The Scientifically-Minded Psychologist: Science as a Core Competency

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At the Competencies Conference: Future Directions in Education and Credentialing in Professional Psychology, the Scientific Foundations and Research Competencies Work Group focused on identifying how psychologists practice scientifically. This article presents the subcomponents associated with the core competency of scientific practice. The subcomponents include: 1) access and apply current scientific knowledge habitually and appropriately; 2) contribute to knowledge; 3) critically evaluate interventions and their outcomes; 4) practice vigilance about how socio-cultural variables influence scientific practice; and 5) routinely subject work to the scrutiny of colleagues, stakeholders, and the public. In addition, the article briefly discusses how the depth of training for and assessment of each subcomponent will vary by training model. Implications and future directions for individual psychologists, training programs,
In November of 2002, the Association of Psychology Postdoctoral and Internship Centers (APPIC), in conjunction with 21 other psychologist organizations, sponsored the Competencies Conference: Future Directions in Education and Credentialing in Professional Psychology. The mission of the conference was to identify core and specialized competencies, formulate competency models for training the next generation of psychologists, and develop strategies for the assessment of competencies (Kaslow, 2002). Delegates at the conference represented the wide variety of domains that contribute to the definition of core competencies within professional psychology, including education, training, practice, public interest, research, credentialing, and regulatory constituency groups.

Members of diverse constituency groups identified eight core competencies via an online survey conducted by the Steering Committee for the competencies conference. The goal of this article is to present the subcompetencies associated with the core competency of scientific practice identified by the Scientific Foundations and Research Competencies Work Group. This article represents a summary of three days of thought-provoking, difficult, and ultimately productive conversations. This article strives to provide a starting place for those in training programs and constituency groups interested in further defining core competencies for psychologists.

At the outset of the conference, member of the Scientific Foundations and Research Work Group recognized that their charge was broad. This group was encouraged to consider the following components: models of training; critical thinking and thinking like a psychologist; affective, biological, cognitive, and social aspects of behavior; history and systems of psychology; human development; adaptive and abnormal behavior; research design and methodology; techniques of design and data analysis; integration of science and practice; and advances in our knowledge base related to individual and cultural differences.

The Scientific Foundations and Research Competencies Work Group rapidly determined that it would not be possible to address its twin charges of scientific foundations and research competencies. After considerable discussion and some serious objections, a decision was made to focus exclusively on how the practice of psychology maintains a scientific basis. The decision to limit the focus of the work group was difficult, as the work group believed that there is a core scientific foundation to the field of psychology that could be explicated [see Benjamin (2001) for a fuller discussion of this issue]. It was determined, however, that there was insufficient time to wrestle with this important issue in the context of the conference. One of the work group’s recommendations is that this topic might serve as the focus for reconvening the conference participants to continue this important exchange.
The decision not to propose a core curriculum freed the work group to concentrate on the other aspect of the charge. There was agreement that a scientific approach to psychological practice (wherever it is practiced) is a critical core competency for all psychologists and serves to distinguish psychologists from other health-care providers. Some psychologists will contribute directly to the development of science through their research efforts; however, even those who do not actively conduct original research will demonstrate enthusiasm for the advantages that a scientific approach confers. This article will focus on the identification of the proficiencies that are needed for what the work group agreed to call a scientifically-minded psychologist. Before delineating the subcomponents of the core competency of scientifically informed practice, a brief summary of the relevant literature in this area will be reviewed. Each subcomponent is described in depth, and an outline of how training for and assessment of the subcomponents might occur is presented. The article concludes by discussing what additional work needs to occur to continue to define and operationalize the subcomponents of the core competency of scientifically informed practice.

Brief Review of the Literature

The literature is rife with models pertaining to the scientific training of psychologists (e.g., Carter, 2002; Chwalisz, 2003; Benjamin, 2001; McFall, 2002; Peterson, Peterson, Abrams, & Stricker, 1997; Stoltenberg et al., 2000; Stricker, 2002; Stricker & Trierweiler, 1995). These studies provide a context for this article by discussing the various models of clinical training and presenting the on-going debates on scientific training and practice of psychologists. How individual training programs incorporate training for the competency of scientifically informed practice is a matter of their own autonomy and conscience; however, the subcomponents should apply across programs. In essence, a set of minimum proficiencies were identified that constituent groups represented in the work group could endorse.

Furthermore, there was agreement that training students to be “scientifically minded” does not begin in graduate training. Halonen, Bosack, Clay, & McCarthy (2003) recently proposed a rubric for learning, teaching, and assessing skills for scientific inquiry at the undergraduate level. The rubric described the progress of students’ acquisition of scientific-inquiry skills applied to behavior. The authors articulated eight domains of scientific inquiry that could serve as outcomes for scientific inquiry in psychology. The domains and skill areas include the following: Descriptive skills (i.e., observation, interpretation, and measurement skills); conceptualization skills (i.e., the ability to use the concepts and theories of the discipline); problem-solving skills (i.e., the ability to conduct research and use research findings); ethical reasoning, including awareness and adherence; scientific values and attitudes; communication skills; collaboration skills; and self-assessment. Similar to the focus adopted here, they deliberately chose to take a broader perspective of scientific inquiry than just methodological and data-analysis skills. For example, they included communication skills because they agreed “research is complete only when the results are shared with the scientific community” (American Psychological Association, 2001, p. 3). They incorporated collaboration as a critical inquiry skill based on their review of representative sources for reporting scientific results; a significant majority of these sources represented collaborative efforts. Although the subcomponents of scientifically informed practice we propose are not identical to the rubric presented by Halonen et al. (2003), there is considerable overlap and a shared belief that development of scientific-inquiry skills should occur over time in the context of appropriate training.
Goals and Assumptions

The over-arching goal of the work group was to identify the subcomponents of the core competency scientifically-minded professional practice. Which components are emphasized and how they are taught will depend upon the context, including program type (i.e., clinical, counseling, school) and training model. Training in scientific skills will begin prior to the doctoral program, but trainees’ identities as “scientifically-minded psychologists” should be emphasized and nurtured predominantly in a doctoral training program.

Several other shared assumptions provided the work group with “common ground” for their discussions. The work group agreed that there is a scientific basis to the practice of psychology. Furthermore, there was agreement that the scientific approach is the hallmark of our profession, a view that is reflected in the literature (e.g., Belar & Perry, 1992; Halonen et al., 2003; McGovern, Furumoto, Halpern, Kimble, & McKeachie, 1991). Although the epistemological views of our work-group members varied widely, the subcomponents of the core competency identified encompass and underlie the diverse ways of knowing embraced by psychologists (e.g., logical positivism, post-modernism). There was agreement that science occurs in a sociocultural context and that good scientific practice necessitates attention to generalizability and the extent to which the social context influences behaviors, including cultural and individual differences. Finally, members of the work groups agreed that the integration of science and practice is of great value in clinical practice; clinical practice is more potent and practitioners should be, at minimum, informed consumers of scientific knowledge.

Components of a Scientifically-Minded Psychologist

Five subcomponents constitute the core competency of scientifically-minded practice, including the ability to 1) access and apply appropriately and habitually current scientific knowledge; 2) contribute to knowledge; 3) critically evaluate interventions and their outcomes; 4) practice vigilance about how sociocultural variables influence scientific practice; and 5) subject work routinely to the scrutiny of colleagues, stakeholders, and the public. Each of these five components is discussed in more detail below.

Access and Apply Current Scientific Knowledge and Skills Appropriately and Habitually

The scientific basis for psychological practice is ever changing. It has been estimated that the half-life for most psychological knowledge is somewhere between 5 and 7 years (Dubin, 1972). Thus, scientifically-minded psychologists have an appreciation for science as a dynamic and continuous process and recognize that continuing education, retraining, and self-exploration must supplement the facts and findings taught in graduate school.

Data indicate that clinical practice rarely keeps pace with new findings. For example, estimates suggest that it takes almost 17 years for the results of randomized clinical trials to become incorporated into clinical practice (Balas & Boren, 2000). Even when implementation occurs, it is typically uneven, with only a few practitioners incorporating new findings. One of the major challenges to implementation of new knowledge is the lack of an effective infrastructure that makes it easy to synthesize the large number of clinical studies present.

There is a growing movement for evidence-based practice in medical practice (Geyman, Deyo, & Ramsey, 2000; Sackett, Strauss, Richardson, Rosenberg, & Haynes, 2000), and psychology might benefit from some of the methods being developed in medicine.
for teaching evidence-based practice. Evidence-based practice incorporates the knowledge from empirically supported treatments, but goes a step farther. Physicians are encouraged to \textit{integrate the best research evidence with clinical expertise and patient values} (Sackett et al., 2000). Thus, rather than merely knowing which treatments have been shown to be effective with specific disorders, evidence-based practice focuses on asking answerable clinical questions with a reliance on scientific strategies.

This may seem simple, but observation of clinician behaviors suggest that most clinicians do not use the best known evidence to influence clinical decision making. Beutler (2000) observed that most decisions about treatment effectiveness are based more on opinion and personal beliefs than on scientific evidence. These beliefs often are based on clinical experience; yet, recall about cases has been shown to be overly optimistic, with a tendency to overlook important factors such as regression to the mean and placebo effects.

Training students to ask clinically answerable questions must be the foundation of clinical practice. Berg (2000) argued that often the primary source of clinical advice is expert opinion. Thus, the trainee asks his/her supervisor a specific question and typically receives a specific answer. However, were the same question asked to a group of experts, one most likely would be provided a range of answers rather than a single answer based on the best available evidence. Supervisors (experts) would serve their trainees better if, rather than providing answers to clinical questions, they would teach students how to find the best evidence to answer the question (Berg, 2000). This stance requires a shift in where and how trainees seek and evaluate evidence (Chwalisz, 2003). Reviews of randomized controlled trials (such as the Cochran Reviews), meta analyses, and other integrative reviews should serve as the primary sources of evidence, rather than classic textbooks or individual research studies (Sackett et al., 2000).

\textit{Contribute to Knowledge}

The scientifically-minded psychologist has an obligation to contribute to the advancement of knowledge. Psychologists must receive training that will allow them to be more than just consumers of research (Stoltenberg et al., 2000; Stricker & Trierweiler, 1995). The specific nature of such contributions to knowledge will vary; respective training models will guide such contributions. A variety of venues for contribution exist, including writing for publication, giving presentations, disseminating information about practice to researchers, contributing to a practice database, participating in peer supervision, and contributing to communities and psychoeducational efforts.

Many scholars have argued that it is essential for practitioners to contribute to scientific knowledge. As Stiles stated, “Practitioners produce research ideas; researchers consume them” (p. 1253; Lampropoulos et al., 2002). In that same article, Goldfried stated, “We may think of the clinical setting as consisting of the context of discovery, highlighting hypotheses that are worth investigating by researchers who operate within the context of confirmation” (p. 1244). These psychologists, along with many others (e.g., Beutler, Williams, Wakefield, & Entwistle, 1995; Carter, 2002; Hoshmand & Polkinghorne, 1992; Lueger, 2002), clearly understand that interplay between practice and science is essential if either is to be effective.

\textit{Critically Evaluate One’s Own Interventions and Outcomes}

While the terminology and the approach to evaluation may differ among proponents of a variety of training models, in essence there is agreement that psychologists must evaluate
critically their interventions and outcomes with clients. For example, Hoshmand and Polkinghorne (1992) discussed the importance of evaluation from a post-modern perspective, emphasizing the importance of reflection on one’s practice. They stated, “. . . the process of reflection performs a crucial function for a science of practice by checking on the validity of practicing knowledge” (p. 60). Hoshmand and Polkinghorne stressed that the separation of science and practice is artificial. Stoltenberg et al. (2000) compared the practitioner–scholar and the scientist–practitioner models and concluded that both models seek to ground all training in scientific thinking. They stated that for both models “comprehensive practice is analogous to empirical science; both require data gathering, hypothesis testing, control of variables, and outcome evaluation” (p. 627). Stricker and Trierweiler (1995), in their description of the local clinical-scientist model, stated, “The local clinical scientist must work toward recognizing the evidence in support of or in opposition to the clinical hypotheses, and must consider how evidence, probably nonexistent, might be gathered and used” (p. 998). Finally, Stricker (2002) discussed that “undertaking an evaluation of their individual practices” is a key characteristic of both scientist–practitioners and local clinical scientists.

Although there may be general agreement on the importance of evaluation, there is, however, little consensus on how such evaluations of interventions and outcomes should be conducted. Despite the many advantages inherent in conducting evaluations of one’s clinical work, there are also numerous obstacles to conducting such evaluations, including feeling threatened by such a procedure (Asay, Lambert, Gregersen, & Goates, 2002), as well as limited time and few role models (Lampropoulos et al., 2002). Training programs and continuing-education workshops need to focus on facilitating the development of such skills. Trainees and practicing psychologists must become familiar with the myriad of evaluation techniques available, including $N = 1$ research (Stoltenberg et al., 2000), scientifically based critical thinking (Stricker & Trierweiler, 1995), and patient-focused (Asay et al., 2000) or case-focused services research (Lueger, 2002).

**Practice Vigilance About How Sociocultural Variables Influence Scientific Practice**

Underlying the previous competencies is the assumption that scientifically minded psychologists understand and apply scientific concepts that influence practice. Scientific concepts in this competency include being able to formulate research questions and develop testable hypotheses, understanding the concept of variance, understanding and applying concepts of generalizability, and choosing the appropriate methodology to use for the question at hand. Minimum competencies for scientifically minded psychologists also include understanding the factors involved in internal validity (the rigor of a study to control for all extraneous variables) and external validity (to whom the results of a study may be applied), and the tension between the two. Gelso and Fretz (2000) referred to this tension as that between rigor and relevance, in essence noting that the tighter a study controls for extraneous variables, the less relevant the results for populations outside the laboratory.

Good scientific practice also necessitates attention to the extent to which social context influences behaviors. The APA Multicultural Guidelines (American Psychological Association, 2003a) encourage psychologists to “recognize the importance of conducting culture-centered and ethical psychological research among persons from ethnic, linguistic, and racial minority backgrounds” (p. 40). This approach often includes using qualitative, rather than quantitative, methodologies. The argument posed in the Guidelines is essentially that, with the dramatically increased racial and ethnic diversity in the United
States (U.S. Census Bureau, 2001), psychologists must broaden the perspectives of their research questions and methods (e.g., using qualitative methods) to address behavior effectively and the effectiveness of interventions across a diverse population. A number of scholars have argued that psychological research that was conducted on predominantly Caucasian populations in the United States inappropriately has been assumed to apply to all other cultural groups (Fuertes, Bartolomeo, & Nichols, 2001; Perez, 1999; Quintana, Troyano, & Taylor, 2001; Sue, 1999). Furthermore, researchers have ignored the within-group heterogeneity of racial/ethnic groups, assuming, for example, that Asian-American college students are representative of the entire group of Asians living in the United States. Thus, research is assumed to apply to all members of the racial/ethnic group, regardless of regional, language, or acculturation differences. Sue (1999) noted that these practices threaten the external validity, or generalizability, of that research. This threat to external validity is a particular concern when behaviors among cultural groups differ, but the norm has been identified by a Caucasian research population, with the result that the non-Caucasian group is defined as having a deficit or as pathological. Psychologists should understand the role culture plays in developing research questions, as well as the role social context plays in the relevance of the research that informs their practice.

Subject One’s Work to the Scrutiny of Colleagues, Stakeholders, and the Public

Perhaps the most novel subcomponent of practicing scientifically that the work group identified was the importance of psychologists subjecting their work to the scrutiny of colleagues, stakeholders, and the public. Although this practice is expected of psychologists who submit their work to peer-reviewed journals, it has been less expected of the practitioner community. It is important to hold practitioners accountable for the science of their practice, and scientific practice is differentiated from non-scientific practice by the scrutiny of others. Only by making psychologists accountable throughout their career can we be certain that practice is being informed by current scientific knowledge.

Scientific training is one of the “value-added” components of training as and practicing as a psychologist. If psychologists are expected to practice scientifically, then they must be expected to demonstrate their effectiveness from a scientific perspective to not only fellow psychologists, but also to colleagues representing other disciplines, as well as clients and the public. We agreed that this should not occur exclusively within the context of within-discipline collegial relationships, as such individuals may not always provide psychologists with critical, formative feedback or attend to issues of particular relevance to stakeholders.

The implementation of this ability is envisioned best as a process by which psychologists have a cadre of treatments that are related to an outcome that is measurable, that they reassess as treatment goes on, and that they change as needed. Disconfirming evidence is examined and treatment is modified accordingly. Psychologists would be expected to model adhering to a set of practice criteria that lead to defensible treatment decisions and to be able to provide evidence beyond testimony for claimed effectiveness. Furthermore, psychologists must be able to demonstrate their effectiveness to current and potential clients, as well as to the public, as this particular skill assumes that the scientific process is transparent.

This particular subcomponent of practicing scientifically raises many issues. For example, we discussed the difficulty of creating mechanisms for private practitioners to collect this information, although technology and practitioner databases may make it easier. More important, however, is the dynamic tension encountered when making the
ork of psychologists visible while simultaneously keeping the primary focus of their work confidential. Failure to scrutinize the work of psychologists or hold them accountable for their practice may lead to serious ethical concerns. We agreed with others in the literature (e.g., Pope & Vasquez, 1998) that scrutiny of the therapeutic process might serve as formative feedback for trainees and psychologists and provide them with the tools to practice even more effectively.

Training

Work-group discussions illuminated some shared beliefs about training philosophy and methods. In general, there was agreement that although training at the undergraduate level ideally provided basic knowledge of scientific methods and reasoning, training at the professional level of competence should occur in doctoral training programs, where students develop identities as scientifically minded psychologists. Depth of training for each subcomponent will vary by training model and multiple factors such as pedagogy, skill level and learning style of student, availability of appropriate training experiences, and program goals. Training programs do not have to include a separate course to establish competence; in fact, the process of attaining competence as a scientifically minded psychologist probably is most efficient when infused in existing content-based courses. Furthermore, learning is a lifelong process; thus, training programs are responsible for instilling a commitment to continuous improvement.

An extensive list of possible training methods, all of which could be elaborated further, was developed. These methods included: role models, research teams, clinical supervision with a scientific focus, mentorship, teaching science as a creative enterprise, supervision in hypothesis testing and applying research knowledge, collegial consultation, and alternative models to just reading and taking a test (e.g., applying scientific knowledge). These methods should be infused across both didactic and experiential curricula.

Assessment

Although the topic of assessment received relatively little attention, some suggestions worthy of further development were generated. First and foremost, it is essential that the competencies we have identified guide the assessment methods adopted (e.g., Halonen et al., 2003), and that the methods of assessment adopted be appropriate for the training model and the program goals. Second, underlying any procedure for assessing competency as a scientifically minded psychologist is the tension between the need for scrutiny and the need for ethical safeguarding of client and student development. Furthermore, assessment is two-fold; trainers must be mindful to use assessment as one way of promoting continual improvement of learning and practice outcomes in addition to using assessment as a means of summative evaluation. Trainers are encouraged to use multiple methods of assessment, as doing so will facilitate the development of competencies.

Where multiple options exist, experts prefer authentic assessment techniques (e.g., Wiggins, 1990). Such techniques employ real-world tasks and ask trainees to engage in meaningful activities that are task relevant, as well as allow for evaluation of effective performance. Some examples of assessment included criterion-based measurement, case simulation, practice portfolio assessment, 360-degree evaluation, dissertation and research projects, American Board of Professional Psychology (ABPP)-like case presentations, evaluation of work samples, examinations, self-assessment strategies, and peer evaluations.
Future Directions

The work group was able to reach some agreement on five subcomponents of the core competency scientifically informed practice. We acknowledge that the subcomponents of this competency represent the view of the participants in our work group, and that research must be conducted to assess whether these competencies are sufficient. Researchers might focus both on how practitioners develop these competencies, as well as how they are implemented within professional practice. The goals of such research inquiry might be to establish a developmental rubric similar to that developed by Halonen et al. (2003). Skills and abilities for the scientifically-minded psychologist would be explicated within each developmental stage; training and assessment practices would be developed accordingly.

The collaboration of multiple stakeholders (e.g., graduate programs, internship programs, regulatory boards) will be necessary when fleshing out the subcomponents of the core competency we have identified, including training and assessment.

Beyond focusing on the definition of the skills and abilities associated with a scientifically-minded psychologist, within psychology, stakeholders must transcend their professional sub-group affiliations (e.g., PsyD vs. PhD; clinical, counseling, school) and primary roles (e.g., practitioners vs. researchers) to reinforce the importance of more fully integrating science and practice. Such a view is consistent with other scholars (e.g., Hoshmand & Polkinghorne, 1992). Our work group brainstormed a variety of suggestions—ranging from far-reaching to relatively minute—intended to infuse the importance of practicing scientifically into the field of professional psychology.

To create systemic change, we recommend that the Council of Chairs of Training Councils appoint a representative work group to examine ways that psychologists can develop and demonstrate the scientific competence of their practice. Furthermore, we advise that the Committee on Accreditation and other regulating bodies include the process of training scientifically-minded psychologists in evaluating core competencies. Recommendations that might be implemented more quickly include revising APPICs internship application to include information about scientific practice experience, encouraging the development of practice-research networks, and offering continuing-education courses for practitioners to integrate and implement science in their practice. We believe that these recommendations will help facilitate and foster a desire among psychologists to embrace a professional identity as a scientifically-minded psychologist.

References


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