correlations of this magnitude suggest 25% to 50% of shared variance, leaving at least half the variance in each unaccounted for.

In terms of causality, most researchers (e.g., Lent et al., 1994, 2000) have suggested that self-efficacy leads to interest development, and Bandura (1997) has agreed with this ordering. But most structural models developed to test this hypothesis have failed to examine alternative models in which interests cause self-efficacy. Therefore, research directed specifically at the causal question has

been needed, and some has now appeared. Kahn (2000) found that research self-efficacy was a significant predictor of 1-year changes in research interests in graduate students in applied psychology programs. Tracey (2002), using linear structural relations (LISREL) to examine confidence of the six Holland themes—Realistic, Investigative, Artistic, Social, Enterprising, Conventional (or RIASEC) and interest scores obtained during a 1-year interval in fifth- and seventh-grade students, reported that a reciprocal influence model, in which interests led to competence development and vice versa in the 1-year period best accounted for the data in both age groups.

Nauta, Kahn, Angell, and Cantarelli (2002) performed a longitudinal study to examine the possible causal relationships of efficacy and interests. They used the Strong Interest Inventory (SII) and the Skills Confidence Inventory (SCI) to measure interests and self-efficacy for the six Holland themes, so for each of the six themes, they had the requisite parallel measures. They administered these to college students at three intervals—September, January, and April—during one academic year, so they were able to study relationships at three time intervals—3 months, 4 months, and 7 months, across the six themes. For each time interval, they postulated five causal models, tested using structural equation modeling (SEM). The five models were no relationship between interests and self-efficacy, an interest as antecedent model, a self-efficacy as antecedent model, a reciprocal relationship model, and a model in which both act equally as antecedents. In general, results of model testing indicated support for the reciprocal model for all three time intervals, indicating that change in efficacy led to changes in interests and vice versa. Only for the 7-month interval was there some evidence for stronger causation of self-efficacy for interest than vice versa, but this was shown only for A, S, E, and C. This study is exemplary in testing five causal hypotheses at three time intervals across six Holland themes. It thus allows simultaneous tests of time interval, Holland theme (content area), and model, offering maximal generalizability.

Silvia (2003) continued in an area originally proposed by Lenox and Subich (1994) regarding possible curvilinear relationships of efficacy and interests. Lenox and Subich found that there was a minimum level of self-efficacy necessary for interests to develop but that beyond that minimum (threshold), or once interest begins to develop, its development proceeds linearly with increases in self-efficacy. In contrast, Silvia examined the “optimal incompetence” hypothesis that interest increases with increases in self-efficacy to a point but that too much self-efficacy can lead to reduced interest, creating boredom. In two experimental studies, task difficulty was manipulated (easy, moderate, and difficult) with consequent changes in perceived task self-efficacy. Silvia found the predicted quadratic relationship—that is, interests increased as self-efficacy increased but then decreased as self-efficacy became very high. Addressing the question of why this curvilinear relationship has not been reported before, Silvia points out that unless the possibility of a nonlinear relationship is examined, traditional correlational procedures will not reveal the existence of one. Experimental studies that use only two levels of the independent variable also cannot reveal a curvilinear relationship. Practical implications may be

infrequent, as a high degree of confidence for a college major or occupation is unlikely for those just beginning this pursuit, but Silvia suggests that this may have relevance for career dissatisfaction in adults, when job duties and responsibilities have become too easy and/or predictable.

INCREMENTAL PREDICTIVE VALIDITY

A major question that has interested researchers is the extent to which measures of career self-efficacy have incremental validity beyond the traditional measures of vocational interests in predicting major and occupational choices; if so, then joint use of interest and self-efficacy (or confidence) inventories in career assessment and counseling would be recommended. The first major study of this incremental validity was that of Donnay and Borgen (1999). This study pioneered the use of discriminant analysis and MANOVA to examine the extent to which Holland theme interest and confidence scores predicted membership (hit rates and percentage of group membership variance accounted for) in college major or occupational groups. Donnay and Borgen used scores on the six GOTs of the SII and the six general confidence themes (GCTs) of the SCI (Betz, Harmon, & Borgen, 1996) to predict occupation among 1,105 adults employed in 21 occupational groups. Using discriminant analysis in both a validation and a cross-validation sample, Donnay and Borgen found significant incremental validity for the self-efficacy scales (the GCTs) beyond that accounted for by the GOTs as a separate multivariate set; the GCTs were somewhat more powerful than the GOTs in separating the 21 occupational groups (6 times greater than chance versus 5 times greater than chance). In percentage of variance terms, GOTs accounted for 79% of occupational differences, GCTs for 82% of occupational differences, and the combined GOTs and GCTs accounted for 91% of occupational differences. In percentage of variance accounted for, prediction was somewhat better for women (in which the combined variable set accounted for 93% of the variance) versus men (for which 89% of the variance was accounted).

Although not all studies that followed Donnay and Borgen used the same approach to statistical analyses, the findings that interests and self-efficacy make incremental contributions to the prediction of major and occupational choice and group membership have been frequently replicated (e.g., see Betz, Borgen, & Harmon, 2006; Rottinghaus et al., 2003; Tracey & Hopkins, 2001), and the joint use of interest and confidence scores in career assessment and counseling has gained considerable acceptance (see the review by Betz & Rottinghaus, 2006).

DIVERSE GROUPS

One of the most active and important areas of research involves the applicability of self-efficacy and social cognitive theories to diverse groups, and considerable

recent research has examined social cognitive variables as a function of gender, ethnicity, or both.

The research of Lent et al. (2005) examined the predictive role of self-efficacy in students enrolled in freshman engineering classes at HBCUs ($N = 221$) and one predominantly White university ($N = 266$). Following examination of the measurement model in SEM, the measure of self-efficacy combined engineering academic milestones and coping self-efficacy. Engineering outcome expectations, technical interests, social supports, and barriers regarding an engineering career, along with intentions to major in engineering, were also measured. Data were collected at the end of the semester, consistent with other findings that self-efficacy expectations are predictive of behavior when measured at the end but not the beginning of the first college semester.

The first finding—that students at the HBCUs reported significantly higher self-efficacy expectations, outcome expectations, technical interests, social support, and educational goals than did students at the White university—was not expected but is discussed in terms of the possibility that students at the HBCUs are receiving better support services than those at the White university. In structural models, self-efficacy was a strong predictor of interests and choice goals (a path coefficient of .54 for the latter relationship) and was significantly correlated with outcome expectations (.49). Supports and barriers predicted self-efficacy and were only slightly related to choice goals. There were no significant differences in model fit as a function of gender or type of university.

This study is important in obtaining a large sample of African American students (87% at the HBCU and 9% at the White university) and comparing students at two different kinds of universities in terms of “climate” for African American students. The findings of stronger perceptions of self-efficacy among students at the HBCUs is intriguing, and the fact that the models fit well among both genders and across types of universities provides evidence for the generalizability of Bandura’s self-efficacy model. One question that remains is the nature of the self-efficacy expectations measured, as the measure used herein combined a content domain (engineering) with a process domain (coping self-efficacy). Although this combined measure was based on findings from the measurement model of SEM, the usage is in contrast to Bandura’s and others’ urgings regarding the content domain specificity of self-efficacy measures.

The development of the LEQ by Schaub and Tokar (2005) enabled Williams and Subich (2006) to examine the hypothesis, originally proposed by Hackett and Betz (1981), that it is differential access to learning experiences that leads to women’s lower self-efficacy for Realistic and Investigative and men’s lower self-efficacy in Social domains. Using the LEQ as well as measures of self-efficacy and outcome expectations for the six Holland themes, they found differential reporting of access to efficacy information as a function of gender. Men reported greater access to information in the Realistic and Investigative areas, whereas women reported more exposure to learning experiences in the Social area. There were no differences in access to information in Artistic, Enterprising, and Conventional areas, in which gender differences in self-efficacy are found much less often.

There were a few counterintuitive findings, however. For example, although men reported greater access to performance accomplishments, social persuasion, and physiological arousal for Realistic activities, there were no differences in vicarious learning, that is, access to role models. Because the gender of role models was not specified, these may have been male role models which would be postulated to have less ultimate impact for a young woman than would female role models (see Williams & Subich, 2006). As another example, access to performance accomplishments, vicarious learning, and physiological arousal for Investigative activities were all greater for men, but there were no gender differences in social persuasion. As this is the first study to comprehensively examine gender differences in these learning experiences, a few counterintuitive findings are not surprising—replications and/or extensions of this study are now needed.

In addition to the findings regarding gender differences in access to learning experiences, Williams and Subich (2006) also found that these learning experiences were predictive of both efficacy and outcome expectations, thus validating other major postulates of Bandura's theory. Specifically, the total of the four sources of learning experiences relevant to each Holland theme accounted for from 26% to 57% of the variance in self-efficacy expectations for that theme. Both learning experiences and self-efficacy contributed incrementally to outcome expectations for the parallel Holland theme area. Correlations between a given component of Learning experience and Holland self-efficacy scores ranged from .19 (male) and .23 (female) between vicarious learning and Conventional self-efficacy to .74 (male) and .66 (female) between performance accomplishments and Realistic self-efficacy. This study is notable in testing a hypothesis that was formulated 25 years ago by Hackett and Betz (1981) but which had not heretofore been tested. Furthermore, the study tested the relationship of learning experiences, a central explanatory mechanism in Bandura's theory, to self-efficacy expectations, again finding strong support for the theory in general, although that support differed across Holland theme area and the type of learning experience in question.

Several programs of research deal with populations largely lacking from the vocational literature. For example, the work of Ali, McWhirter, and Chronister (2005) is noteworthy in its focus on lower-SES and/or Appalachian youth. Ali and Saunders (2006) studied high school students in rural Appalachia, an area characterized by high levels of poverty and unemployment. They found that vocational/educational self-efficacy (confidence) for finding and pursuing options for college, technical training, or employment, and parental support explained substantial percentages of variance in college expectations. Self-efficacy explained 18.4% of the variance, and self-efficacy plus parental support explained 37% of the variance. These two variables were far more powerful than was either parental education or occupational status.

The work of Flores and her colleagues (e.g., Flores & O'Brien, 2002) and Gushue (2006; Gushue & Whitson, 2006) focused on Latino/a adolescents. For example, Gushue (2006) examined the relationship of ethnic identity to career decision self-efficacy expectations and outcome expectations (expectations of

positive outcomes from the career decision-making process) in 128 Latino/a ninth-graders. He found that more fully integrated identification with one's ethnic group was positively related to higher career decision self-efficacy, which was, in turn, related to more positive outcome expectations.

C. Brown and Lavish (2006) examined the relationship of life-role salience to career decision self-efficacy in Native American college students, finding that valuing of work, involvement in and commitment to the student role, and valuing and commitment to community service roles were all related to career decision self-efficacy. Although this latter study falls within the rubric of Bandura's theory only in its inclusion of the Career Decision Self-Efficacy Scale (CDSE) as the dependent variable, attempts to examine career decision self-efficacy among members of Native American groups are noteworthy.

Lindley (2006) has provided an excellent review of research on self-efficacy in diverse populations. Among other observations, she notes that more research is needed on those with intersecting identities, such as African Americans with disabilities or gay Asian Americans. She also notes the paucity of research on outcome expectations or on interventions with diverse groups.

Interventions

One of the most useful features of Bandura's theory is that the intervention is embedded within the initial statement of etiology—that is, the four sources of efficacy information postulated to lead to the initial development of self-efficacy expectations are the same sources of information that can be used to guide the development of interventions. These sources are facilitating successful performance accomplishments, providing role models (vicarious learning), social persuasion and encouragement, and teaching methods of anxiety management (physiological arousal). Ideally an intervention should target a specific behavioral domain and contain all four sources of efficacy information.

Evidence of the effectiveness of an efficacy-theory-based intervention in increasing Holland theme self-efficacy was provided by Betz and Schifano (2000)—the intervention was designed to increase self-efficacy regarding Holland's Realistic theme in college women. The Realistic theme, the theme on which gender differences are most persistent, is important along with Investigative theme, for choosing a large array of engineering and technical fields in which women continue to be underrepresented.

The selection of participants was based on recent work concerning the joint use of measures of interests and efficacy in career counseling (Betz & Rottinghaus, 2006). In these uses, the optimal conditions for choice are moderate to high levels of both interests and confidence, but in cases in which there is interest without high levels of confidence, Bandura's (1977) sources of efficacy information can be used to increase self-efficacy and thus possibly expand career options.

Accordingly, Betz and Schifano (2000) wished to target the intervention to women with some level of Realistic interests, for whom an efficacy-focused intervention might have the effect of increasing the possibility of that as a career

option. College women were selected for the study if they scored low on a measure of Realistic self-efficacy but at least moderately high on a measure of Realistic interests. The experimental group intervention included all four of Bandura's sources of efficacy information and included the following content areas: hand tool identification and usage; building and repairing useful objects such as bookcases, lamps, and sink drain pipes; and architectural design and engineering. During the instruction, periodic breaks were taken for structured relaxation exercises, positive self-talk, and group support. The modeling component was met by having the chief university architect, a woman, take the young women on a "hard hat" tour of major construction sites on campus, teaching them about the process of designing and constructing large buildings. The intervention ended with a "test" wherein each young woman was given a broken lamp to repair, and then when she had accomplished the task, she was given a new light bulb to serve as a test of her success (or failure)—the "light turned on" was a literal as well as figurative symbol of her success, which fortunately occurred in all cases.

The intervention, as opposed to the control condition, led to significant increases in Realistic self-efficacy. Although no pretest treatment group participants had high Realistic confidence, 62% of the posttest treatment group did. Because they had Realistic interests on entering the treatment program, the ability to increase their Realistic confidence meant that these Realistic theme areas could now be included among their career options.

Research to date on self-efficacy-focused interventions was recently reviewed by Gainor (2006). She notes that research designs have included a few analog studies, program evaluations, and about 16 quasi-experimental and experimental studies since 1981. The large majority of experimental and quasi-experimental studies have focused on increasing career decision self-efficacy (Uffelman, Subich, Diegelman, Wagner, & Bardash, 2004), with the next most common emphasis on increasing women's self-efficacy for male-dominated career fields (Kerr & Kurpius, 2004; Turner & Lapan, 2004). Of the 16 experimental or quasiexperimental studies mentioned by Gainor, 10 used the CDSE as the only or one of the dependent variables, and one other study (Turner & Lapan, 2004) also used a measure of confidence for career exploration and planning activities.

Although a primary focus, then, has been on increasing career decision self-efficacy, many studies only tangentially or inadvertently refer to the four sources of efficacy information in Bandura's theory, and of those that do, few actually make reference to all four sources of efficacy information. Many use interventions already in place or developed without reference to self-efficacy theory, for example interest assessments including the SII and SDS (Luzzo & Day, 1999; Uffelman et al., 2004), DISCOVER (Maples & Luzzo, 2005), and a required high school career-education class already in place (McWhirter, Rasheed, & Crothers, 2000). Some use one component of information; for example, Luzzo and Taylor (1994) used verbal persuasion and encouragement as the basis of their career intervention, and Luzzo and Day (1999) suggested that performance accomplishments and verbal persuasion are significant ingredients in their treatment.

Other researchers more explicitly acknowledge and incorporate the four sources of efficacy information. Foltz and Luzzo (1998) incorporated anxiety reduction, verbal persuasion, exposure to role models, and discussion of personal career accomplishments in their career guidance workshop (which showed significant increases in CDSE for nontraditional women students).

An exemplary study of an intervention designed to increase career decision self-efficacy and based on self-efficacy theory was that of Sullivan and Mahalik (2000). They designed a 6-week group career-counseling intervention designed explicitly using the four sources of efficacy information. The intervention (for which there is also a manual) is described in detail in their article—for each source of efficacy information, there are from three to five specific interventions that were part of the treatment program. Examples included (a) construct a vocational history in which previous task mastery experiences were revisited (performance accomplishments), (b) interview a successful female role model about her career decision process (vicarious learning), (c) relaxation and adaptive self-talk (physiological arousal), and (d) facilitators' positive affirmations and encouragement (social persuasion and encouragement). There were 31 women in the treatment group (which was divided into six smaller groups for the intervention) and 30 in a no-treatment control group. Results indicated that there were significant increases in CDSE in the treated groups but not in the no-treatment control groups. In addition, a follow-up 6 weeks after the posttest indicated that the gains in career decision self-efficacy had been maintained in the treatment group participants. This study is exemplary in its building an intervention explicitly based on self-efficacy theory principles, in its use of a complete experimental design, and in its follow-up 6 weeks later.

Regardless of treatment methods, all of the studies of interventions designed to increase CDSE showed significant changes with treatment and no changes for no-treatment control groups. From the standpoint of CDSE, this may provide support for the suggestion of Uffelman et al. (2004) that we look more closely at the work of S. D. Brown and Krane (2000) suggesting five critical ingredients for positive outcomes from career counseling. Because my focus is self-efficacy theory, I will leave that to others, but suffice it to say that CDSE has become a frequently used dependent variable in career intervention research—often cut from its theoretical moorings. That is not necessarily negative but should be noted—it does suggest the broad appeal and practical utility of one of the major behavioral domains to which self-efficacy theory has been applied.

INTEGRATING MEASURES OF PERSONALITY

Research on Holland's theory has included a number of studies of the personality correlates of the six Holland themes (for a review, see Holland, 1997), but the last few years have witnessed an explosion in the relationships of personality to vocational behavior in general and Holland's theory in particular (e.g., see

Barrick, Mount, & Gupta, 2003; Sullivan & Hansen, 2004). One of the most frequently studied topics has been the relationship of the Big Five personality traits (McCrae & Costa, 1997) with the Holland RIASEC dimensions, both interests and confidence. Meta-analyses of the relationships of RIASEC interests to the Big Five (Barrick et al., 2003; Larson, Rottinghaus, & Borgen, 2002) have strongly supported the relationships of extraversion to both Social and Enterprising interests, openness to Artistic and Investigative interests, agreeableness to Social Interests, and conscientiousness to Conventional interests.

The relationships of Big Five Factors and RIASEC confidence measures have also been examined (Nauta, 2004; Schaub & Tokar, 2005). This research has indicated relationships parallel to many of those found between RIASEC interests and the Big Five, for example, those of extraversion to both Enterprising confidence and Social confidence (Rottinghaus et al., 2003). In addition, generalized effects, in which a personality measure correlates with self-efficacy dimensions in addition to those similar in content, have also been reported. Nauta (2004) and Rottinghaus et al. (2003) found that openness showed statistically significant correlations with all six Holland efficacy themes. Nauta also found small, negative relationships between neuroticism and all six Holland efficacy themes (five were statistically significant), but Rottinghaus et al. found only two significant negative relationships. Conscientiousness showed significant positive associations with four of six efficacy themes in the Rottinghaus sample (all but Realistic and Artistic) and three of six in Nauta's sample. Hartman and Betz (2007) also found generalized effects for confidence in that conscientiousness was significantly related to confidence in I, S, E, and C, neuroticism was significantly negatively related to all but Artistic confidence, and extraversion was significantly related to confidence in Artistic, Social and Enterprising domains. Because RIASEC interests have different patterns of relationships to personality in comparison to RIASEC confidence measures, an integration of personality with Holland interests and confidence would be a useful direction of research and theory.

SUMMARY

The studies I have mentioned in this article represent a sampling of the career self-efficacy research done in the past 10 or so years. By no means have I been able to mention every high-quality study that has been done, so I intend no slights to worthy articles nor authors. Rather I have intended to showcase some highlights of what I believe to be an excellent body of research.

To me, this most obvious conclusion from this selective review is the heuristic value of a good theory in the hands of the creative, thoughtful, and methodologically sophisticated researchers cited herein. Bandura's theory is simple yet powerful, lends itself nicely to operationalization and hypothesis generation and testing, and has both theoretical and practical relevance and application. Each of

the studies reviewed herein is different, and each has weaknesses as well as strengths, but cumulatively they create an impressive and stimulating array of possible implications and additional research directions. I hope that we may continue to build on this rich and diverse foundation of work.

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