Qualitative and Quantitative Research in Clinical Practice
Katherine F Shepard
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KATHERINE F. SHEPARD

The purpose of this article is to describe types of research that are particularly suitable for use in clinical settings. Examples of the case study, descriptive research, and quasi-experimental research and examples of both qualitative and quantitative methods to record and transmit subjective data are described briefly.

Key Words: Physical therapy, Research.

All of us have understood from our first days of clinical practice that effective physical therapy is both an art and a science. We have thought of science, however, as the rational, deductive, measurable aspects of practice and of art as the intuitive, inductive, nonmeasurable aspects of practice. I do not believe this traditional way to think about these two aspects inherent in clinical practice is true or useful either for the physical therapy practitioner or the researcher. Rather, we have available for our use well-known tools from the biological and physical sciences to measure quantitative input and outcome data. Few physical therapists, however, have been exposed to the research tools from the social sciences. Some of these tools are qualitative, some are quantitative, and many can record the therapist's "artistically" applied therapeutic input in addition to the patient's individual, or subjective, responses and outcome.

When a clinician becomes interested in pursuing research, he usually begins with a notion about which treatment interventions seem to be particularly effective with which patients. Commonly, clinicians say, "In my experience, I have found. . . . or "I have a notion that. . .(treatment A) is more effective than. . .(treatment B) for. . .(patient group) when. . .(certain conditions exist)." These statements emerge from prolonged therapist-patient contact, usually with specific patient groups in whom the clinician is particularly interested. As the clinician discusses the notion with colleagues, excitement about the notion grows until the clinician is prompted to test it by conducting research. As any clinician who has tried to "do research" on the basis of a notion knows, the likelihood, however, that the same question using the exact same intervention with the exact same sample already has been answered is practically nonexistent.

The next step in the traditional research model is to formulate the method or research design for doing the research. The research design begins with defining the sample. What inclusive and exclusive criteria should be considered? Specific age, sex, disability type, and stage of recovery are "ruled in" and complicating medical histories, associated disabilities, and confounding cultural factors are "ruled out." During this process, many patients in the original patient group about whom the clinician was interested are ruled out.

After defining the sample, the instrumentation and procedures must be established. During this process, the clinician struggles to figure out how to keep within the traditional basic science notions of reliability and validity. How can one establish the reliability of a hands-on technique in which one is skilled? How can one make a case that a specific intervention, by itself, is primarily responsible for specific patient outcomes? How can one ever get enough patients who meet the inclusive and exclusive criteria constraints? Will the findings be relevant for use by other physical therapists with different educational backgrounds and experience who work with patient groups that are similar, but not equal, to the sample test group? At this point, the clinician's interest and excitement in research begins to wane. It has become increasingly apparent that by following all of the rules of scientific experimental research, it will take years to gather enough patients and refine the instrumentation and procedures to a credible (replicable) level such that the original notion can be added as fact (external validity) to the practice of physical therapy. Many reasons, including the lack of knowledge, time, and resources, have been cited for lack of research in clinical settings. Perhaps another even more powerful reason has not been recognized fully. That reason is that transferring the rigor of reductionistic traditional laboratory research into the wonderful messy world of clinical practice is impossible.

Research by clinicians has been criticized in public forums in our profession for not attending to the rigors of traditional scientific research. The reason for this criticism is that clinicians think not in terms of laboratory research but in terms of research that can be applied functionally to patient populations. Applied research does not involve reducing the num-

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Dr. Shepard is Associate Professor and Director of Graduate Studies, Program in Physical Therapy, College of Allied Health Professions, Temple University, Philadelphia, PA 19126 (USA).
ber of variables or using constrained procedures for data collection. Rather, applied research involves designing a research strategy that best can capture what is actually occurring in patient care in everyday practice.

Suppose, for example, that a clinician wanted to study training effects that may alter kinesthetic awareness in the standing position. The obvious position to put the subject in would be standing (M. Bray, R. Westwood; unpublished data; June 1983). The laboratory-trained researcher, however, could and has argued that the use of a standing position involves so many "confounding" variables from weight shifting to posture that such a study should be conducted with the person in a nonweight-bearing position. Although this approach makes sense in terms of variable control, it does not make sense to the clinician who questions the applicability of such outcomes to their original interests. The clinician responding to such criticism is left with a research design that is "clean" and "reproducible," but hardly applicable to clinical practice.

Fortunately, we are making some headway, albeit slowly. The best-documented, laboratory-controlled intervention that does not work in the multistimuli world of clinical practice is of little value to physical therapists. One answer for those of us involved in physical therapy research is the use of an expanded range of research methods. In particular, the use of qualitative as well as traditional quantitative research methods may hold the key to viable clinical research.

Quantitative research methods include research design and analysis principles derived from the biological and physical sciences that emphasize experimental or quasi-experimental design and statistical analysis of many cases (subjects). Qualitative research methods include research design and analysis principles derived from the social and behavioral sciences that emphasize data collection methods involving nonnumeric data (behaviors) and analysis of one or more cases and that do not necessarily involve statistics. The following types of research that lend themselves to qualitative methods will be discussed briefly: 1) the case study; 2) descriptive research that may include literature review, ethnography, or descriptive correlational studies; and 3) quasi-experimental research. I also will discuss the emerging use of combined qualitative and quantitative methods and analyses.

CASE STUDY

The case study usually presents the outcomes of one patient with complex or "different" symptoms who gratifyingly responded to innovative treatment by a determined physical therapist. The reason for reporting a case study is to share one's clinical ideas that have triumphed. Case studies may use both quantitative and qualitative research methods.

Hallum, for example, described how to elicit motor behavior in a 2.5-year-old blind, profoundly retarded, Spanish-speaking child. She used quantitative methods and a clinically applicable sequential time series design involving physical therapy intervention and withdrawal of behavior modification techniques. She was successful in eliciting sustained head raising in the prone position, which was the key to establishing head control in sitting.

In another case study, Upson reported on the use of topical hyperbaric oxygenation (THO) in treating ischemic lower extremity ulcers. Her methods were qualitative; that is, she described a treatment protocol that included THO treatment for two patients. In both cases, the results were improved healing of recalcitrant leg ulcers. In her conclusions, she confidently stated:

Although other factors such as judicious wound care, whirlpool therapy, medicinal agents, TENS [transcutaneous electrical nerve stimulation], and smoking may have important effects, I primarily attribute the success and improved rate of healing in these two cases to THO therapy.

Obviously, further research would be necessary to prove whether any one of these variables, including THO, really did make a significant difference or whether ulcers may improve without physical therapy. Reporting successful outcomes, however, and suggesting a cause-and-effect relationship enables clinicians to raise rich research questions.

Thus, use of a case study on one or several patients is an excellent way for skilled clinicians to begin writing and sharing their ideas. In this type of research reporting, all confounding variables may be included rather than excluded, and the author makes no predictions as to what the outcomes will be for other therapists working with similar patients in different clinical settings under different circumstances. One clinician's idea, however, which has proven effective on one patient is a seed for innovation that broadens our clinical awareness and stimulates our curiosity as the care giver as well as the researcher in each of us.

DESCRIPTIVE RESEARCH

For research that is a step beyond the same study, the clinician might consider several forms of descriptive research. In one form of descriptive research, the clinician describes a certain patient population he is very familiar with and then discusses relevant physical therapy clinical problems and how the current literature addresses those problems. No numerical data are gathered and analyzed, but insights are added from the clinician's own practice setting. The use of a literature base supported by the clinician's own observations and successes can be considered a form of clinical research that uses a qualitative data approach. Specific testable hypotheses often can be drawn from this type of research for later quasi-experimental clinical research. For example, in an article on rehabilitation of burn patients, Giuliani and Perry state:

When the patient perceives he has more control of the treatment, his apprehension seems to decrease as does his experience of pain. . . . For example, we have observed that when a patient cleans his own wounds, he tends to be more vigorous than the therapist and has fewer complaints of pain.

Operational hypotheses could be formulated from this observation that might include measures of patient independence in wound cleansing as an independent variable and measures of wound cleanliness and number of complaints as dependent variables. As with the case study, this type of descriptive research that combines description of one's clinical experience with published literature is a good starting place for clinicians interested in research.

Another type of descriptive research that can be used in clinical practice is that of ethnography. The structure and methods for this type of research are described in the article by Schmill in this issue of PHYSICAL THERAPY. This research strategy, although currently not in widespread use in physical therapy, has tremendous potential to guide the clinician to develop theories about how and why clinical interventions work. In addition, ethnographic research as well as other forms of qualitative research are most appropriate for answering clinical questions that have only partially quantifiable components. Research on such issues as adaptation to chronic
illness, effectiveness of out-of-hospital compared with in-hospital patient care services, individual compliance with therapeutic regimens, and cultural differences in seeking and responding to physical therapy interventions may be initiated using qualitative research methods. Methods of data gathering in qualitative research are not unlike the data that are gathered spontaneously and naturally by clinicians to aid in their understanding of patient care problems. These methods may include a combination of observational data, unstructured interviews, and use of medical records (historical data).

As more specific research questions and operational hypotheses are generated from literature review or ethnographic studies, a third form of descriptive research can be used. This form includes qualitative descriptive data. These numeric data are gathered from recording of measurements on standardized scales, the use of questionnaire responses, or from structured interview formats. Descriptive statistics are used to describe the sample under study. All research studies use descriptive statistics to report demographic data on subjects such as age, sex, time since onset of disability, or number of days in the hospital. Common descriptive statistics include means, standard deviations, ranges, medians, and modes. Tables of numbers and percentages may be used to illustrate how many subjects did what or how frequently a phenomenon occurred. Histograms or bar graphs give an easily readable account of how many times or what intensity something happened to different subgroups. Line graphs can be used to plot changes over time. Scatter diagrams can be used to show correlation between two or more variables. Correlational statistics also may be performed on descriptive data (descriptive-correlational research) to show how strong an association is between two variables. This association, of course, does not indicate in any way that one variable had an effect on another variable. Rather, correlational statistics demonstrate that the pattern of incidence of one variable corresponds with the pattern of incidence of another variable. For example, a study of patients with low back pain may show that as their activity increased, their pain decreased. Those who read about this research will know that pain and activity appear to be related in patients with low back pain. Additional research, however, would be needed to determine whether increased activity had an effect on decreasing pain, decreased pain had an effect on increasing activity, or some other variable had an effect on both pain and activity.

The first few chapters of most general statistics books include information on the use of these descriptive statistics. The Style Manual of the American Physical Therapy Association gives numerous suggestions about how to display descriptive data.

**QUASI-EXPERIMENTAL RESEARCH**

Quasi-experimental research designs, although subject to the traditional laws of validity and reliability, can be used in clinical settings without the clinician feeling that treatment techniques must be standardized to the level of laboratory studies. If hands-on treatment techniques of the physical therapist were regimented strictly, not only might they be ineffective in any single patient case, they also might cause us to wonder about the ethics of such human subject research. Witt and MacKinnon, in their study on improving chest mobility of patients with chronic lung disease, provide an excellent model of how quasi-experimental research can be performed without responding to the traditional reliability and standardization constraints that often hamper the clinical researcher. They reported:

We followed a set treatment protocol that had an anticipated progression. It was not possible, however, to standardize the exact movements performed, the number of repetitions given, or the speed of each movement because TPI [Trager Psychophysical Integration] is subject-specific. Modification of movements depends on the responses of the subject during the treatment session. A tightly structured treatment regimen with a specific number of repetitions at a particular speed, with a standardized force, and within a given range certainly would make data analysis easier, but one then would not be analyzing TPI. Witt and MacKinnon standardized what could be standardized without jeopardizing the individual patient, that is, the goals for this group of patients all of whom had respiratory problems, the treatment time, and the sequence of body parts treated.

**QUALITATIVE AND QUANTITATIVE RESEARCH IN PHYSICAL THERAPY PRACTICE**

Subjective influences are a perennial problem for most physical therapy researchers. Although many of the subjective influences that are inherent in any type of human research can be controlled in laboratory studies, such control rarely is possible in the clinical setting. In addition, clinical researchers may not want to eliminate subjective influences. They instead may search for ways to gather and code subjective data as an integral part of the effectiveness of treatment strategies and outcomes.

Some subjective measures can be quantified, reliability established, and concurrent validity demonstrated. Roland and Morris, for example, won the 1982 Volvo Award in Clinical Science in part for their research regarding the development of a reliable and sensitive measure of disability in patients with low back pain. The 24-item Disability Questionnaire used in their study was constructed from a previously published scale. Examples of the Disability Questionnaire items to which respondents answered "yes" or "no" were, "I walk more slowly than usual because of my back," and "Because of my back pain, I am more irritable and bad tempered with people than usual." The "yes" responses simply were added to find the total disability score. Thus, an individual score could range from 0 (no disability) to 24 (severe disability). The Disability Questionnaire was compared with a six-point Likert-type pain "thermometer" with levels of pain ranging from "no pain at all" to "the pain is almost unbearable." The researchers concluded:

The questionnaire was simple, and was completed without difficulty by a mixed population of patients in about five minutes. It showed good short-term repeatability and compared well with self-rated measures of pain. The responses from the questionnaire were not related to age, or social class.

The Disability Questionnaire, a quantitative data-collection tool, proved to be a more discriminating indicator of outcome than the simple qualitative pain rating scale.

Clinicians can develop similar short, standardized questionnaires to gather descriptive quantitative data on pretreatment and posttreatment measures. These subjective data may include patient perceptions of illness and disability, pain, compliance behaviors, and attitudes toward health care prevention practices. A good place to start looking for model scales is the Ninth Mental Measurements Yearbook. For each scale cited
in this enormous compendium, the development of the scale is discussed along with reliability coefficients and validity measures of the scale if they are available.

Other subjective findings may not lend themselves to quantification, but the combined use of qualitative and quantitative data can add tremendous richness and greater truth to physical therapy research. In particular, qualitative data can be used to explain why quantitative data are valid, that is, why statistically significant data do or do not reflect reality.

Some experienced clinical researchers in our field already use this method. Beekman and Axtell, for example, studied the effectiveness of an inpatient rehabilitation program on the level of activity, perceived pain, and amount of medical care sought by 49 patients with chronic spinal pain. One of their findings was a statistically significant increase in distance ambulated between the admission and discharge tests. Rather than concluding that this particular outcome supported the effectiveness of their rehabilitation program, they reported:

At least two confounding factors probably contributed to the increased distance walked between initial and discharge tests. First, we believe that many patients were initially uncertain how long and how fast they could walk. . . .To assure compliance with our instructions, many patients slowed their pace (perhaps even more than was necessary) during the initial test. At subsequent tests . . . they knew how much they could demand of themselves and were thus able to walk at their maximum speed. Second, at discharge and follow-up tests, the patients were proud of their progress and strove to show the investigators, other patients, and themselves how much they had improved. Particularly on the discharge test, patients appeared to be putting forth a great deal of effort to better their initial test results. 

This is honest reporting by clinical researchers who are unafraid to state (nonstatistically) how powerful their data are in a clinical sense. Thus, for us, the consumers of research, their data are clinically useful. Clinical usefulness should be the ultimate goal of research in our field.

CONCLUSION

In conclusion, remember that one does not have to start big. The first step may be a case study or a review of the literature with a sharing of one’s own clinical observations, speculations, and interpretations. The next step may be to describe a clinical problem using qualitative research methods, such as a mini-ethnography or quantitative research methods, from which tables of descriptive data, graphs, or simple correlations between variables can be derived. The third step may be to use quasi-experimental designs, such as sequential clinical trials that can be implemented effectively and judiciously in the clinical setting. When one has grasped the basic tenets of both qualitative and quantitative research, one can move back and forth mixing many different research methods to frame and answer clinical questions. The combined use of qualitative and quantitative research strategies may be the single most important breakthrough in defining a body of knowledge that is unique to the practice of physical therapy.

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