

Dimensions of Research

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Reviewers: Greg Atkinson, Sport and Exercise Sciences, Loughborough University, Leicestershire LE11 3TU, UK; Alan Batterham, Sport and Exercise Science, University of Bath, Bath BA2 7AY, UK; Michael Brach, Sportwissenschaft und Sport, Rheinische Friedrich-Wilhelms-Universitaet, Nachtigallenweg 86, 53127 Bonn, Germany; Steve Olivier, Sport Sciences, University of Northumbria, Newcastle upon Tyne, Newcastle NE1 8ST, UK.

Identification of the various dimensions or components of research projects may be helpful for research students and supervisors confused about the different kinds of project they can undertake. In my experience, research consists of the following dimensions: the nature of the research topic (physical, biological, psychological, behavioral, social), scope of enquiry (single case vs sample of a population), mode of enquiry (observational vs interventionist), methods of acquisition and analysis of data or information (quantitative vs qualitative), ideological stance (objective vs subjective), and political stance (impartial vs partisan). The terms *quantitative research* and *qualitative research* and the so-called research paradigms—positivism, interpretivism, radical, and so on—define projects within certain regions of the multidimensional research space. Researchers who choose an unusual region of this space for a project may gain new insights but may struggle to publish in journals devoted to more popular regions. KEYWORDS: analysis, case study, design, paradigm, qualitative, quantitative, sample, statistics. [Reprint pdf](#) · [Reprint doc](#) · [Slideshow](#) · [Reviewer's Comment](#) · [Update 2006](#)

In a [short item](#) in the previous issue of Sportscience I depicted qualitative research in exercise and sport science as essentially the study of single cases, whereas quantitative research is the study of populations via samples. I received two responses to the item, both of which questioned the appropriateness of my use of the terms *quantitative* and *qualitative*. One was a letter to the editor, which along with my reply appears in the [In-brief page](#) of this issue of the journal. The other was an unpublished manuscript on research paradigms, which I summarize at the end of this article.

To address the concerns expressed in these two responses, I have devised a more comprehensive view of the research endeavor by identifying what I consider to be the important dimensions (that is, independent components) of research. Details of this view are in the accompanying [slide show](#), which you may find suitable for several lectures of an undergraduate or graduate course on research design. This article summarizes and elaborates on parts of the slide show.

The dimensions of research are as follows...

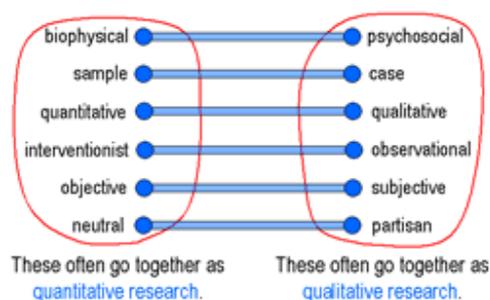
- **Nature of the topic.** A research project begins with identification of a specific topic, problem or question, such as identifying the health needs of a particular population group, determining the effect of a treatment on physical performance, developing a measuring tool, solving a public relations problem in an organization, and so on. The nature of the topics forms a dimension that extends from purely physical at one end through biological, behavioral, psychological to social topics at the other end.
- **Scope of enquiry:** single case vs sample of a population. In a case study you solve a local problem by finding out "what happened here". Studying a sample allows

you to solve a lot more problems by making inferences about "what happens in general".

- **Mode of enquiry:** observational vs interventionist. An observational or descriptive study is one in which you try to find out about something without influencing it in any way. In an intervention or experiment, you characterize changes or differences resulting from some action that you have perpetrated.
- **Methods:** quantitative vs qualitative. Using quantitative methods, you gather data with an instrument, such as a stopwatch or a structured questionnaire, then quantify relationships between variables derived from the data. With qualitative methods you gather information or themes from texts, conversations or loosely structured interviews, then tell a coherent story.
- **Ideological stance:** objective vs subjective. Most researchers assume they can make and share observations about objects, then identify and solve problems related to those objects without disagreement about the nature of meaning or reality. Other researchers place more importance on the subjective nature of meaning and truth. This dimension helps characterize some of the so-called research paradigms, from the objectivity of positivism (the dominant paradigm) through the enigmatic ambivalence of post-structuralism to the subjectivity of interpretivism and grounded theory.
- **Political stance:** neutral vs partisan. While most researchers aim to present all sides of an issue impartially, some adopt a partisan or adversarial stance by overtly or covertly selecting evidence and biasing arguments towards a particular point of view, invariably their own. Such value-laden research is the basis of the critical or radical paradigm in social sciences, but it also occurs in the physical and biological sciences.

These six dimensions define a kind of multidimensional space in which a given research project or part of a project is represented by a single point. Some regions of this research space are popular, some are unusual but potentially rewarding, and some are inhospitable.

The most popular region is sometimes known as *quantitative research*: impartial, objective studies of physical or biological topics, using quantitative assays and analysis of data obtained preferably from an intervention on a sample. Another popular region is *qualitative research*, which tends to be the opposite of quantitative research on all dimensions. This figure, taken from the slide show, summarizes these two regions:



Of course, it is neither helpful nor remotely possible to pigeonhole all research projects into two such non-overlapping groups. Researchers should instead try to find the region in research space that is optimum for a given project or for a given phase of a project. For example, some researchers who normally think of themselves as being quantitative might benefit from including qualitative data-gathering methods in research related to human behavior, and some public health projects based on qualitative data gathering need large representative sample sizes and appropriate statistical analyses to have any impact. Exactly how a researcher chooses an optimum region is unclear to me. In his [review of this article](#), Alan Batterham raises related philosophical issues, and another reviewer

(Greg Atkinson) provided [this link](#) to a comprehensive list of various types of study at the [Bridges site](#) for mixed methods in behavioral, social, and health sciences.

I label some regions of research space as inhospitable, because the researcher is likely to encounter difficulties when trying to publish a project performed in those regions. For example, you rarely see case studies of anything but unusual examples of illness or injury in most biological journals, and qualitative methods are also rare in projects published in such journals. Even so, if you believe that a novel combination of stance, mode, scope, and methods illuminates your research topic in a useful manner, persevere with it. To be creative, you have to break rules of the establishment.

The political dimension in research is worthy of further comment. Although the perceived ideal is an impartial stance, in reality many (most?) researchers are motivated by a pet theory coupled with the all-too-human desire to be right. We therefore have to be wary of the possibility that belief and ego involvement cause the researcher to ignore or misinterpret evidence. A biased report of research can also mislead inexperienced readers, if it is not clear that the author is presenting only one side of the coin. Nevertheless, a biased report also has its place, because it energizes other researchers to present evidence that the author is wrong.

The article you are reading right now is itself an example of research, so it's instructive to consider where it resides in research space. The topic—what is research?—is sociological. The scope is the population of all research projects, but the sample of projects consists only of my own and those I have read about recently—hardly a random or representative sample. On the other hand, I am not trying to quantify an effect in the population of research projects, which would require a random sample. Instead, I have developed a tool for analyzing research projects. What's important, therefore, is that the tool produces a credible analysis for most types of project, a point I will discuss presently. The mode of enquiry is clearly observational. The methods are, surprisingly, qualitative: I have somehow intuited a coherent account of the research process from an examination of information about existing research. The ideological stance is clearly objective. The political stance is, again surprisingly for me, partisan: I have presented only my own way of looking at research, without even a reference to other work. (A Web search for "dimensions of research" led me to dozens of websites featuring various analyses of the research endeavor, but they were either too riddled with jargon to understand or they identified only one or two of my dimensions.)

So, does dissecting research into dimensions produce a credible analysis of the various kinds of research project? Perhaps. A potential problem is that a sum of components does not necessarily capture the full richness of a phenomenon. For example, we can analyze a molecule into its component atoms, but molecules can have properties that we cannot work out from knowing how the atoms are strung together. Such unpredictable emergent properties may also be a characteristic of some research projects. I couldn't think of any, but one of the reviewers (Steve Olivier) suggested that flexibility and serendipity are emergent properties of projects based on qualitative methods. I agree. A corresponding emergent property of quantitative projects might be their capacity to quantify our uncertainty.

Even if a dimensional analysis captures most of the richness of research, it's not clear whether I have identified the important dimensions. Two of the reviewers (Greg Atkinson and Michael Brach) suggested a dimension of **utility**, at one end of which are pure, basic, or theoretical projects aimed at understanding phenomena, while at the other end are applied or practical projects impacting directly on health, wealth, or culture. This dimension overlaps at least partly with my topic dimension, but it might be helpful to consider it separately when matching a topic to the personalities or prior experiences of the research student and supervisor. .

Addressing these uncertainties about the dimensional analysis of research will require further study, possibly involving analysis of research projects from various disciplines and some kind of assessment (objective or subjective? impartial or partisan?) of the analyses by other researchers or acknowledged experts on research. The peer reviews of this article represent case studies of such assessment.

Finally, I include here a short critique of the unpublished manuscript I received from Lynne Giddings (Auckland University of Technology) describing a framework to help novice researchers understand research methodologies in any discipline. Giddings and coauthor Barbara Grant (Auckland University) have drawn on the work of Thomas Kuhn and more recent authors to identify four research paradigms. A research paradigm is a set of beliefs and methods that a community of researchers uses to engage with the world. Their four paradigms, with brief descriptions adapted from their manuscript, are as follows...

- **Positivist:** The researcher discovers knowledge by observation and experiment. The aim is to explain, predict or control events.
- **Poststructuralist:** The researcher views people as subjects of discourses (interrelated systems of unstable social meanings), which serve mainly the interests of a dominant group. Social change is the goal, but there is no clear path to it.
- **Interpretive:** Part of the truth of a situation can be found in the self-understandings of participants, which the researcher interprets. Truth is discovered more by thought than by observation.
- **Radical:** The focus is the experiences and views of people from marginal and disempowered social groups. The researcher's role is to raise understanding of oppression and to facilitate collective action against it.

Researchers seem to use the words *quantitative* and *qualitative* to refer to paradigms, but Giddings and Grant think we should use these words to describe methods available to researchers of any persuasion. I agree. However, their manuscript does not address a key issue of my previous article: the quest for truth with a single case is fundamentally different from that with samples. I suggest that logic or common sense is at the heart of solving most single-case problems, whereas inferential statistics is the best tool to generalize from a sample to a population. Students of exercise and sport science who go on to assess and counsel individuals might benefit from a formal course in common sense, if they don't gain enough of it from their practicums. Students who end up researching factors that affect health, injury, or performance obviously need training in quantitative assays and analysis.

In searching for a concluding statement, I found myself wanting to play down the importance of paradigms. To me, a paradigm implies a constraint. Relegating paradigms simply to an objective vs subjective ideological stance or an impartial vs a biased political stance demystifies and weakens them, appropriately in my view. It would be nice to think that we are moving into a post-paradigm era of research.

[Reviewer's Comment](#)

Slideshow: (Right-)click to view/download [PowerPoint](#) or [Acrobat PDF](#) versions.

Reference: Hopkins WG (2002). What is research? [Slideshow].

Sportscience 6, sportsci.org/jour/0201/What_is_research.ppt (2220 words)

Updated Nov 11, 2002. The utility dimension (pure vs applied) is now in the slideshow, with three reasons why you should try to include something on mechanisms in an otherwise applied project (to get the work into a high-impact journal, to provide ideas for more projects, and to account for any placebo effect in an unblinded intervention).

Updated Dec 12, 2006. I have added two new dimensions to account for two more kinds of legitimate research project: **novelty** (are you creating new data or are you reviewing

published findings?), and **technology** (is the project about development of a new method or are you using existing methods?).

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