Humans have always pondered the nature of reality, and the basic arguments and positions have changed little over time. The concept of a single separate reality has been contrasted with the concept of multiple realities with interrelated parts that are constructed by each individual.

Ideas about what is fact and knowledge and about how to study human existence reflect these disparate views. Guba (1981, 1986) differentiated between a naturalistic paradigm and a rationalistic paradigm, which most of us were taught was the scientific model. It is from these paradigms that differences in methodologies arise.

Guba (1981, 1986) suggested that a researcher's view of science could be determined from his or her responses to questions at three levels: (a) the ontological level, which examines the nature of being, (b) the epistemological level, which examines the origin, nature, and limits of human knowledge; and (c) the methodological level, which examines the ways in which knowledge is acquired.

Thus, one's answer to the ontological-level question (What is knowable?) determines one's view of reality and constrains the possible answers to the epistemological-level question (What is the relationship of the knower to the knowledge?). Whether the knower and the knowledge are viewed as independent or interrelated determines the answer to the methodological-level question (How can the knower acquire knowledge?). The differences in research methodologies should reflect the researchers' different belief systems.

Science consists not of one method of acquiring knowledge, but rather of many methods, including those that elevate individual meaning. Occupational science must frame appropriate questions for the study of occupation. The methodological decisions will arise from occupational scientists' answers to these three basic questions regarding reality and knowledge.

Research is a planned form of inquiry, of collecting information. The development of a research design can be one of the most creative acts in science (Stein, 1989). The research design is the outline for data collection. The choice of a design depends on the purposes of the study and the methods available to the researcher. The diversity of purposes and increasing familiarity with various methods has produced many potential designs for the occupational therapy researcher. Each of these designs has strengths and weaknesses, of which the researcher must be aware. No single design is optimal for all studies; such a simplistic view limits the researcher, the knowledge to be gained from the research, and science itself. The research design chosen should be the best solution for a particular problem in a given set of circumstances; it should be selected on the basis of the ways of acquiring knowledge that arise from the scientist's ontological and epistemological position.

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Proposed Continua for Research Designs

A research study can be described on continua representing several scientific dimensions, for example, basic to applied, theoretical to atheoretical, ahistorical to historical, manipulative to naturalistic, explanatory to normative, quantitative to qualitative, and group to single subject (Reese & Liptrot, 1970). These dimensions are proposed as continua, not as dichotomies, because most designs fall within these dimensions, not at one end or the other. On a continuum, a research project is described in terms of its relative position. Although some of the dimensions are frequently associated with each other at one end of the continuum, they should be considered potentially independent of each other, thus allowing for infinite variation in design and methodology. For example, case studies (Isaac & Michael, 1981) tend to be naturalistic and applied, but in a single-system design (Owenbacher, 1986) the design is at the manipulative end of the continuum, although both variations may focus on a single subject.

The basic–applied continuum differentiates an orientation that values knowledge for its own sake from one that focuses on problems of social or practical significance. However, in a field such as occupational therapy, the relationship of knowledge about occupation to practice is a close and important one. Position on this dimension is often based on the researcher's intention rather than on the study method or outcome, because even the most basic research finding may have important implications (e.g., the recent furor over high-temperature thermoconductivity in...
physics), and as such, intention is a tenuous differentiator.

The theoretical–athoretical continuum also presents many possibilities. Atheoretical research is designed to substantiate an informal observation or to satisfy a particular curiosity. It is exploratory in an area where no adequate theory exists; thus, it may be appropriate to occupational therapy treatment techniques in several areas of practice. Theoretical research entails the testing of a proposition derived from a well-organized set of theoretical axioms. Occupational therapy research programs increasingly use an existing theory as a basis for research, thereby testing and refining the development of our theory base.

Researchers also make choices about what is important in terms of the dimension of history. Ahistorical research deals with relationships among variables studied contemporaneously, with little or no exploration of their origins, whereas historical research requires an examination of the origins. An ahistorical study may try to describe spasticity and function in persons at a particular time; a historical study might explore the change in spasticity and function over time.

Although the layperson might judge exploration done in the laboratory as more scientific, researchers must determine whether their questions can be answered best by letting events happen naturally or by causing things to happen for the purpose of study. The manipulative–naturalistic continuum ranges from the study of behavior under ordinary circumstances to the study of behavior under laboratory conditions. The setting alone is not the sole differentiator here, because the acceptance of normally occurring variables (as in descriptive and correlational studies) is considered more naturalistic than is the imposition of intervening variables in an experimental method.

A normative approach to fact gathering is usually descriptive and attempts to determine under what conditions various behaviors are observed. It is often age related, but may relate to other demographic characteristics. In contrast, studies near the explanatory end of the explanatory–normative continuum seek to discover causal relationships, usually to make predictions from antecedents to consequences. In developmental research, these extremes are exemplified by studies revealing the mean age for attainment of certain fine motor functions in children versus studies that explore the effects of differential training on these functions.

The quantitative–qualitative continuum reflects differences at the ontological level (i.e., What is knowable?). It contrasts the extremes of external, shared evidence that can be summarized numerically with the attempt to fully describe something, possibly through introspection and the subject’s oral description. A quantitative approach measures the amount of something (the variables of interest) and usually assigns numerical values. A qualitative approach attempts to ascertain the characteristics or attributes of the thing studied.

The group–single-subject continuum distinguishes between single-subject and group design studies. Single-subject models include case, single-system, and time-series designs. Rationalistic research, which searches for convergence in generalization, has usually used a group design, but group design is not appropriate for all research: A single-subject design can have the quality of most group designs yet focus on the unique qualities of the individual (Ottenbacher, 1986).

Most research models or approaches have been described on one of these continua with assumptions made about their position on the other continua. This has been a limiting factor in our understanding of research methodology and has encouraged the idea of dichotomous approaches, which were proposed as either right or wrong, scientific or unscientific, valid or invalid.

**Common Research Designs**

Stein (1989) proposed eight research models for allied health and rehabilitation: experimental; evaluative; heuristic, or ex post facto; correlational; methodological; clinical observation; survey; and historical. The experimental model of traditional physical science is based on the control and direct manipulation of causes and the examination of effects. This falls at the manipulative end of the naturalistic–manipulative dimension, with traditional assumptions of the quantitative, explanatory, ahistorical, and group ends of the other continua. However, experimental methods can be applied to normative questions, longitudinal approaches, and small samples. The standards of validity for experimental methods arise from specific assumptions regarding the answers to the ontological- and epistemological-level questions about knowledge. Different answers, reflecting a different philosophical view, would be judged by different forms of validity.

Evaluative methods, according to Stein (1989), are those focusing on an assessment of the effectiveness of health systems or treatment programs. Evaluation reflects the applied end of one continuum and probably the explanatory end of another. However, we cannot assume what the positions of such research on other continua would be. Occupational therapy evaluative research can probably be performed within natural treatment settings or through a more manipulative, or controlled, treatment application, and single-subject data may provide appropriate answers. These arguments may be based on differing philosophical and scientific views, and such differences are appropriate to a developing occupational science.

Stein (1989) defined heuristic, or ex post facto, research as retrospective searching for potential relationships between factors or variables (e.g., attempts to determine etiologic factors such as nutrition and exercise in cardiac disease processes). This approach seems to exemplify a historical, naturalistic, explanatory, applied, group approach that is atheoretical.

In contrast to the heuristic approach, correlational studies of relationships are based on preestablished hypotheses, although the methodology and statistical analysis may be the same as in the heuristic model. Thus, we may see the same general placement on the continua except for a more explicit theoretical basis.

As a methodological approach, Stein (1989) described the construction of a measuring instrument, curriculum, or therapeutic procedure.
Such approaches suggest normative, applied ends of those continua.

Clinical observation is Stein's (1989) term for the in-depth study of individuals, as in patients' case studies, which may employ a variety of methods. The continua placements suggested are naturalistic, applied, and single-subject designs, with open options for the others. A single-system approach to clinical research might be considered more manipulative than naturalistic, but may appear in a similar position on other continua.

Survey research attempts to study the characteristics of populations and defines general factors that characterize groups (Stein, 1989). The qualities suggested here include normative and group designs, with other options available to the researcher.

Historical research involves a reconstruction of events to understand contemporary problems (Fox, 1969; Isaac & Michael, 1981; Stein, 1989); as such, it mainly reflects a position on the history scale.

Other authors have provided other classifications for research. Isaac and Michael (1981) defined nine functional categories of research design: historical; descriptive; developmental; case, or field; correlational; causal-comparative; true experimental; quasi-experimental; and action research. Fox (1969) described historical, survey, and experimental designs. Many of these overlap with Stein's (1989) categories, and some offer additional forms that are not commonly used in occupational therapy and rehabilitation research. Descriptions of research designs abound in the literature, but use of the continua for examination and determination of methodology reflecting the researcher's philosophical base provides an additional approach to understanding research.

Conclusion

A research plan cannot be adequately described on only one dimension—it requires the use of many of the proposed dimensions. The automatic linking of positions on several dimensions makes no more sense than suggesting that all tall people have blond hair and blue eyes. Although certain combinations do exist, so do many other combinations. As people differ in their answers to the questions What is knowable? What is the knower's relationship to the knowledge? and How can we acquire knowledge? so will researchers differ in the dimensions they choose to define their methods of answering research questions that arise from differing philosophical paradigms.

A good research design involves a careful choice among various dimensions of science to provide valid information. If research, as defined by the American College Dictionary (Barnhart, 1978), is the diligent and systematic collection of information to ascertain facts or principles, then a prime requirement is that the method of systematic collection be one that assures the validity of the facts uncovered. Discussions of validity all relate to questions that might be generically phrased as Is the information true (reality), or is it false? The answer to this question and the validity of a research design or method is in the design's relationship to the researcher's views about knowledge. Thus, science has many forms, and these forms provide a rich tapestry of knowledge to which occupational science has a potentially vital contribution.

References


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