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On the Making of a Scientist–Practitioner: A Theory of Research Training in Professional Psychology

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This article offers a revised and updated theory of the research training environment (RTE) in graduate education in professional psychology. Ingredients of the RTE that are theorized to enhance students' research attitudes and eventual productivity are proposed. Six primary ingredients have been supported by research as "main effects." Two additional ingredientssuggest "aptitude by treatment interactions" in that they appear to interact with personality and training level variables in affecting research attitudes and productivity. Attention to these ingredients of RTEs will permit a sound test of the ultimate value of the scientist side of the scientist–practitioner model.

The scientist–practitioner model of graduate education in the fields of professional psychology[1] has been a source of great controversy over the 40 years since its inception. Although the causes of the controversy are many, one of the bottom-line issues is whether it is viable to train students to be scientists generally and psychological researchers specifically when, at the core, these students enter training with the wish to be practitioners and not researchers. The low research productivity of doctoral graduates has been repeatedly documented over the years (Barlow, 1981; Garfield & Kurtz, 1976; Kelly & Fiske, 1950; Kelly & Goldberg, 1959; Peterson, Eaton, Levine, & Snepp, 1982; Shinn, 1987) and is often cited as evidence for the essential lack of viability of the scientist–practitioner model. A large majority of our students become practitioners after completing graduate training, and few practitioners produce research.

One might conclude from the foregoing that the scientist–practitioner model has outlived its usefulness (if indeed it ever was useful) and ought to be either done away with or modified, perhaps beyond recognition. An alternative view, and the one offered in this article, is that the model has not yet been given a fair trial, at least regarding the research and science part of the model. The problem has been that our research training practices have had some profound deficiencies. These deficiencies, I shall maintain, revolve around lack of systematic attention to the research training environment and to those elements in the environment that enhance or retard students' investment in research.

In this article, I offer theoretical propositions about the research training environment in graduate programs in professional psychology. I delineate the ingredients of such environments that are hypothesized to influence students' attitudes toward research (their interest in doing research and the value of research in their future careers) and their eventual research productivity. During the past several years, a number of empirical studies, mostly arising from counseling psychology, have been conducted that help inform this emerging theory, and these investigations will be incorporated into the discussion. Two assumptions undergird the propositions I will offer: (a) The production of more and better science (research and theory) is a desirable goal

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[1] The fields of professional psychology referred to throughout this article are those involving counseling or clinical practice, especially clinical, counseling, and school psychology. The formulations also are pertinent to related specialties that involve psychological practice (e.g., community psychology, industrial/organizational psychology).

in professional psychology, and (b) the most effective setting in which to influence scientific production is the graduate training situation. It is during graduate school that students' attitudes toward and investments in research are shaped. Such shaping, much more than postdoctoral experiences, will determine the extent to which professional psychology students will be involved in research during their careers.

Regarding the first assumption, a question might be raised as to why the production of more research in professional psychology fields is seen as desirable. In my view, greater involvement by more psychologists increases the extent to which our practices will be based on scientific findings and scientifically sound theories. In addition, involving more psychologists who are primarily practitioners in the research–science process also will facilitate research that is more clinically meaningful. Psychologists who are mainly practitioners, for example, can contribute enormously to research teams as these practitioners add insights derived from their practice to all phases of the research.

The above paragraph does not imply that all psychologists should be involved in research, nor that scientist–practitioners need to attain the idealized 50–50 split between science and practice (Gelso, 1979a). Some of our students will not want to invest in research after graduate school, regardless of the quality of their research training or the potency of the research training environments in their graduate programs. Research is simply not what they are about, and this should not be seen as problematic. The aim of effective research training is to increase the likelihood that students will be involved to some extent in research following graduate education and to increase the extent of involvement that students might otherwise attain. Some psychologists might devote 5% of their worktime to research, some 10%, some 50%.

Below, I review the current scene in graduate education regarding research training and the general effects of the research training experience on students' attitudes toward research. Then I proceed to discussing theoretical propositions about effective research training environments.

The Current Scene in Graduate Education

Most students enter graduate school in professional psychology fields with very strong service commitments as well as a basic sense of self-efficacy regarding service. Although they may be inexperienced and thus insecure about their potential as practitioners, entering students have had a history of interacting with people in a way that leads them to believe they are capable of being effective helpers (Betz & Taylor, 1982; Frank, 1984; Gelso, 1979a). In contrast, entering students tend to be ambivalent about their interest and capabilities to be researchers and, more broadly, scientists. Most think they are interested but are not sure; few have a clear sense of efficacy as researchers (Gelso, 1979a).

The effective graduate training environment, I suggest, needs to aim at resolving this ambivalence toward research—at enhancing students' attitudes (again, interest in doing research and valuing it) and sense of efficacy as budding researchers, which in turn will influence subsequent research productivity. Such training may profitably be viewed as a behavior modification situation in the broadest sense. Whether or not construed in such terms, though, it is important to recognize that if graduate programs in professional psychology wish to have a significant impact on the quality and quantity of research produced by psychologists after graduate school, they must do more than teach research skills. Research skills (including quantitative skills) have to be taught, of course, and they are vital to a student's sense of effectiveness as a researcher (see Wampold, 1986). However, training needs to go beyond the skill level and influence students at the motivational level. We need to light a fire under our students—to show them how research (as well as practice) can be exciting and rewarding, and to help them experience the excitement and rewards. As part of this effort, programs need to be planful about what research experiences are offered, when, and how, such that our chances of affecting students' research attitudes are maximized.

In contrast to the above suggestions, training efforts aimed at resolving students' ambivalence toward the role of research in their future careers, I maintain, have too often been unsystematic, perhaps even haphazard. Although most programs offer a standard fare of required research courses and experiences (O'Sullivan & Quevillon, 1992; Wampold, 1986), there is little evidence of planfulness in any of the professional psychology specialties about where, when, and how research training experiences

are offered (Frank, 1984; Gelso, 1979a; Shinn, 1987). Few programs vigorously seek, or even explicitly state, enhancement of students' research attitudes to be a training goal. Even the experiences that are offered or required (theses, research seminars, statistics courses) can have negative, at times devastating, effects on students' research attitudes, depending on the quality of teaching and advisement, the timing of offerings in relation to students' skill level, and the extent to which the experiences are integrated with other student experiences (e.g., clinical practice).

A cause as well as a consequence of the unsystematic nature of research training in professional psychology has been the lack of theory to guide us in research training efforts. For example, rare or nonexistent are theories about the stages of development in researchers; about graduate training environments that foster and impede students' research attitudes; about how to cultivate students' interest, even passion, for research; about how to tailor research training experiences to training level; or about how to integrate research training with clinical training. Although some research has been done in recent years on training environments that facilitate research attitudes, such empirical work is very clearly in its early stages.

Contrast this sorry state of theory development and research with that in the area of counselor and psychotherapist training and development. A recent review by Gelso and Fassinger (1990), for example, pointed out the enormous growth of empirical and theoretical literature on counseling and therapy supervision during the past decade. There are now a number of influential theories of therapist development and training that serve to guide training efforts (e.g., Stoltenberg & Delworth, 1987), and an entire journal devoted to counselor training and supervision exists.

In sum, I contend that the scientist side of the scientist–practitioner model gets short-changed right from the beginning of training in professional psychology. Training aimed at motivating students to be researchers and scientists is unsystematic and lacking in theory and research. Is it any wonder that the scientist–practitioner model does not work well, at least in terms of the scientist side of the model?

Given these deficits in training, what are the effects of research training, as it is currently implemented, on graduate students' attitudes toward research (i.e., in doing and valuing it)? What does research say about students' interest levels when they enter graduate training? Do students' interest levels change as they progress through training?

Effect of Graduate Education on Research Interest

Research that has been done thus far suggests that students in professional psychology fields enter doctoral training with modest levels of interest in research (e.g., doing and valuing it in their future careers), and become slightly more positive as they progress through their doctoral programs. Regarding research attitudes at entry, for example, Royalty, Gelso, Mallinckrodt, and Garrett (1986) surveyed 358 students from 10 doctoral programs in counseling psychology and found that these students' retrospective ratings of their research interest on entrance to their graduate programs approached the neutral point in the rating scale that was used. I do not believe that this "neutral" rating reflects indifference toward research. Rather, the fact that they are at the middle or neutral point of interest ratings belies a sense of ambivalence. Beginning students think they would like to do research but do not have enough experience to know, and their interest is tempered by the anxiety they feel about their research potential.

Despite the problems I have described in research training, the evidence consistently indicates that research attitudes do strengthen during training, if only modestly. Perl and Kahn (1983), for example, studied over 1,000 students in various applied psychology fields (mostly clinical) and found a pattern of increased interest in research during graduate school, although a minority of students actually decreased in their research interest. Royalty et al. (1986) likewise found a general, if modest, increase; intensive studies of single programs in clinical (Berman, 1990,1992) and counseling (Gelso, Raphael, Black, Rardin, & Skalkos, 1983) psychology support the general tendency for a modest increase in research interest.

It is important to note, however, that the general pattern of a slight increase masks important individual differences among training programs. Thus, substantial between–program variability appears to exist in these programs'

impact on students' research interests and attitudes (Perl & Kahn, 1983; Royalty et al, 1986) and on subsequent research productivity (see, e.g., Levy, 1962). As reported by Royalty et al. (1986), some programs have a striking and positive impact on their students' attitudes toward research, whereas most have a modest positive impact, and a few appear to inhibit interest. What factors underlie these differences in impact among training programs? A look at the research-enhancing ingredients of research training environments may help answer this question.

The Research Training Environment: Research-Enhancing (and Retarding) Ingredients

Research training environments (RTEs) may be conceptualized as all of those forces in graduate training programs (and, more broadly, the departments and universities within which the programs are situated) that reflect attitudes toward research and science. Generally these attitudes exist on continua and may range from highly positive to highly negative. All of the constituents of the environment (e.g., faculty, students, support staff) contribute to the overall tone or press of RTE. However, because training program faculty have the most power to affect the environment, they also have the greatest responsibility. This power of the faculty over the RTE is reflected in such activities as student selection, organization and teaching of courses, and control of the rewards students are able to obtain.

Theoretical Propositions About Research-Enhancing Ingredients

In an earlier article (Gelso, 1979a), I posited 10 ingredients in RTEs that were seen as enhancing students' attitudes toward research (and subsequently their productivity). Several of these ingredients have received empirical support in recent years, whereas others have not. Some have received support inasmuch as they interact with other variables (e.g., student personality and training level). Those that have received moderate-to-strong empirical support are stated below as theoretical propositions, and this statement is followed by brief descriptions of each ingredient along with the supporting evidence. I then discuss the ingredients that have been found to have interactive effects on research attitudes and conclude with an examination of those that have been unsupported by research or untested.

I propose that graduate students' research attitudes (interest in doing research and the expected value of research in their subsequent careers) and eventual productivity will be positively affected to the extent that the following occur.

1. Faculty model appropriate scientific behavior and attitudes
2. Scientific activity is positively reinforced in the environment, both formally and informally
3. Students are involved in research early in their training and in a minimally threatening way
4. It is emphasized during training that all research studies are limited and flawed in one way or another
5. Varied approaches to research are taught and valued
6. Students are shown how science and practice can be wedded

Faculty modeling of appropriate scientific behavior and attitudes. The scientific behavior and attitudes of the faculty are probably the most fundamentally important research-enhancing (or retarding, if negative) ingredient in the overall RTE. The importance of this factor has been repeatedly noted in the literature and was underscored during the recent National Conference on Scientist–Practitioner Education and Training for the Professional Practice of Psychology (Belar & Perry, 1992).

Just what behaviors and attitudes must the faculty model if students' research interest is to be positively influenced? It goes without saying that the faculty needs to be involved in research themselves. But such involvement may have a paradoxically retarding effect if not accompanied by certain attitudes. For example, the faculty member who communicates verbally or nonverbally that she or he is producing research

in order to meet external demands and does not enjoy the process all that much can have a deadening effect on students' interest level.

It is crucial that faculty be excited by their research and share this excitement with students. Even more fundamentally, I suggest that an interest in ideas and theoretical concepts, and a pleasure in sharing ideas would be modeled, for these undergird the empirical research process. In serving as effective research models, it is important that faculty share not only their positive experiences. Students can be enormously relieved by hearing about admired faculty members' failures—the experiments that did not work out and the manuscripts that were not well received. This communicates that the faculty member is human and that it is okay to have failures. I believe that communicating failures as well as successes allows students to feel that they do not need to "succeed" in all or nearly all scholarly endeavors, and it helps students to experience their research goals as reachable.

Recent research has strongly supported this faculty modeling ingredient (Goodyear & Lichtenberg, 1991; Krebs, Smither, & Hurley, 1991; Royalty & Magoon, 1985; Royalty & Reising, 1986; Royalty et al, 1986). Royalty et al. (1986), for example, developed items to fit the "faculty modeling" ingredient as described above and found that counseling psychology doctoral programs having a strong, positive impact on their students' research attitudes scored substantially higher on this ingredient (using students' ratings) than did programs that did not have such an impact. Krebs et al. (1991) went a step further. Using the same measure as did Royalty et al. (see Gelso, Mallinckrodt, & Royalty, 1991), these researchers found that counseling psychologists' retrospective ratings of the faculty modeling ingredient correlated significantly with actual research productivity during their careers.

Positive reinforcement of students' research efforts. If one of the goals of scientific training in professional psychology is to enhance students' research attitudes—to help resolve their ambivalence toward research in the positive direction—then it goes without saying that the RTE ought to contain ample reinforcers for research-relevant behaviors. More broadly, the RTE needs to provide sufficient research opportunities, encourage research, and reinforce research efforts that approximate the kinds of attitudes and behaviors that are desired. Sources of reinforcement may be many and varied. Specific examples of encouragement-reinforcement are travel monies for conference presentations, access to computers and funding for computer assistance, recognition of research-related activities in departmental newsletters, and student research awards. Although these specific and concrete reinforcers are highly desirable, it is probably the less concrete, more interpersonal reinforcement that has the greatest effect on students. For example, faculty members' responses (or nonresponses) to students' research accomplishments may be the most potent reinforcers. Such reinforcement may be at its strongest within the context of the advisor–advisee relationship, which will be discussed later. Suffice it to say for now that the importance of a rewarding advisor–advisee relationship has been revealed in a number of studies (Berman, 1992; Gelso et al., 1983; Parker & Detterman, 1988; Royalty & Reising, 1986).

Attention to positive reinforcement ought to be deliberate and systematic. The provision of a positively reinforcing RTE may not be as easy as it would seem. Successful faculty members have often gotten where they are by having high expectations and being demanding on themselves and others. My impression is that thinking in terms of systematic reinforcement may require an attitudinal shift for some or many.

Regarding research on the importance of this reinforcement ingredient, Royalty et al. (1986) found that counseling psychology training programs that had the greatest effect on students' research attitudes were rated by their students as significantly more reinforcing than were programs that were less influential. The results of the study by Mallinckrodt et al. (1990) also suggested that this reinforcement ingredient may be especially important for students who have the strongest social-interpersonal orientations. This finding makes sense, because the reinforcements that were studied (e.g., faculty praise) had a strong interpersonal flavor. Finally, Galassi et al. (1986) found that actual research productivity among students was significantly related to the encouragement, support, and reinforcement provided by their training programs.

Early and minimally threatening involvement. For many or most students, their first research-related experience in graduate school is a beginning statistics course. If our training goal is to positively affect students' motivation and attitude toward research, this is precisely what should not happen! First, to those who are not mathematically oriented (i.e., probably most students in professional psychology fields), statistics can be and often is anxiety engendering, especially when taught by faculty who are not interested in clinical research applications or indifferent to students' needs and feelings about the subject matter. Thus, students' first taste of "research" may be a "psychonoxious" one. The set often develops in this situation that statistics *is* research, and this initial set may be hard to counter.

Perhaps just as important, statistics is not especially meaningful in a vacuum—before students have involved themselves in actual research courses and experiences to which they may apply the statistics. Thus, despite the inarguable importance of grounding in the quantitative elements of psychology, statistics as a first experience may well be a research-retarding ingredient.

If the goal is research enhancement, it is important that students be involved in both didactic and experiential components of research as early as possible—the earlier the better. Beginning research seminars, participation on research teams that are actually doing research, and work with individual faculty members are examples of the kinds of experiences that are possible. It is crucial that the experience be matched to the student's skill level, such that what is required of the student in a given experience is neither too mundane nor so demanding that research becomes associated with anxiety.

A major aim of both early research coursework and experiences should be, undoubtedly, to inform students. From a motivational standpoint, however, other aims are perhaps more important: to help students experience the truly exciting aspects of research and science at their most impressionable stage; to enhance their nascent sense of competence; and correspondingly, to reduce the anxiety they are feeling about themselves as researchers and scientists. Very early research experiences present the student with the message that research is a crucial part of what we are all about and get the student "thinking research" early.

Several studies have provided strong support for this "early involvement" ingredient (Galassi et al, 1986; Gelso et al, 1983; Krebs et al, 1991; Royalty et al, 1986). Royalty et al. (1986), for example, found that this ingredient differentiated training programs that strongly and positively affected students' research attitudes from programs that did not; Galassi et al. (1986,1987) discovered that highly productive programs (i.e, students' productivity) provided substantially more early research experiences for students than did what the authors termed "low production programs," and Krebs et al. (1991) were able to link doctoral-level counseling psychologists' actual productivity to the RTE in graduate school. They found that participants' retrospective ratings of the extent to which their training programs provided early and minimally threatening research experiences were associated with research productivity during their careers.

The flawed and limited nature of every research study. In the initial theoretical statement, I used the term *bubble hypothesis* metaphorically to capture the idea that each and every empirical study has inevitable limitations and that solutions to given methodological problems themselves created other problems (Gelso, 1979a, 1979b). As but one example of this trade-off process in research, I noted how efforts to enhance the methodological rigor (internal validity) of a study themselves created problems of low clinical relevance (external validity) and vice versa. In this sense, the research process is likened to the placement of a sticker on a car windshield, where a bubble appears in the sticker. One may press the bubble in an effort to eliminate it, only to have it appear elsewhere. The bubble cannot be eliminated, unless one tears the sticker off the windshield. Thus, the bubble hypothesis states that methodological problems cannot be eliminated, and the researcher needs to accept the inevitability of such problems and settle for the problems that are least injurious to the overall research effort.

To experienced researchers the bubble hypothesis is both obvious and axiomatic. To the inexperienced graduate student, it is not. Students need to be taught the bubble hypothesis as an antidote to the often hidden belief that they need to do flawless research that has earth-

shattering implications. This belief, it is here maintained, does more to diminish research interest than perhaps any other. Both students, and at times their faculty research supervisors, are afflicted by this "perfect research" malady.

One might worry that an RTE that carries the message of the bubble hypothesis would discourage students from wanting to engage in a process that is inevitably flawed and limited. To the contrary, I propose that the bubble hypothesis is a great relief to the new researcher and positively affects motivation when accompanied by two additional messages. First, despite the inevitable limitations of single studies, knowledge is advanced by research, especially when that research is programmatic. Such programmatic research may consist of a number of studies, each with its own set of methodological problems (different ones, it is hoped). Convergent findings under varying methodological conditions and limitations allow for powerful conclusions about the phenomena under investigation. A second message that needs to accompany the bubble hypothesis is that single studies can indeed have an impact in that they may add usefully to an unfolding body of knowledge. Adding a little piece to that body is what we can expect, and adding such a piece can be an exciting experience.

At least four pieces of research support the impact of this ingredient on students' research attitudes and productivity. Taken together, Goodyear and Lichtenberg (1991); Mallinckrodt et al. (1990), and Royalty et al. (1986) suggest that training programs that were research productive and had an influence on students' research attitudes were more likely than others to promote the views inherent in the bubble hypothesis as well as the idea that individual studies can still contribute usefully to knowledge. Krebs et al. (1991) found that career productivity levels of counseling psychologists were related in the theorized direction to participants' retrospective reports of their training programs' RTEs on this ingredient.

Teaching varied approaches to research. There are of course many and varied methodological approaches to research. One may, for example, classify methodologies dichotomously as field or laboratory, experimental or correlational, quantitative or qualitative, manipulative or naturalistic, and so on, and one may combine these classifications (e.g., experimental field or correlational field; see Gelso, 1979a; Gelso & Fretz, 1992; Heppner, Kivlighan, & Wampold, 1992). If one of the aims of graduate education in professional psychology is to enhance research attitudes and students' sense of effectiveness as researchers, then it is important to familiarize students with a range of methods and to permit, even facilitate, students' use of varying methodologies. In contrast, mandating certain methods (e.g., traditional experimental studies) to the exclusion of anything else is seen as a research-retarding factor.

The rationale behind familiarizing students with varied methods and facilitating students' use of them is twofold. First, doing so will give students the greatest degrees of freedom in fitting the method to their research questions. Thus, students will complete their graduate training with a wide range of competencies regarding the use of methodology.

The second rationale for teaching and facilitating the use of varied methodologies may be even more important, although it is generally not acknowledged in our field. That is, it allows the student researcher to use the methodology that fits his or her personality and personal preferences. Although some researchers might believe that personal preferences should never dictate choice of methods, I maintain that when investigators are given the freedom of choice, personality factors virtually always play a role in methodologies that are chosen. In addition, a study of 296 counseling psychologists (Royalty & Magoon, 1985) revealed that personality factors were very clearly related to preferred research approaches.

Basing methods on personal preferences and personality rather than the research question being studied might cause us big problems if, in fact, certain questions logically dictated only certain methods. I suggest, however, that essentially any question one could cook up in professional psychology would lend itself to a wide range of methodological approaches (e.g., field, laboratory, qualitative, naturalistic), each with its own set of problems, *a la* the bubble hypothesis.

In teaching students a wide range of research approaches, methodologies that differ (sometimes markedly) from the traditional, "received view" of science should be incorporated into training. These alternative methodologies, which I shall call *qualitative* for the sake of

convenience (for elaboration, see Gelso & Fretz, 1992; Hoshmand & Polkinghorne, 1992), tend to be more field-based, idiographic, and naturalistic than traditional approaches. As such, they may also be more appealing to students who will eventually become primarily practitioners. Teaching such methods in graduate training programs may provide these students with research tools that they can use in their practices and that have a better fit with practice than do traditional methods.

Support for this "varied approaches" ingredient can be found in several studies (Galassi et al., 1986,1987; Gelso et al., 1983; Royalty & Magoon, 1985; Royalty & Reising, 1986). Galassi et al. (1986, 1987), for example, found that training programs in which students were research-productive taught more varied methods, namely qualitative approaches as well as traditional methods. Similarly, in an intensive study of students and doctoral graduates of one training program, Gelso et al. (1983) found that training in applied, practical, and less traditional (e.g., qualitative) approaches to research had a positive impact on the development of research interest. These researchers noted that nontraditional and applied methods seemed most appealing because they represented a better fit with the clinical settings in which most graduates worked and to which most current students aspired.

It should be noted that this ingredient has not received uniform research support. In the four studies that used the Research Training Environment Scale (Gelso et al., 1991) to measure this ingredient, no relationship was found between "varied approaches" and measures of research interest or productivity (Goodyear & Lichtenberg, 1991; Krebs et al., 1991; Mallinckrodt et al, 1990; Royalty et al, 1986). Inspection of the relevant subscale on that instrument, however, reveals doubtful reliability (e.g., retest r after a 2–4 week period was only .47) and thus questionable validity.

The wedding of science and practice. One of the most powerful and consistent facts about students who enter doctoral training in professional psychology is that they are oriented toward clinical practice much more than toward research (Garfield & Kurtz, 1976; Kelly & Fiske, 1950; Parker & Detterman, 1988). Because of this predominant practice orientation, it is proposed that a crucial research-enhancing ingredient of RTEs is the belief that research and practice may be integrated and clarification of how it might be done. This belief-clarification may occur in what faculty communicate informally to students as well as through the medium of formal coursework. In the latter, for example, pertinent research may be discussed during clinical courses such as practica, and practice issues may be examined in research courses.

However it is done, what needs to be communicated is that, for one, practice is a potent, perhaps the most potent, source of ideas for research. In contrast to the traditional notion that research hypotheses are derived from the literature, students may be shown how work with clients provides a marvelously fertile source of material for empirical investigation. The therapist-trainee simply needs to open his or her mind and eyes to become aware of the many clinical questions worthy of empirical study that may become evident even in a single session.

A second view that must be communicated is that research, in turn, relates to and can enhance practice. Not only is it crucial that this view be communicated, but faculty must also clarify and help students see the many ways in which research bears upon practice. As part of this clarification, it is wise to show how the relationship of research to practice is not a direct, linear one. Even the most effective scientist–practitioners probably rarely, if ever, apply research findings directly to their practice. Rather, research is relevant in the sense that findings become part of the practitioner's construct system about therapy and become applied in the appropriate ways at the appropriate times (Gelso, 1979a, 1985; Gelso et al., 1988). This concept of *indirect relevance* has been seriously under-addressed in the research training literature, yet it may be one of the most useful concepts in demonstrating to students how research affects practice.

Of the ingredients discussed thus far, empirical support for the effect of this one is the greatest. RTEs that make this research–practice link have consistently been found to affect student interest in research (Berman, 1990; Gelso et al., 1983; Mallinckrodt et al., 1990; Royalty et al., 1986) and research involvement, both during (Galassi et al., 1986) and after (Krebs et al., 1991) graduate school.

Some Treatment x Aptitude Interactions Worthy of Note

In the earlier theoretical statement (Gelso, 1979a), two ingredients of research-enhancing RTEs were suggested that have not been clearly supported in subsequent research in terms of "main effects." Instead, research suggests that these ingredients may interact with certain subject or "aptitude" variables in affecting research attitudes and productivity.

Looking inward for research ideas. Regarding the first of these two ingredients, I had suggested that "more than is usually done, we need to teach students to 'look inward' for research questions and ideas" (Gelso, 1979a, p. 29). Here I was concerned that students be aided in seeing themselves as an integral part of the knowledge-generating process and in owning their research ideas rather than experiencing research as personally alien and as something "out there." Actually, I suggested that the research process is probably best seen as a threestep process. The first step entails looking "out there"—acquiring sufficient knowledge from the outside in a given domain. The second step, however, entails experiencing, looking inward, and owning ideas such that the researcher is at the center of his or her work and of the knowledge-generating process. Evaluation is suspended for a time as students get in touch with their curiosity and with the research ideas that intrigue them. Then the third phase involves accountability wherein the researcher puts his or her ideas to the test through implementing an acceptable research design. My contention in 1979 was that in an effort to produce academically respectable science, we often neglect Step 2, making the process evaluative and accountable but devoid of the sense of ownership that is vital to the scientist.

It was a great-sounding theory. The problem with it was that none of the subsequent research was supportive. In fact, Royalty et al. (1986) found that training programs having the strongest impact on their students' research attitudes were lower on this "looking inward" factor than were less impactive programs! Thus, it appeared that RTEs that encouraged students to look inward for research interests and ideas at best did not have a positive effect and at worst had an adverse effect on student research interest.

Before totally discarding this ingredient, however, it is worth examining the data gathered by Royalty et al. (1986) in greater detail. When these investigators broke down their large sample ($N = 358$) in terms of year in graduate training, a potentially important pattern was uncovered. No relationship was found between the looking-inward ingredient and change in research interest among students in the first, fourth, and fifth year of doctoral training. Significant positive correlations were found, however, for second- and third-year students, whereas a significant negative correlation between looking inward and change in research attitudes was discovered for the students who were beyond their fifth year.

Thus, it may be that an RTE that fosters students' looking inward for their research ideas has a positive impact on research attitudes during the second and third year of training, after these students have spent their first year adjusting to graduate school and studying research issues and findings. In other words, the first year may be a time when students need to "look outside themselves" before looking inward can be facilitative. Students may be aided, for example, by working on others' (e.g., faculty members') research teams and surveying different topics before they have the tools to look inward effectively.

The situation may reverse itself for students beyond the fifth year of training. These students may be the "stragglers," those who have had significant trouble implementing their dissertation projects. For them, looking inward may just cause further frustration. It seems likely that such students need greater structure and may need outside help to effectively develop the dissertation.

Given that more research is needed before definitive statements may be made about this ingredient, we may now tentatively restate a seventh proposition about research-enhancing RTEs as follows:

> 7. Graduate students' research attitudes and productivity will be positively affected to the extent that the importance of their looking inward for research questions and ideas is emphasized when they are developmentally ready for this responsibility.

Promoting looking inward at certain points, however, will not have a positive effect, and at other points in the students' development it may have an adverse effect.

Science as a partly social experience. In the original theoretical statement, I suggested that RTEs emphasizing that science is a partly social-interpersonal experience as well as a private intellectual one would facilitate the development of positive research attitudes. Although inevitably there are points in the scientific process when the investigator must work alone, there are also many points when he or she may work effectively with others. Emphasizing those points, it was reasoned, would be helpful to students in applied fields because such students tended to be socially and interpersonally oriented. Thus, such RTEs would capitalize on students' personality needs.

Two primary vehicles through which social-interpersonal elements of research could be emphasized are the advisor-advisee relationship and team research experiences. A sound, stimulating interpersonal relationship between advisor and advisee can have a profound impact on the students' research attitudes. To be optimally effective, the research advisor should offer the student a generally facilitative relationship (empathy, positive regard, genuineness), while at the same time serving as a stimulator of ideas and a model of the scientist who is excited about his or her work. Furthermore, depending on the students' level of development and the stage of a given research project, the effective advisor is able to oscillate between the roles of thoughtful critic on the one hand and consultant-colleague on the other.

Research teams can also be a powerful vehicle through which the student both learns about research and experiences the gratifying interpersonal elements that may be part of the scientific process. To be optimally effective, such teams should be coordinated by researchers who have some expertise in the often delicate interpersonal dynamics and power issues that inevitably develop in team research situations.

Research has provided strong and consistent support for the impact of the advisor or mentor relationship on students' research attitudes and productivity, including research productivity after graduate school (Berman, 1990,1992; Gelso et al., 1983; Krebs et al., 1991; Parker & Determan, 1988; Rardin, 1986; Royalty & Reising, 1986). Also, the negative effect of not having a good relationship with an advisor or mentor has been noted by students and doctoral-level psychologists (e.g., Gelso et al., 1983). The importance of team research has also been pointed to in some studies (Galassi et al., 1986; Krebs et al., 1991).

Because of the strong empirical support just noted, one might conclude that the "science as partly social experience" ingredient should be stated as a main effect, as were the initial six propositions. Evidence uncovered by Mallinckrodt et al. (1990) and Royalty et al. (1986), however, points to the likelihood that main effects for this ingredient may be qualified by important interactions. Mallinckrodt and his colleagues found that this ingredient had the greatest impact on research attitudes of students who were assessed as Social and Artistic personality types according to Holland's (1978) theory. In addition, Royalty et al. discovered that the positive impact of science-aspartly-social-experience centered on graduate students in their second and third year of doctoral training and not on those at other points in their training.

On the basis of the evidence, it is probably best to restate Proposition 8 as both a main effect and an interaction hypothesis as follows:

> 8. Graduate students' research attitudes and productivity will be positively influenced to the extent that the RTE emphasizes science as a partly social-interpersonal experience, and the effect of this ingredient will be greatest for students who possess strong social-interpersonal needs and are at certain developmental stages in their doctoral education.

Some Unsupported and Untested Propositions

One of the 10 propositions offered in the original theory (Gelso, 1979a) has been thoroughly unsupported. I had argued that there was an unproductive link between statistics and research in most research training situations. Research design and the logic of research were both too often seen as equivalent to statistics, to the detriment of students' interest in becoming researchers. This linkage between statistics and research was an unhappy one for two reasons. First, most students in the professional fields of psychology were verbally oriented. They were less comfortable with their mathematical skills, and because of that, the implication that one had to be a master of statistics in order to be a good researcher discouraged them from the latter. Second, instruction in statistics courses was typically so irrelevant to the needs of applied researchers who were not statisticians that the

linking of statistics and research diminished students' investment in research. Thus, it was proposed that students' research interest would be enhanced during training by separating the artificial tie between statistics and research.

After studying research training and reflecting on RTE ingredients during the nearly 15 years since the original conceptualization, I have concluded that this was simply a wrong-minded theory. As indicated, none of the empirical work examining the effect of untying statistics and research during training has supported this proposition (Goodyear & Lichtenberg, 1991; Krebs et al., 1991; Mallinckrodt et al., 1990; Royalty et al., 1986). Furthermore, knowledge of statistical aspects of design certainly can help the researcher, both in analyzing data and in understanding the possible ways in which a given research question may be formulated and studied (Royalty & Reising, 1986; Wampold, 1986).

Although it is helpful to have as much grounding as possible in statistics, I do maintain that it is important to help students understand that they do not have to be statistical experts in order to be effective researchers. The logic of research design and the importance of the idea being studied are the most fundamentally important elements of research, and training in both of these elements needs to be as deep and pervasive as possible. Research training faculty also need to do everything possible to enhance the quality of instruction and applied relevance of quantitative courses in the graduate curriculum. Statistics courses that are insensitively and ineffectively taught can traumatize students and deeply affect research interest. The most influential RTEs actively seek to assure that quantitative instruction fits the level and needs of budding applied researchers.

A final ingredient should be noted here, although it has never been empirically studied. Originally, I proposed that students' eventual research productivity would be enhanced by attention in the latter parts of their graduate education to how research gets done in agencies. The reasoning behind this ingredient was that positive research attitudes and interest would not help much if the student did not have a sense of the issues, problems, and possible solutions involved in doing research in counseling agencies.

Through vehicles such as agency research assistantships, participation in agency-based research teams, discussions in advanced research seminars, and informal discussions with faculty, students would begin to learn the ins and outs of agency research. Through these vehicles, and prior to completing graduate studies, students can receive formal and informal instruction in the politics of doing agency research, the importance and ways of protecting research time when in an agency, and how to create an agency atmosphere that reinforces research.

Because this ingredient was viewed as relevant only in the latter parts of graduate training, it was not included as a factor in the Research Training Environment Scale (RTES; Gelso et al., 1991), the primary instrument used in studies of the RTE. No other studies have tested this ingredient. Thus, the ingredient still awaits empirical scrutiny.

Given the large numbers of new professionals who now enter independent practice essentially right out of graduate school, this final ingredient requires revision. Thus, it is suggested that research productivity will be enhanced by a focus in the latter part of graduate education on how research and other scholarly activities may be accomplished in all practice settings, not only in agencies. Pointing to "other scholarly activities" is important because in many practice settings empirical research simply is not feasible (Gelso & Fretz, 1992). In such settings, however, other scholarly activities may be quite feasible (e.g., construction of clinical theory). During the latter portion of their graduate education, students would profit from examination of how one can incorporate such viable scholarly activities into their practices. Practicing clinicians report numerous situational impediments to their doing research in the context of their practices (see survey by Haynes, Lemsky, & Sexton-Radek, 1987). Preparing clinicians to cope with such impediments and to negotiate research-inhibiting issues will provide important help.

Conclusion

In this article, I have discussed how graduate students' research attitudes (interest in doing research and belief in the value of research in their subsequent careers) and eventual research productivity may be enhanced by the presence of certain ingredients (and retarded by the absence of those

ingredients) in the research training environment. I have revised and updated a theoretical statement originally presented nearly 15 years ago to take into account research that occurred during the subsequent years.

The overall aim of the theory is to facilitate the creation of research training experiences that will result in more and better applied research in professional psychology. In contrast, it might be argued that the most potent way to enhance productivity is through the "input" factor rather than the "treatment" (research training environment) factor (see Holland, 1986). Those who take the "input" position tend to argue that, rather than worrying so much about RTEs, we should devote our energies to selection of the personality types that are most likely to be productive researchers. Support for this "input" argument may be found from studies showing that research interest, changes in interest during graduate school, and research productivity are all related to personality factors (Goodyear & Lichtenberg, 1991; Mallinckrodt et al., 1990; Rardin, 1986; Zachar & Leong, 1992). For example, Rardin (1986) found that psychotherapy researchers have more verbal/analytic cognitive styles than do therapy practitioners, who in turn have more global/intuitive styles. Similarly, Zachar and Leong (1992) found that psychology graduate students with strong scientific interests were likely to have "investigative" personalities, whereas the Mallinckrodt et al. (1990) study revealed that students with such investigative personalities tended to increase research interest during training. In contrast, psychology graduate students with strong practice interests were more often "social" personalities (Zachar & Leong, 1992), and students with "enterprising" personalities showed decreased research interest during training (Mallinckrodt et al., 1990).

The problem with the input argument and the focus on selection is that, to begin with, the pool of applicants to most professional psychology programs who fit the verbal/analytic or investigative personality style is quite small. For example, Mallinckrodt et al. (1990) found that only 16% of their large sample of counseling psychology doctoral students were investigative or investigative-artistic types. Perhaps more significantly, most doctoral programs are not simply trying to select researchers but rather seek scientist–practitioners, and those personalities who fit the research mold very well (e.g., the verbal/analytic and investigative types) tend to have weak practice interests (Zachar & Leong, 1992) and may not make for effective practitioners. Thus, the selection problem in scientist–practitioner programs is a highly complex one and not likely to be solved by simply selecting personality types that fit either the scientist or the practitioner mold.

From the standpoint of the scientist–practitioner model, it is probably most effective to select students who appear to have potential to be both scientists and practitioners and then provide these students with research training environments that maximize the likelihood of their actually becoming both scientists and practitioners. To do that effectively will offer a great challenge to doctoral training programs in professional psychology fields. From the scientist side of the scientist–practitioner model, going this route will allow for an ultimate test of the potential of the scientist–practitioner model of training in clinical, counseling, and school psychology. Both theory and empirical efforts on research training environments and the research-enhancing and retarding ingredients of those environments are just now moving past infancy into early childhood. The success or failure of the practice of research training will be deeply affected in the years ahead by theory development and research related to research training.

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