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Title: The Redundancy of Positivism as a Paradigm for Nursing Research

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Title

The Redundancy of Positivism as a Paradigm for Nursing Research.

ABSTRACT

New nursing researchers are faced with a smorgasbord of competing methodologies. Sometimes they are encouraged to adopt the research paradigms beloved of their senior colleagues. This is a problem if those paradigms are no longer of contemporary methodological relevance. The aim of this paper is to provide clarity about current research paradigms. It seeks to interrogate the continuing viability of positivism as a guiding paradigm for nursing research. It does this by critically analysing the methodological literature. Five major paradigms are addressed: the positivist; the interpretivist / constructivist; the transformative; the realist; and the postpositivist. Acceptance of interpretivist, transformative or realist approaches necessarily entails wholesale rejection of positivism, while acceptance of postpositivism involves its partial rejection. Postpositivism has superseded positivism as the guiding paradigm of the scientific method. The incorporation in randomised controlled trials of postpositivist assumptions indicates that even on the methodological territory that it once claimed as its own, positivism has been rendered redundant as an appropriate paradigm for contemporary nursing research.

Keywords

Research methodology, positivism, interpretivism, constructivism, realism, postpositivism,

Introduction

As part of their rite of passage into the research community, it is common for new nursing researchers to have to defend their methodology and justify their chosen research design. In order to be accepted as a respected member of the discipline, there is motivation for them to adopt the powerful discourses of the time. In particular, they can be influenced by those held in authority regarding what constitutes knowledge and what approaches to its generation are acceptable to the discipline. There is a danger that this influence may lead them to adopt inappropriate philosophical groundings for their research. The danger is all the more acute if the paradigm that the neophyte is being encouraged to adopt is no longer of contemporary relevance.

Background

Paradigms can be defined as sets of beliefs that provide theoretical frameworks for the purpose and conduct of research (Kuhn, 1962). These beliefs relate to both ontological concerns (relating to the nature of reality or realities) and epistemological issues (relating to what can be known about reality/realities). Such perspectives underpin the selection of research methodologies. Since the 1970s there has been much debate about the relative merits of different paradigms and their application in healthcare research, a debate often referred to as the 'paradigm war' (Denzin, 2010). The fog of this war has led to confusion among many researchers regarding the paradigm within which their research is positioned.

Aim and outline

The general aim of this paper is to provide clarity on this topic by addressing the current relationships between some of the most influential paradigms, and describing how these

have changed over time. Its specific aim is to interrogate the continuing viability of positivism as a guiding paradigm for nursing research.

Competing paradigms will be examined to show how their critical insights have fundamentally challenged core aspects of positivism. Four major paradigmatic challenges to positivism are examined. While these paradigms have complex histories involving numerous thinkers, for heuristic purposes we have identified the origin of each of them with the ideas of a single seminal theorist: the Kantian, which led to the development of interpretive and constructivist approaches; the Marxian, which led to the development of transformative approaches; the Durkheimian, which led to realist approaches; and the Popperian, which led to postpositivist approaches. We will argue that acceptance of any of the first three of these approaches necessarily entails wholesale rejection of positivism, while acceptance of postpositivism involves its partial rejection.

In order to show how positivism, even on the methodological terrain where it was once reigned supreme, has been rendered redundant, we will explore how it relates to that paragon of contemporary scientific method – the randomised controlled trial.

The source of paradigm confusion

Much of the paradigm confusion in nursing appears to stem from the sometimes misleading information emanating from one source of authority – research methods textbooks. We explored this issue by undertaking a content analysis of a number of nursing research books published between 2010 and 2015. Coding of descriptors demonstrated that the characterisation of positivism was inconsistent, and in some cases anachronistic. Thus, for example, while some textbooks clearly explain the differences between positivism and

postpositivism and position contemporary quantitative research within the postpositivist paradigm (Grove et al., 2013), others do not differentiate between the approaches (Grove et al., 2015). Indeed, the term postpositivism itself is riven with ambiguity, with no agreed definition of it amongst commentators. For some, it is a broad term including both interpretivist and objectivist positions (O’Leary, 2004). For others, it is confined to a description of Karl Popper’s revision and reformulation of positivism (Cresswell, 2003). Because of its greater definitional specificity, it is the latter sense that we will use in this paper.

In other instances, authors classify all quantitative research as having its roots in positivism, and qualitative research as having its roots in interpretivism or constructivism without reference to alternative paradigms or to the broad range of research that comes under their influence (McKie, 2014; Topping, 2015). Some textbooks refer to positivism as the paradigmatic origin of quantitative research, but do not qualify its current position (Burns and Grove, 2011). Others do make such a qualification, arguing that while quantitative social research developed within the positivist paradigm, today it is no longer guided by positivism (Grove et al., 2013; Parahoo, 2014). Still others suggest that quantitative research is a “...modified positivist position...” (Polit and Beck, 2012: p.12), which is dominant in nursing research and, for reasons of simplicity, categorise it as positivism. Furthermore, there are a number of authors that label quantitative and qualitative approaches as ‘paradigms’ rather than methodical strategies (Tappen, 2011; LoBiondo-Wood and Haber, 2014).

The lack of consistency in terminology and categorisation of approaches in research textbooks is particularly confusing for novice researchers, who are often challenged to justify the philosophical underpinnings of their studies. In order to meet this challenge, they need to

be clear on the differences and similarities between the competing paradigms, and be confident in defending the philosophical foundation of their work.

Untangling the elements of this challenge requires an appreciation of the historical development of the philosophy of science, including how various philosophical strands relate to each other historically and ideationally.

The emergence of the 'scientific method'

'MAN, being the servant and interpreter of Nature, can do and understand so much and so much only as he has observed in fact or in thought of the course of nature: beyond this he neither knows anything nor can do anything' (Bacon, 1857: Aphorism I).

Before addressing positivism, it is important to set out the context of its emergence.

According to Karl Popper (1989), it can be seen as an important stage in human intellectual evolution.

For Popper, the first great evolutionary break of humans from other animals was the development of language, which enabled humans to describe and seek to explain the world around them. In early societies, these explanations were animistic and superstitious, developing in time into more sophisticated myths and religions with their own hermetically sealed schools of thought. A crucial characteristic of these schools, for reasons of societal cohesion (Durkheim, 1995), was that their tenets were regarded as inviolate: 'A school of this kind never admits a new idea. New ideas are heresies' (Popper, 1989:141).

According to Popper, the next momentous stage in human intellectual evolution was the emergence of criticism, whereby it was permissible to question established ideas about the nature of the world. Criticism found its first expression in the pre-Socratic philosophers of classical Greece, but submerged again in Europe with the rise of Platonic idealism and then dogmatic Christianity¹. Later, with the Renaissance (the name of which refers to the rebirth of classical ideas), followed by the Enlightenment and the rise of science, criticism began to be accepted again as a powerful tool for advancing knowledge.

It was in this context that the seventeenth century English philosopher, Francis Bacon, promulgated what is known as the scientific method. For Bacon, our understanding of the world should not be based on metaphysical systems but on observation. However, he accepted scholastic philosophy's concerns about the unreliability of human interpretation of sensory inputs. He argued therefore that our stance towards any claims to empirical knowledge should be one of doubt, and that they should be tested systematically and repeatedly. He identified the experimental method as the best way of doing this. This involved the repeated application of a putative causal state or event to ascertain whether a putative effect was consistently detected following its application.

Positivism

'All good intellects have repeated, since Bacon's time, that there can be no real knowledge but that which is based on observed facts' (Comte, 1896:29).

The practical successes of natural science were the inspiration for the development of positivism as a model for understanding society. The French philosopher and sociologist, Auguste Comte, saw science as the means for understanding society and human behaviour.

He coined the term 'positive' philosophy to differentiate it from the negative philosophy, which he believed underpinned woolly and metaphysical thinking (Comte, 1875). Comte's positivist approach involved the use of scientific methods to uncover the dynamics of society in the same manner that physical science was uncovering the dynamics of the natural world (the philosophical term for this common purpose is 'naturalism', a term which has somewhat confusingly also been adopted by recent qualitative researchers to describe the study of people in their 'natural' environments. It is used in the former sense in this paper).

Comte believed that scientists should focus on confirmable observations of empirical events and this alone should constitute human knowledge. His analogy between the natural and social worlds was not limited to his epistemology. At the ontological level, he assumed that the people's actions were subject to social laws in the same way that events in the natural world were governed by natural laws.

The word positivism originates from the Latin word 'positum' and means that facts are 'posited' or positioned in front of the researcher (Alvesson, 2009). For positivists, objective truth existed and the goal of science was to discover it. To uncover truth, the researcher was required to be objective and collect facts using methods that were value-free (McEvoy and Richards, 2006). By such methods, it was claimed they could identify general laws (McEvoy and Richards, 2006; Parahoo, 2014; Weaver and Olson, 2006).

As to what those laws were, positivists took an empiricist approach (empiricism being the doctrine that all knowledge is based on experience). They regarded laws as empirically observable relations of cause and effect. This reflected the position taken by the Scottish eighteenth century philosopher, David Hume (1969). He argued that causal laws are based

on the empirical experience of 'constant conjunctions', whereby one event is observed to occur immediately and consistently after another. Thus, causality rests in the relation of constant conjunction, rather than in any force external to that relation. In essence, the positivist doctrine involved the following logic:

Our minds interpret the world through our senses, and because the world is subject to the laws of science, events outside the mind can be observed, described, explained and predicted. Therefore, to make sense of the outside world all we had to do was to observe it (McKenna, 1997, p 121).

By placing rational observation as the key to understanding the social world, positivism marked an important step in humanity's intellectual development. However, it should be noted that Comte (1875) regarded it as a new (albeit secular) religion, in that he saw it as capable of uncovering inviolable truths gathered together under the umbrella of a unified science. Later positivists, most notably those of the Vienna circle of logical positivists, while vociferously decrying any form of metaphysics, remained true to the Comtean aspiration to the unity of science.

Logical positivism

The aim of the logical positivists was to defend and strengthen positivist empiricism in the context of early twentieth century scientific developments. They attempted to shore up empiricism in an era where an ever increasing proportion of science's subject matter was not directly observable; a development most dramatically displayed by the replacement of

classical physics by quantum mechanics. They argued that the theoretical axioms required to explain these phenomena, while they could not be verified directly, could be anchored empirically by 'correspondence rules' (Carnap, 1966) which were amenable to observational testing².

Logical positivists also attempted to strengthen positivism by marshalling the ideas of the early Wittgenstein (1974) to argue that empirical knowledge was the only valid form of knowing. On the basis of 'the principle of verifiability', which states that the meaning of a proposition lies in its method of verification (Passmore, 1967), they contended that any statement that could not be empirically verified was not just mistaken or confused, but was meaningless nonsense (Ayer, 1936).

Challenges to Positivism

Positivism has faced a number of significant challenges, four of which we will adumbrate here. Our discussion is ordered according to the chronology in which the challenges emerged. Indeed, Immanuel Kant planted the seeds of the first challenge before Comte was even born. These challenges at least partially map on to the four-part typology of paradigms proposed by MacKenzie and Knipe (2006) – interpretivist/constructivist; transformative; pragmatic; and postpositivist. The Kantian challenge led to what they term the 'interpretivist/constructivist paradigm', and the Marxian challenge to the 'transformative paradigm'. However, in contrast to the problem-driven approach of methodological pragmatism, the scientific realism that developed from Durkheim's challenge to positivism, while sharing with the 'pragmatic paradigm' a licence for mixed methods research, contains well-developed realist ontological and epistemological positions.

These three challenges provided clear alternatives to the positivist model as a means for understanding the world. In contrast, the Popperian challenge aimed to improve on positivism's conception of the scientific method. Popper's challenge led to the paradigm that MacKenzie and Knipe term 'postpositivist'.

The Kantian challenge

'It is not that by our sensibility we cannot know the nature of things in themselves in any save a confused fashion; we do not apprehend them in any fashion whatsoever' (Kant, 2007: B62).

The first set of interrelated challenges have their wellspring in the philosophy of Immanuel Kant (2007), who distinguished between things in themselves (noumena) and what appears to our senses (phenomena). He argued that all we can ever have access to are phenomena, rendering the objective world unknowable.

Kantian ideas influenced the work of Max Weber (1949), who used their emphasis of the importance of the subjective to refute the ability of natural scientific methods to explain human behaviour. He argued that understanding social behaviour required interpretation of the meanings and motives of the actors involved, whose actions were the result of choice rather than determined by social laws. Thus, the naturalist approach of positivism was challenged by the rise of interpretivist sociology.

An even more direct line from Kant can be found in the phenomenological tradition. Thus, in relation to scientific method, Edmund Husserl (1970) argued that the use of positivistic

science to uncover human thinking in disciplines such as psychology distorted human experience. Once again, the message was that positivism was an inappropriate way to find out about people because it treated thinking and feeling human beings as objects.

Another neo-Kantian attack on positivism came via the nineteenth century German philosopher, Friedrich Nietzsche, and in particular his admonition to seekers after knowledge:

Let us guard against the snares of such contradictory concepts as 'pure reason', ... 'knowledge in itself': these always demand that we should think of an eye that is completely unthinkable ... in which the active and interpreting forces ... are supposed to be lacking ... There is only a perspective seeing, only a perspective 'knowing' (Nietzsche, 1969, 119, emphasis in original).

Nietzsche's perspectivism had a major influence on postmodernists' rejection of grandiose explanatory 'metanarratives' (Lyotard, 1984). The postmodernist acceptance of perspectivism led to their abandonment of any pretensions to generalise knowledge, and to their denial of the scientist's ability to adopt an objective stance.

The Marxian Challenge

'The philosophers have only interpreted the world, in various ways; the point is to change it'
(Marx, 1974: 123).

In contrast to the positivist conception of the role of the social scientist as simply describing the causal laws that govern human behaviour, Marx argued that structured social relations could be altered through political action (Marx and Engels, 2002). The role of the social scientist, according to Marx, should be to engage in critical analysis of existing social structures with a view to informing political action to overcome the exploitative and oppressive relations they contain.

Acceptance of the Marxist position entails a denial of positivism's objectivism. This differentiates between facts and values and argues that scientists, because their job is solely to gather empirical information, should eschew the adoption of values, which distort objective neutrality. In contrast, Marxists and other critical theorists argue that in order to explain social reality, it is essential to evaluate and criticise its own self-understanding (Horkheimer and Adorno, 2002).

Marx concentrated on class inequalities between those who owned and controlled the means of production and those who did not. However, critical or transformative social science has since broadened its scope to encompass other forms of inequality, such as those associated with ethnicity, gender and sexual orientation.

The Durkheimian challenge

'A social fact is ... capable of exercising on the individual an external constraint ... [It] is general throughout a given society, while at the same time existing in its own right, independent of its individual manifestations' (Durkheim, 1966:13).

The nineteenth century French sociologist, Émile Durkheim, challenged positivism's empiricist ontology. As can be seen from the quotation above, Durkheim (1966) expanded the definition of what counted as real from 'individual manifestations' (i.e. the empirically observable events that positivists viewed as constituting reality) to include those forces that exercised 'external constraint' on events. In doing so, he was setting out the scientific realist alternative to positivism.

Scientific realists argue that positivists misunderstand the nature of causation. This misunderstanding comes from their acceptance of David Hume's (1969) empiricism, which reduces causal laws to being one and the same as constant conjunctions. In contrast, realism asserts the independent reality of causal forces, which they see as ontologically distinct from the events they generate. Moving causation from constantly conjoined events to generative mechanisms has significant consequences for science. Rather than being restricted to describing constant conjunctions, science can start to explain how the influence of causal mechanisms is exerted.

Since Durkheim, scientific realism has developed along a number of lines. However, its most sustained development as a philosophy of science is critical realism, which combines the ontological realism of Durkheim with the critical social science of the Marxist tradition (Archer, 1995; Bhaskar, 1998).

In his examination of the nature of causation, the twentieth century British philosopher, Roy Bhaskar (2008), argued that, except in artificially controlled situations such as experimental conditions, constant conjunctions rarely pertain. This is because multiple causal mechanisms are at play in open systems. There should be acceptance that events in open

systems are generally caused by a combination of causal mechanisms, which may mutually reinforce or undermine each other's powers. This allows for a more nuanced analysis than that of positivism, depicting causation as involving tendencies rather than invariable consequences.

For critical realists, the opportunities, restraints and social mores embedded in structured social relations have a powerful influence on how people behave (Archer, 1995). Their assertion of the power of social mechanisms to influence the patterning of events, including human actions, involves a rejection of the neo-Kantian position that explanation of human behaviour should be sought solely in the meanings and motivations of the actors involved (Weber, 1949; Husserl, 2012).

However, critical realists also reject the Comtean model of causation, which places exclusive causal onus on social laws and regards human agency as epiphenomenal. Instead, they insist that, because both social structures and human agents possess their own unique generative mechanisms, one cannot be reduced to the other (Archer, 1995). They assert the need to 'distinguish sharply ... between the genesis of human actions, lying in the reasons, intentions and plans of human beings, on the one hand; and the structures governing the reproduction and transformation of social activities, on the other' (Bhaskar, 1989: 79). This in turn leads to an assumption of the appropriateness of mixed methods approaches. Patterns of events and behaviours can only be demonstrated through numerical calculation. However, because 'meanings cannot be measured, only understood' (Bhaskar, 1998: 46), qualitative approaches are needed to uncover people's understandings and motivations.

Summary of points of divergence between positivism and alternative paradigms

The primary points of divergence between positivism and the three perspectives outlined above are as follows:

- Interpretivists' insistence on the importance of taking into account individuals' capacity to think and to choose to act in certain ways, undermines the determinist philosophy of positivism, which sees people's actions as governed by natural and social laws.
- A stronger constructivist argument refutes positivism's claim to be able to uncover objective knowledge about a unified reality, adopting a relativism that regards both reality and our understandings of it as constantly shifting from one perspective to another.
- Those from the transformative paradigm argue that acceptance that humans can shape their social world is at variance with positivism's value-neutrality and social determinism, which prevents it from contributing to critical analysis of social formations that in turn can be used to inform human choices about improving the social world.
- Realists argue that positivism's empiricist concentration on establishing laws through the observation of constant conjunctions of events leaves it unable to adequately explain causation in terms of tendencies, which is how it is almost invariably manifested in open systems.
- A common criticism of positivism from all these perspectives involves their rejection of its belief in science's ability to uncover definitive objective facts.

The Popperian challenge

'Observation is always selective ... It needs a chosen object, a definite task, an interest, a point of view, a problem' (Popper, 1989:46).

Not only has positivism had to contend with profound challenges from alternative philosophical positions, it has also been subjected to immanent critiques that demonstrated

internal inconsistencies. Karl Popper, the twentieth century Austro-British philosopher of science, posited the most important of these. As a supporter of the scientific method (and a friend of members of the Vienna circle), Popper's aim was to eliminate positivism's weaknesses.

While subscribing to the general tenets of the scientific method, Popper (1972) believed that the positivist conception of the method was weakened by its failure to address what is known as the Humean problem of induction. Positivists accepted Hume's (1969) ontology of causation that identified it as the experience of constant conjunctions of events.

Consequently, they argued, knowledge was generated by the systematic gathering of data to demonstrate causal relationships in the form of constant conjunctions. If one event was demonstrated to occur repeatedly shortly after another, then the former could be established as an effect and the latter as its cause. Such an approach, whereby a general conclusion emerges from the observation of a number of particular instances, is known as induction. However, positivism's approach ignored the crucial weakness of inductivism that Hume (1969) identified. His argument that observation of past conjunctions is no guarantee that they will be observed in the future logically compromised the generalisability of inductively generated knowledge about the nature of causal relations. The certainty that Comtean positivism aspired to was fatally undermined by the Humean problem of induction.

Recognising the dilemma, logical positivists sought to argue their way out of the contradiction between the empiricist principle that only experience could decide between the truth and falsity of a statement and the Humean objection that inductive arguments from experience are invalid. Following Wittgenstein (1974), they did so by attempting to redefine what was meant by a scientific statement. Popper was scathing in his criticism of these attempts, accusing them of sharing 'with all the older attempts an unfounded assumption ...

that all genuine statements must be, in principle, completely decidable' (Popper, 1972: 312). He went on to argue that 'If this assumption is dropped, then it becomes possible to solve in a simple way the problem of induction. We can, quite consistently, interpret natural laws or theories as genuine statements which are *partially decidable*, i.e. which are, for logical reasons, not verifiable but, *in an asymmetrical way, falsifiable only*' (312-13, emphasis in original). In other words, while it is not possible to state definitively that a statement is true, it is possible to state definitively that it is false.

In replacing the principle of verification with the principle of falsification, Popper reversed the logical flow of scientific endeavour, which for positivists proceeded inductively from observation of specific instances to constructing general statements about causal relations. Instead, Popper proposed the hypothetico-deductive method, which involved the initial formulation of a hypothesis about the nature of a causal relationship, followed by the gathering of empirical data to test that hypothesis (the process of deduction), with the aim of falsifying rather than verifying it.

The replacement of positivism's scientific aim of inductive verification by deductive falsification marked an important qualification to claims about the epistemological power of science. No matter how frequently experimental science fails to falsify a hypothesis, the possibility that it will be falsified in the future still remains. This inability of science to vouchsafe the causal relations it identifies leads postpositivism to accept that scientific knowledge is always provisional and subject to potential falsification. While science may get us closer to the truth by ruling out false conjectures, it can never definitively assert that it has attained it – scientific statements are only ever 'partially decidable'.

Popper's rejection of positivism's inductive approach involved a rejection of epistemological empiricism. For positivists, knowledge could be gained from simply looking at the facts, while for Popper this was an untenable position: 'the belief that we can start with pure observations alone, without anything in the nature of theory, is absurd' (Popper, 1989:46). Thus postpositivism asserts the primacy of theory, arguing that science progresses from the identification of clearly articulated hypotheses that are posed in such a manner that they are amenable to empirical falsification.

The centrality postpositivism gives to theory has important consequences for how it views the role of the scientist. It accepts that the development of scientific knowledge depends upon the creation of theoretical conjectures. This involves a conception of scientists as having an active and imaginative role to play in the scientific endeavour. This contrasts with positivism's perception of them as passive gatherers of objective data.

While Popper criticises positivism's exclusive concentration on empirical experience as the source of scientific knowledge, asserting instead the crucial role of theory, he shares with positivism an ontological empiricism that identifies causation with empirically observable events. In other words, while the method of identifying causal relations may have moved from induction to the deduction, the object of that process remains the same. Critical realists, who assert the independent reality of causal forces, ontologically distinct from the events they generate, have challenged this conception of causality.

Popper's acceptance of positivism's ontological empiricism also entails a sharing of its adherence to scientific value neutrality that asserts that the world is as it is, irrespective of how we would wish it to be. It is therefore important, notwithstanding the scientist's role in

deciding what aspects of the world should be investigated, that science is conducted in such a way that involves the acquisition of facts not tainted by the values of those involved in its acquisition. This is in contrast to the transformative paradigm which warrants the development of assumptions about how the world should be (Popper, 1957).

Similarities and differences between positivism and postpositivism

Similarities

Positivism and postpositivism share the following assumptions:

- The scientific method can be used to understand relations of cause and effect in both the social and natural worlds.
- Systematic and sustained empirical observation is key to gaining knowledge.
- The focus of science should be on the conjunctions of events because it is the constancy of conjunction that constitutes causation.
- Science should be value neutral.

Differences

Positivism and postpositivism differ in relation to the following assumptions:

Positivism	Postpositivism
Causal laws are identified by means of systematic and sustained empirical observation of instances of conjunction	Hypotheses conjecturing a causal relationship are tested by systematic and sustained empirical observation of

(inductivism).	instances of conjunction (hypothetico-deductivism).
The existence of causal laws can be confirmed if observation reveals the constant conjunction of the events being investigated (verification).	The aim of observation is to refute hypotheses about causal relationships (falsification).
Science is capable of uncovering the true nature of causal laws.	While science can rule out false conjectures, it can never definitively establish the true nature of causal laws.
The role of the scientist is to systematically observe and record instances of constant conjunction and to develop or verify statements about laws on the basis of those observations.	The scientist's role includes the development of conjectures and hypotheses, which means that they have a creative part to play in the research process.

Positivism, postpositivism and the randomised controlled trial

In order to demonstrate that, even in the area where the claim of positivism's salience is most persistent, key components of positivism have been rendered redundant, we will now examine the methodological underpinnings of the current 'gold standard' of the scientific method in healthcare research – the randomised controlled trial (RCT). We will support our arguments through the use of examples of recent nursing RCTs.

In the literature, confusion often surrounds the question of whether RCTs in healthcare research are paradigmatically positioned within positivism or postpositivism. We wish to argue that they sit firmly within the postpositivist paradigm. While the assumptions underlying RCTs include those that are common to positivism and postpositivism, they also include an acceptance of hypothetico-deductivism, falsification, the provisional nature of scientific knowledge, and the active role of the scientist in selecting scientific problems. On these grounds, it is inappropriate to label RCTs as being founded on positivism.

In terms of the common assumptions of positivism and postpositivism, RCTs' comparison of experimental groups that are exposed to interventions with control groups that are not entails the adoption of the scientific method. In addition, they use systematic and sustained observation to measure the frequency of conjunction between the intervention and the outcome of interest in comparison to the frequency of the outcome's occurrence in the control group. Through their adoption of blinding procedures, they are designed to ensure that the predispositions of the scientists and subjects involved will not bias the results of the trial (Altman, 1991; Jadad, 1998).

In terms of the differences, RCTs do not simply gather data with a view to identifying effective therapies, but commence with hypotheses that are then empirically tested (Jadad, 1998). For example, an RCT of a nursing intervention for pressure ulcer prevention was based on the primary hypothesis that "...the incidence rate of HAPU [hospital acquired pressure ulcers] in at-risk hospitalised patients who receive a PUPCB [pressure ulcer prevention care bundle] will be lower than that in those receiving standard care" (Chaboyer et al., 2016, p 64).

While Chaboyer et al.'s positive directional hypothesis might be taken as demonstration that the positivist strategy of verification remains the dominant approach, the use of this form of hypothesis in RCT reports is essentially a literary device used for clarity. It does not reflect the actual processes involved in RCTs, where inferential statistics are used to test null hypotheses, which predict that no causal relationship exists (Machin et al., 2007). Thus, the testing of null hypotheses in RCTs, notably through the use of p (probability) values that seek to measure the probability of observed outcomes being the result of chance, adhere to the postpositivist dictum that scientific research should aim for falsification rather than verification. Numerous examples of the use of p values in nurse-led RCTs can be given (see, for example, Dumville et al., 2009; Mooney et al., 2014).

The greater evidential weight given to systematic and meta-analytic reviews of multiple RCTs than to individual RCTs indicates an acceptance that, notwithstanding their rigour, the results obtained from RCTs should not be regarded as definitive (Gough et al., 2012). Thus, for example, an RCT evaluating an educational programme to reduce the use of external restraints by staff on patients with dementia came to the conclusion that 'staff education can ... reduce the use of physical restraints'. (Pelifolk et al. (2010:62). However, a Cochrane systematic review which included five cluster-randomised controlled trials which met Cochrane quality criteria (including that of Pelifolk et al.) came to the conclusion that 'There is insufficient evidence supporting the effectiveness of educational interventions targeting nursing staff for preventing or reducing the use of physical restraints in geriatric long-term care' (Möhler et al., 2011:2).

Because the selection of hypotheses to be tested by RCTs is discretionary, scientists have a creative role to play in the direction in which science develops. One way they do this is by identifying problems that they regard as worthy of investigation. Thus Hanson et al.

(2005:577) provide a rationale for their evaluation of a quality improvement intervention targeted at palliative care in nursing homes with the following statement: 'Death is a frequent occurrence in nursing homes, yet few clinical quality standards promote excellence in palliative care for those who die in this setting'.

It can be seen from the above review that postpositivist tenets, rather than those of positivism, animate contemporary randomised controlled trials in the field of nursing.

Contemporary nursing research paradigms

The strong influence of postpositivism in the areas of experimental and quasi-experimental health research should not be taken to indicate that we have reached the end of methodological history. Even within the paradigm, it is recognised that postpositivist strategies contain problematic tensions with which researchers and methodologists continue to struggle. These include the artificiality of RCTs' controlled settings, which compromises their ability to predict the effects of interventions in everyday clinical settings, and their focus on average effects, which blinds them to human individuality (Rothwell, 2005; Ernest et al., 2015). Attempts have been made within the parameters of the postpositivist paradigm to address these problems, a notable example being the British Medical Research Council's (MRC) Framework for the Development and Evaluation of Complex Healthcare Interventions (MRC, 2008).

More widely, it can be noted that the current state of play in nursing research methodology is one of pluralism. Acceptance of the importance to successful nursing care of patients', relatives' and clinicians' experiences and motivations has provided a solid foundation for those paradigms that assert the need for interpretation (Streubert and Carpenter, 2011). Conversely, the rise of evidence-based nursing, with its assertion of the need for robust evidence about the effectiveness of nursing interventions has encouraged the adoption of evaluation strategies that sit within the ambit of postpositivism (Porter and O'Halloran, 2009).

While the increasing acceptance of pluralism has led to a cooling off of paradigmatic wars, this does not mean that conflict has ceased altogether. While there is mostly a patrician silence from the confident ranks of postpositivist methodologists, adherents to alternative paradigms continue to point out what they see as postpositivism's errors. Probably the most vociferous critics here have been postmodernists, who have gone so far as to accuse scientifically guided evidence-based practice of being fascistic in its dehumanisation of the individual (Holmes et al., 2006).

The current attitude of realists to postpositivism's scientific method is more ambiguous. While they are at one in pointing out what they see as its weaknesses and contradictions (Porter and O'Halloran, 2012; Pawson, 2013), they are divided about what should be done about them. Some (Marchal et al., 2013; van Belle et al., 2016) argue that experimental designs' reliance on the notion of constant conjunction means that they cannot provide an adequate understanding of how and why things work. Others (Bonell et al., 2012; Porter et al., 2017) argue that the RCT, with its capacity to identify the efficacy of an intervention within the confines of a closed system, is a necessary but not sufficient methodology, and needs to be combined with realist-based interrogations of individual experience and social context.

The most acute controversy between critical realism and postpositivism is grounded in the former's acceptance of transformative assumptions, which lead critical realists to challenge the postpositivist dichotomy between rationally-based reasoning and value-based reasoning. They have pointed out that as beings whose relation to the world is one of concern (Sayer, 2011), humans constantly use empirical knowledge to inform their concerns about present or future flourishing or suffering. While those who espouse value neutrality may be formally correct in their assertion that 'ought' cannot be logically derived from 'is', from a realist perspective, '[t]he force of the "ought" . . . is not a matter of the logical relations between statements, but of bodily needs or compulsions – states of being or becoming, not statements' (Sayer, 2011, p. 51). Thus, a factual statement that describes an objective human need or lack contains within itself the inference that there is merit in responding to alleviate that need or lack. This argument has particular resonance for nurse researchers, given their shared acceptance that the avoidance of avoidable suffering of patients is a paramount value position (Porter, 2016).

Ironically, the paradigm identified by MacKenzie and Knipe (2006) that has not been considered in depth here – the pragmatic paradigm – has, with the rise in popularity of mixed-methods approaches (Curry and Nunez-Smith, 2014) that are intimately associated with it, been one of the success stories of the last decade. The reason why we have not concentrated on pragmatic approaches is that their paradigmatic characteristics are very unclear. To the extent that pragmatic simply refers to the belief that research methods should be considered according to their practical consequences (Peirce 1958), it is hard to see them as constituting a distinct paradigm. To the extent that the pragmatic paradigm flags an adherence to the anti-foundationalism of Richard Rorty's pragmatism (1991), then it can be categorised as another variant of Nietzschean perspectivism. Ambiguity is not lessened

by consideration of the paradigmatic location of mixed-methods approaches. While often associated with pragmatism, they can be equally applicable in other paradigms including the transformative (Mertens, 2005), realist (Allmark and Machaczek, 2018) and postpositivist (Medical Research Council, 2008). Nevertheless, we would be remiss not to acknowledge that, with the cooling off of the paradigmatic wars, pragmatism's influence continues to grow.

It will be noted that positivism has not been mentioned in this summing up of contemporary healthcare methodology. While some of its tenets continue to animate the postpositivist paradigm (and continue to be the focus of critics of postpositivism), as a coherent overarching paradigm, it is now of little more than historical interest.

Conclusion: the redundancy of positivism

The previously hegemonic position of positivism has long gone. Many social and healthcare researchers have abandoned it in favour of paradigms that they believe better incorporate the experiences, needs and aspirations of human subjects. However, while the interpretive, transformative and realist paradigms challenged the dominance of the positivist paradigm, they did not render it redundant. As long as positivism could claim to provide the paradigmatic structure for the scientific method, it could still assert its relevance. What finally rendered positivism redundant was the emergence of postpositivism, which supplanted it on the methodological territory that it had claimed as its own.

While debate continues about where best to locate healthcare research, that debate has moved on from consideration of the appropriateness of positivism as a foundational philosophy. The twin pincers of anti-positivist and postpositivist paradigms have divested it of its *raison d'être*. It is therefore anachronistic for nursing methodologists and research

methods textbook writers to continue to refer to positivism as a pertinent research paradigm for contemporary nursing, just as it is inappropriate for nurse researchers to be expected to defend their work from a positivist stance.

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Endnotes

1. Like many sweeping historical schema, Popper's can be accused of oversimplification. For example, there is evidence that medieval thought was considerably more disputatious than Popper indicates (Marenbon, 2007).
2. While logical positivism had disintegrated as a distinctive philosophical position by the 1940s (Passmore, 1967), its echoes continued in Anglo-American thought, not least through influence of the diaspora of those associated with it. Thus, the emphasis that logical empiricists such as Hempel (1965) placed on the importance of theoretical axioms as the foundation of scientific disciplines provided considerable impetus for the development of nursing theories and conceptual frameworks in the 1970s and 80s (Risjord, 2010).