

Postpositivism in Health Professions Education Scholarship

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Abstract

An understanding of the diversity of perspectives within the research paradigms of health professions education (HPE) is essential for rigorous research design and more purposeful engagement with the contributions of others. In this article, the authors explicitly discuss the underlying assumptions, notions of

good scholarship, and shortcomings of the postpositivism research paradigm. While postpositivism is likely one of the more familiar paradigms within HPE research, it is rarely formally or explicitly described. Drawing on key literature and contemporary examples, the authors describe the ontology, epistemology, methodologies, axiology,

signs of rigor, and common critiques of postpositivism. A case study provides the focus for a practical illustration of how a postpositivist approach to education research could be applied. Suggestions for further reading are provided for those who are keen to delve deeper into the history and key tenants of the postpositivist stance.

Editor's Note: This article is part of a collection of Invited Commentaries exploring the Philosophy of Science.

Postpositivism, a familiar paradigm in health professions education (HPE) research, developed as a critique and extension of positivism.^{1,2} Positivism (as highlighted by Park et al³) embraces certainty, seeks universal laws that govern behavior, and argues an objective external reality can be accurately and thoroughly understood. In the positivist tradition, there is a truth that science can observe, measure, and describe. Positivist research values the dissociation between the researcher and the object of study to uncover *the* truth. Positivist research advances through research *proving* or *supporting* a hypothesis. Positivism values extrapolation from theory-neutral observations to generalized statements—following many observations, one can draw conclusions, and with repeated observation, conclusions can be considered “truth.” In the mid-20th century, positivism was challenged on this extrapolation from observation to general

conclusion by several thinkers. Among them, Popper⁴ criticized positivism’s apparent inability to distinguish between scientific and pseudoscientific theories—as both could collect supportive observations. Popper argued that true scientific theories were capable of being disproven, or falsified, and pseudoscientific theories (such as Freudian theories) were not. One infamous example of extrapolation from observation is that, if enough swans are observed, we conclude that all swans are white. However, a single black swan would falsify the conclusion, therefore falsifying the generalization that all swans are white.⁵

Popper suggested that science does not progress through verification of theories, but rather through their falsification.⁴ In other words, science advances by making a guess and working hard to prove it wrong, rather than making a discovery and continuing to prove it right.⁶ Concurrent with emerging criticisms of positivism, definitions of “science” were expanding to include social sciences, anthropology, and more critical and feminist approaches that directly critiqued the dominant reductionist approach.⁷ Postpositivism asserts that, in contrast to the “black or white” tone of positivism, a theory can never be definitely proven correct.^{2,7,8} Instead, falsification is a fundamental tenant of postpositivism; it contends that science moves forward as theories are refined or refuted through careful testing.

Like positivism, postpositivism maintains a dependence on observation and measurement to develop strong

causal understandings of the world. Postpositivism retains the assumption that there is an objective truth but concedes that (just like the Holy Grail) we are unlikely ever to find it; instead, we build our understanding of the world within the limitations of our times, techniques, and currently available knowledge. This stance recognizes that scientists (as humans) are fallible and subject to a multitude of influences, and bias (while undesirable) is inevitable. Observation and measurement are considered imperfect. Understanding will never be complete. For postpositivists, science is slow, progressive, iterative, theory refining, and characterized by attempts to advance through proving a theory wrong or incomplete. In a way, postpositivism is characterized by a large dose of scientific humility—while truth exists and we can approximate and understand it probabilistically, we will never fully comprehend it.

The Underpinnings of Postpositivist Research

Ontology: The nature of reality

A postpositivist believes in a single-objective, external, tangible, measurable reality,⁹ adopting a perspective aligned with *scientific realism*.¹ However, to a postpositivist, truth or the understanding of reality remains incomplete or probabilistic.¹⁰ This “best case scenario” of partial understanding is a direct result of the fundamental postpositivist tenet that we can never fully comprehend our external world. In essence, the “truth” is out there, but we do not have the tools,

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measures, abilities, techniques, or theories to fully understand it.

In postpositivism, reality is inferred by observation, and theories act as organizing structures for the interrelationships between relevant concepts, observations, measurements, and interpretations of how the world works. Postpositivism typically sits within a objectivist deductive perspective¹¹; however, postpositivism is more of a stance or orientation than an absolute school of thinking,¹ meaning postpositivism is a broad stance, with a variety of possible approaches and few prescriptive components.¹²

In postpositivism, theories are used to organize what is currently known, to provide a basis for hypothesis development, to allow for prediction, and to stand open to testing (i.e., to falsification). Better theories, supported by more evidence, allow for more confident prediction.¹³ Hypotheses are derived from theories, describe the relationships between the concepts, and suggest a specific causal relationship about the workings of an external reality.¹ Postpositivism holds that every study should move us closer to understanding the truth about our external reality, and every study provides the chance to falsify a theory.⁶

Epistemology: The nature of knowledge

Within a reality we cannot fully comprehend, knowledge is seen as a current understanding, not a perfect truth.¹ In postpositivism, truth has a probable value¹⁰—we articulate our best understanding of a given phenomenon, but we recognize that facts, hypotheses, and theories are created by humans (fundamentally limited in the ability to measure and comprehend external reality) and can be overturned as we develop a more complete and nuanced understanding through continued research.¹⁴ Knowledge is seen as progressive rather than static. As knowledge accumulates, we develop insight, shift theoretical understandings, and test hypotheses in new ways and in different contexts, resulting in a deepened understanding or falsification of a current hypothesis or theory.

In a true postpositivist stance, theories are never considered to be complete; they are constantly in a state of being refined, tested, or refuted in new contexts.^{15,16} Kuhn claims that virtually all theories are

falsified to some extent, at some time.¹⁷ This suggests that the act of proving a previously held belief to be wrong (i.e., falsification), and continually engaging in theory refinement, has an important place in moving our understanding of the external world forward.¹⁷ Statement of definitive causal relationships is rare in postpositivism, yet testable causal hypotheses are often described.

The slow and iterative approach to science in the postpositivist view places the researcher in the position of lifelong learner—one that values problem-setting in addition to problem-solving.⁷ The postpositivist researcher progressively works toward a more complete understanding of our external reality, including the shaping of better questions—a description in contrast to the positivist orientation, which could be inferred to be in pursuit of the one perfect truth.

Methodology: How to conduct scientific research

As methodology includes justification, theoretical underpinning, and explicit rationale for choice of methods in a given research study,⁵ there are a variety of methodologies and methods available for use within a postpositivist frame—so long as the study is designed to build on existing knowledge and engage in theory-derived hypothesis testing.

Experimental approaches are common, but not exclusive, to postpositivism. In positivism, findings of an experiment can be used *to confirm* a hypothesis and provide definitive evidence that supports a theory. In postpositivism, an experiment is used as an opportunity to *falsify* or *fail to support* a theory¹³ or hypothesis, or to suggest that our current understanding is incomplete.¹⁸ This distinction rarely affects experimental design but instead manifests in the *use* and *intended inferences* drawn from the study. The distinction in the inferences drawn from experimental data to hypothesis and theory is related to the core assumptions of each paradigm—one can prove a theory or one can simply provide an opportunity to fail. Falsification of a hypothesis may demonstrate that a previously understood “truth” does not apply in all circumstances and then lead the researcher to describe those exceptional situations and contexts.

A postpositivist approach is primarily objective but often values subjectivity¹⁹ and multiple stakeholder perspectives.¹⁰ Studies may include qualitative data and multiple- or mixed-methods approaches as long as the phenomenon of interest is isolated,¹ and the goals of data collection and interpretation are testing, refining, or refuting a given hypothesis derived from a relevant theory.¹ Also embedded in a postpositivist approach is the understanding that any given study is but one possible way to study a phenomenon in a given sample of a population, context, or environment. This acknowledgment leads to a reliance on inferences— inferences from a given study context to a larger population, to a different context, or to the larger theory—and high value placed on reproducibility.¹⁴

Axiology: The role and values of the research process

While postpositivism considers the external reality to be static, it acknowledges that the way a researcher poses questions, designs studies, and interprets findings can be influenced by prior knowledge, values, and beliefs.¹ The researcher can influence what is observed, how it is observed, and how it is understood in light of a given explanatory theory.¹² In a sense, postpositivism acknowledges that bias is likely (albeit undesirable) in research.

Rigor: Criteria for evaluating the quality of research

Rigor is demonstrated through explicit effort to reduce bias through several elements: choice of research question (and its phrasing), study populations, outcome measures, data analysis, interpretation, acknowledgment of limitations, and contextualization within the current body of knowledge. Postpositivism recognizes potential bias and acknowledges our imperfect understanding of reality but values studies that test the generalizability or applicability of a given theory across contexts.^{14,20} Thus, postpositivism values replicability (i.e., the potential for replication) and replication (i.e., multiple instances of the same study).

Replicability of findings across multiple contexts allows for theory refinement. To understand why a hypothesis was falsified, a researcher must disentangle the potential causes (e.g., was the hypothesis tested in the most appropriate

population? Was the intervention delivered as intended?) to draw inferences back to the theory that was tested. Some falsifications of a hypothesis (e.g., the intervention was not successful for a certain group of participants) allow for theory refinement; other falsifications challenge the underlying assumptions that may be considered core to a given theory.²¹ A theory is abandoned only after significant evidence is collected through multiple replications and testing of different hypotheses.

In parallel to replication efforts, studies incorporating triangulation in their design shed light from multiple different perspectives, and whole programs of research designed to explore a hypothesis from multiple perspectives are consistent with and valued in postpositivism. Lakatos²¹ suggests that theory development, refinement, and falsification occur within programs of research, rather than individual studies. In this view, research programs are necessary for scientific progress—individual studies cohere into programs, and these allow for developments that support inference and prediction.²¹ The value and credibility of a given study, in the context of a program of work, is deeply dependent on the evaluation of the scientific community. Therefore, postpositivism places great value in peer review.¹⁴

In summary, the signs of a rigorous and credible postpositivist study are downstream consequences of the fundamental ontology, epistemology, axiology, and methodologies associated with the paradigm. Postpositivism assumes we can never truly understand the world, but we increase our understanding by testing falsifiable theories and hypotheses with a clearly articulated logic, by striving to reduce potential bias, and by positioning a given study with reference to previous work. The value and credibility of a given study is determined by a peer-review process, where attention is paid to

1. the logic and rationale for this study within the current context, including how this work contributes to what is known (referred to as the conceptual framework)¹¹;
2. the rationale for how a given theory is transformed into a testable hypothesis, including a description of relevant concepts and assumptions, and the operationalization of the concepts of

interest into objects of study (referred to as an aspect of the theoretical framework)¹¹;

3. the methodological detail allowing for the replication of findings¹⁴ and providing evidence of efforts made to reduce bias;
4. acknowledgment of limitations regarding the operationalization of a given topic, context, population, or design choices within a given study; and
5. the description of the contribution of the current study to the lineage of work on the same theory.

A Case Study Using Postpositivism

We will apply these postpositivist principles to develop an educationally relevant research question and set of studies for the case of Lee (Box 1).

Research question

Does disclosure of an error influence supervisor perceptions of trainee competence?

Theoretical foundation

Theories of impression formation suggest that our interpretation of a given event depends on what we know, and infer, about a person.²²

Hypothesis

A trainee who has disclosed an error is less likely to be judged as competent than an identically skilled trainee who has not disclosed an error.

Methodology

The hypothesis would be tested with a 2-phase sequential mixed-methods study. Phase 1 would be an experiment in which assessors were asked to rate the competence of a videorecorded trainee; half of the participants would be told that the trainee recently disclosed an error on a very similar procedure, half would receive no information. Phase 2 would be an interview and think-aloud study involving supervisors. The interviewer would recount the case involving error and ask the supervisor to describe how they might approach rating trainee competence in the context of a previously disclosed error.

Considerations for rigor

Videos would be identical across study arms, and careful consideration for personal characteristics of the learner would be depicted. Experimental and interview protocol should be piloted before study launch. A research associate would be responsible for recruiting and executing both arms of the study, with support from methodological experts, to ensure limited collusion in participation and to limit bias in the data collection. Participant sampling would target faculty members from large training programs, both medical and surgical, to support generalizability of findings. If possible, more than one training site would be included to support generalizability and to limit researcher bias.

Outcome

At the end of this study, following the integration of findings from both study phases, there are a few possible outcomes:

Box 1

Sample Case^a

Lee was a resident assigned to monitor a postop patient. The patient had a periodically low respiratory rate and lower-than-normal pulse and blood pressure. Narcan was ordered on an "as needed" basis, to be given in doses of 0.2 mg intravenously. In checking the patient's vitals, Lee decided it was time to administer an intravenous (IV) dose of Narcan.

Once Lee injected the vial of Narcan into the IV port, Lee noticed it was labeled "2 milligrams per 1 milliliter (ml)"—the entire vial should not have been injected. Feeling panicky, Lee reported the mistake to an attending and rushed back to the patient's side to monitor the vital signs. Lee was surprised to find that the patient's vitals had come up to normal rates, and the patient was actually much more alert. When Lee reported this change to the attending surgeon and anesthesiologist, they told Lee to continue to monitor the patient closely, remarking that it may have been just what the patient needed.

Lee felt hugely relieved, but was still overwhelmed and very upset. In most cases, giving 10 times a normal dose of any medication could have led to extremely serious consequences, and even death. Still, Lee managed to remain outwardly composed and took the time to complete an incident report. At the end of the day, when Lee finally sat down to rest, the incident played over and over again. Lee did not sleep.

^aThis sample case is used throughout the Philosophy of Science Invited Commentaries to illustrate each research paradigm.

1. rejection of the hypothesis (disclosing does not result in differences in judgments of competence),
2. failure to reject the hypothesis (disclosure does appear to influence judgments), and
3. development of greater understanding of how assessors perceive disclosure to influence their judgments of competence.

At the end of this study, there should be contributions to evidence regarding the perceived and actual influence of disclosure on complex judgments of competence in medical education that could contribute to refinement of theory around impression formation.

Limitations to Postpositivism

Any paradigmatic stance has affordances, limitations, and common critiques. Knowledge claims made within a postpositivist stance, at best, represent probabilities about human phenomena rather than governing or universal laws.¹⁰ If we can never truly understand a phenomenon, why bother? This stance values incremental improvement in current understanding more than discovering grand truths and embraces the fact that, as we advance knowledge, we will likely often falsify our current theories and understanding. In other words, the slow, incremental march toward better understanding is worth it, but requires patience.

Box 2

Suggested Resources for Further Reading on Postpositivism

1. Crotty M. Positivism: The march of science. In: Crotty M. *The Foundations of Social Research: Meaning and Perspective in the Research Process*. London, UK: Sage Publications; 1998.
2. Houghton C, Hunter A, Meskell P. Linking aims, paradigm and method in nursing research. *Nurse Res*. 2012;20:34–39.
3. Ryan AB. Post-positivist approaches to research. In: Antonesa M. *Researching and Writing Your Thesis: A Guide for Postgraduate Students*. Maynooth, Ireland: National University of Ireland, Maynooth; 2006:12–26.
4. Weaver K, Olson JK. Understanding paradigms used for nursing research. *J Adv Nurs*. 2006;53:459–469.

The prioritization of causal understanding within postpositivism can be interpreted as encouraging reductionism; that is, neglecting *the whole* while studying *the parts*.²³ Careful control, and a desire for causal understanding, could lead to focusing on components of phenomena rather than their complex social wholes; however, this is usually countered by using multiple methodologies, approaches, and viewpoints—all permissible within a postpositivist stance.

Likely the most challenging limitation is the dependence on peer review for the establishment of credibility. Dependence on peer review and the desire for a piece of work to be perceived as credible may encourage conformity, which may disadvantage truly novel thoughts, ideas, theories, or challenges to conventional understanding. The rejection of early manuscripts describing the relationships between *Helicobacter pylori* and ulcers is an illustrative example.²⁴

In sum, postpositivism may disadvantage grand discovery and may minimize the likelihood of truly new thought directions because of its dependence on peers and its incremental view of knowledge building.

Conclusion

Postpositivism is grounded on an assumption that there is an external reality, but as fallible humans we are unlikely ever to fully understand it. Value is placed on programs of work, on falsifying hypotheses, refining theories, reducing bias, and clearly communicating methods to ensure replicability of findings. Credibility of work is determined by peer review, and rigor is grounded in clear articulation of the logic supporting decisions made throughout the research process. Postpositivism is a broad term that encompasses many methodologies, so long as research is focused on hypothesis testing. Further reading is suggested in Box 2.

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