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The problem of evidence : philosophy of science and evidence based practice in clinical social work

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ABSTRACT

Evidence Based Practice is one of the most prevalent concepts in social work today, guiding social workers across the world. This theoretical thesis examines Evidence Based Practice, its theoretic foundations, and its application in social work, using the theories of Logical Positivism and Critical Rationalism from Philosophy of Science. Philosophy of Science is a branch in Philosophy that studies and theorizes about precisely what science is, how science works, the implications of science, and the logic behind it. This thesis argues that Logical Positivism is the scientific foundation that Evidence Based Practice rests on, and uses Critical rationalism to dispute Evidence Based Practice's theoretic foundation. The conclusions were that we should be concerned about EBP affecting the future development of therapy, that it creates the possibility of harm when used in policymaking, that we should not be favoring one theory over another just because one has more supporting research, and the idea that theories can be proven is impossible.

The Problem of Evidence:

Philosophy of Science and Evidence Based Practice in Clinical Social Work

A project based upon an independent investigation,
submitted in partial fulfillment of the requirements
for the degree of Master of Social Work.

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Introduction

Philosophy of Science and Evidence Based Practice in Clinical Social Work

An important drive, in the field of clinical social work, has been the repeated attempts to reinforce social work's scientific merit and practice. This has led to the concept of Evidence Based Practice (EBP), which has become the new 'cause célèbre' in both the broader field of Social Work, and in Medicine. In addition, government and private insurance have also been supporting the implementation of EBP for both mental and physical health services. However, support for EBP has not been universal; there have been a number of academics and practitioners that have objected to EBP's theory and its implementation in the literature, for a wide variety of reasons that I will explore further on.

The most commonly accepted definition for *Evidence Based Practice*, is that it is "the integration of the best research evidence with clinical expertise and patient values" (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). Originally, the definition of EBP did not include clinical expertise, nor patient values, each were added at different points, from its introduction in 1992, mostly because of criticism from practitioners and advocates for client rights. For example the definition given in 1996 was "Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research." (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996, p.71). EBP itself started life

as Evidence Based Medicine (EBM), before being rebranded to Evidence Based Practice, as it spread to other fields. EBP and EBM are the same thing.

Since its introduction, EBP has spread across the world, and is influencing the practice and policy of a wide range of professions, including medicine, teaching, social work, psychology, dentistry, and more. While there is a lot of support for EBP in the literature, that support has been far from universal, as there have been a number of criticisms raised about how it is being used in practice and in policy. EBP has been criticized using different philosophies of science, using various social theories, and various other philosophic theories including postmodernism and feminist theory (Goldenberg, 2005). A common accusation is that EBP's theoretical foundation uses an impoverished view of science, EBP's links to positivism, empiricism, and logical positivism (which grew out of positivism and empiricism). It has also been argued that EBP is not at all the Kuhnian paradigm shift it claims to be. One significant argument I did not see was Karl Popper's (year) Critical Rationalism, which in a way was odd, as he was one of the first philosopher's to thoroughly refute Logical Positivism, and many different articles had already made the connection as well. However, in another way it is not too surprising, in that Karl Popper and his theories are virtually unheard of in North America, and not all that well known in the West in general. On top of that, Popper has often been erroneously attached to the Logical Positivist movement, and his theories were thrown in as well.

EBP has had a significant impact on virtually every aspect of social work. It affects teaching, practice, and policy. BSW and MSW students are taught EBP. Therapists are expected to use Evidence Based treatments such as CBT in their treatment planning and implementation. Case managers use EBP as part of their own assessments. Policy is guided by

EBP, from the little clinic, to the federal government. EBP is a pretty big deal in social work and has an effect on virtually every social worker.

Theories

The first theory I have chosen to examine in my investigation of Evidence Based Practice, is Logical Positivism (LP) from Philosophy of Science. I have chosen this theory because of the repeated links made in several different articles, both for and against EBP (Anastas, 2014; Goldenberg, 2005; Gray & Mcdonald, 2006; Greenhalgh and Russel, 2009; Houston, 2005; Okpych & Yu 2014; Thyer, 2008; White & Willis, 2002). I chose Logical Positivism specifically, because it was the last of the line in both the Positivist movement, and the British Empiricist movement (Logical Positivism is also known as Logical Empiricism). The creators of LP had chosen at the start to include Positivism and British Empiricism (Ayer, 1952, p. 2, 91). EBP itself connects in similar ways to all three of these theories, and LP is the best choice, because it incorporates the other two theories.

As a counterpoint, I have chosen Karl Popper's (year) Critical Rationalism (CR). I am choosing CR for two reasons. First, it was one of the key theories that overturned Logical Positivism, and second, I could not find any mention of Popper in the literature surrounding EBP.

In the next chapter, I will outline my conceptualization for this thesis, and I will explain my methodology. I will unpack Evidence Based Practice, Present Logical Positivism and link EBP with Logical Positivism, Present Critical Rationalism as a counter to LP, and lastly use CR to confront EBP.

CHAPTER TWO

Conceptualization and Methodology

This thesis will examine the theory behind Evidence Based Practice and its implementation, followed by how EBP theory connects to Philosophy of Science, by using the theories of Logical Positivism and Karl Popper's Critical Rationalism. I will explore how Evidence Based Practice is based in Logical Positivism, why the theories of Logical Positivism have problems using the theories of Critical Rationalism, and then shift those arguments back on to Evidence Based Practice.

Philosophy of Science attempts to understand all the aspects of precisely how science works, and what exactly science is. Most importantly, Philosophy of Science can help us understand the flaws and weaknesses that exist within science, such as examining the ways we are inherently biased, or helping us understand some of the subtler differences between science and pseudoscience.

Logical positivism.

I chose the theory of Logical Positivism because Evidence Based Practice's concepts of science are deeply rooted in the Positivist movement of the 16th century, British Empiricism of the 17th century, both which Logical Positivism inherit as its foundation. EBP also has connections to the new theories Logical Positivism was adding. Logical Positivism functionally was the last phase of both the Positivist movement and British Empiricism. LP started in the late 1800s and lasted in Philosophy until about 1960. By then it was widely considered a dead end by most philosophers of science, leading to the statement in The Encyclopedia of Philosophy that "Logical positivism, then, is dead, or as dead as a philosophical movement ever becomes" (Passmore, 1967, p. 57).

Critical rationalism

One of the major critiques that offered strong refutation to many of Logical Positivism's key arguments was Karl Popper's Critical Rationalism. Popper's seminal books in Philosophy of Science were: *The Logic of Scientific Discovery*, which was published as *Logik der Forschung* in Austria, 1935, and was translated into English by Popper himself in 1960 and further annotated by him in 1968; *Conjectures and Refutations: The Growth of Scientific Knowledge* was published in 1965 in English. These two books form the core concepts behind Critical Rationalism. As Critical Rationalism was one of the principle schools of thought that overturned Logical Positivism, and due to EPB's close connection to Logical Positivism, Critical Rationalism suggests itself as a good tool for examining some of the potential failings in EBP.

Methodology

The main avenue of investigation regarding EPB, in this thesis will be its focus on using scientific research (evidence) in clinical practice. EBP's founders in their original article had made the bold claim that EBP (specifically its emphasis on using evidence in practice) was a Kuhnian paradigm shift (Evidence-Based Medicine Working Group, 1992, p. 2420-2421). A paradigm shift is an event that revolutionizes that specific branch of science (e.g. Einstein's theory of relativity radically shifted Physics), because it completely changes the way scientists think about that branch of science and generally falsifies all of its prior theories or forces their reformulation. EBP's claim of creating such a shift is completely absurd, as EBP did not fundamentally revolutionize the way scientists (or doctors) think about medicine, not even a little, as White & Willis point out (2002, p.8) it is not even a new concept.

This thesis will examine in detail the finer points of the concepts of evidence as it applies to EBP, how clinical research is to be applied in clinical practice. I will also look at how in

actual practice the concepts of EBP are used, by individuals, by agencies, by insurance companies, and by government. In addition, we will also examine what constitutes evidence in social work, and the inherent problems with this type of evidence.

The first part (Chapter 3) will examine Evidence Based Practice. I will offer an overview of its history, examine its concepts, and detail some of the literature that supports it, and some of the literature that assails it. Following that, I will move to Logical Positivism (Chapter 4). I will outline Logical Positivism's lengthy history and authors, and I will give a brief overview of its theories that are most relevant, and the theories it bases itself off of (Positivism & Empiricism), after which I will connect the relevant theories from Logical Positivism and its antecedents, to Evidence Based Practice. Next (Chapter 5), I will introduce Karl Popper and Critical Rationalism. I will look at his history, and I will introduce his relevant opposing theories. Finally in the Discussion (Chapter 6), I will bring all the above material together and analyze it, and examine how that analysis impacts Evidence Based Practice, by discussing the flaws I believe I will find, both within its theory, and in its application in the world at large, due to its chosen theoretical foundation. I am anticipating that Popper's Critical Rationalism will be quite fruitful, because of how strongly it refuted Logical Positivism as a whole. Primarily I expect to be using his concepts of falsification, objective knowledge, his criterion for demarcation between science, and non-science, his concepts of the utility of evidence, and more. My intent is to evaluate the results by using overall discussion.

Biases

Obviously since my objective is to offer criticism toward Evidence Based Practice, I have some bias against it. Part of this stems from my sense that it is pushing therapists into using 'cook-book therapy' because of its overwhelming emphasis on manualized treatments over most

anything else. I worry that it will stunt the future development of new therapies, and I worry it is taking away a lot of choice from clients as to the kind of therapy they would prefer. I guess fundamentally my problem is that I see Social Work, as both a science and as an art, and I think EBP is sacrificing the art part. There is so much we do not understand about the mind, the brain, and everything human. In my humble opinion, I think that the artistic/creative aspect of social work is important too, for creatively building client relationships, figuring out what is going wrong for that client.

Conversely, I largely agree with EBP's basic concept. Of course using available research to help determine treatment is a good idea. I doubt there would be many who would disagree with that. It is the theories that EBP bases itself upon that is of concern.

As another bias, I am quite fond of Poppers theories in Philosophy of Science; it is partly why I chose him, because I think many of his theories contain good ways to improve science. As the Nobel Prize winning neurophysiologist, Sir John Carew Eccles, wrote in his book *Facing Reality* (1970), Popper's theories can be very freeing for scientists, because of how it shifts the objective of science away from proof to disproof "because it is not scientifically disgraceful to have one's hypothesis falsified" (p. 105). A sentiment that I share in. Being relatively familiar with Positivism and Logical Positivism, I think Popper pretty thoroughly demolished them through superior logic.

Strengths and Limitations

The key limitation of this thesis is that it is entirely theoretically based, as all the work and the analysis will be done using two different theories from philosophies of science, to target the theory behind EBP. However, as I will come to argue, everything involving human knowledge is purely theoretical, and thus the limitation of this thesis, is the same limitation as all

theories. My thesis's strength is that the theory I am using (Critical Rationalism), is the key

theory that overthrew Logical Positivism, which is the theory that I am arguing Evidence Based

Practice used as its foundation, consciously or not by its authors.

In the next chapter, I will examine Evidence Based Practice. I will examine its history,

its concepts, and I will delve into some of the available literature, both literature in its favor, and

literature that is highly critical, including some of the arguments made about its connections to

Logical Positivism.

CHAPTER THREE

Phenomenon: Evidence Based Practice

Evidence Based Practice is an evolved version of Evidence Based Medicine (EBM). Introduced by the Evidence Based Medicine Working Group, comprised of Guyatt et al. (1992), thought that EBM represented a paradigm shift in medicine, in that it would complete transform the conceptualization and practice of medicine.

Based on an awareness of the limitations of traditional determinants of clinical decisions, a new paradigm for medical practice has arisen. Evidence-based medicine deals directly with the uncertainties of clinical medicine and has the potential for transforming the education and practice of the next generation of physicians. (Evidence-Based Medicine Working Group, 1992, p. 2424)

The basic concept that they presented for EBM was that, 1) clinical experience and the development of clinical instincts are necessary for the development of competence, 2) that the study and understanding of the basic mechanisms of disease are necessary but also insufficient on their own for clinical competence, 3) and that a comprehensive understanding of the concepts of evidence are necessary to be able to correctly interpret available research literature. These were the three original tenets of Evidence Based Medicine. As time went on, the main tenants of EBM shifted to "integrating individual clinical expertise and the best external evidence" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). A few years later, the concept of patient values was added as well (Sacket et al., 2000). During this period, the core ideas behind EBM traveled into other fields, including the fields of nursing, dentistry, education, psychology, and social work. Because of the propagation of its concepts into other non-medical fields, EBM rebranded to Evidence Based Practice in those fields.

Since its introduction, EBP has slowly spread to most corners of social work, including the various payment-for-service mechanisms such as private and public insurance. Its tenets are guiding policy and practice for both large and small organizations, at all levels of care, including inpatient, residential, partial-hospitalization, outpatient, and private practice. In the United States, it has become difficult to receive non-evidence based treatment, unless the client is willing to pay for services out of their own pocket, because payment sources are now insisting on therapists using specific forms of Evidence Based Treatment. In the countries where EBP has been widely adopted, EBP affects the entire population of people receiving mental health services. Arguably, EBP has been widely adopted in North America and Europe, though it is difficult to give a precise account of exactly how far spread it is, as I could not find any sources tracking its spread. There is an extensive paper trail in many of these countries coming from government organizations, local services, proponents and opponents of EBP publishing material on the subject, and the like, that suggest EBP has been widely adopted, but unfortunately I could not find hard data on its dispersal.

As previously mentioned, the core concept of EBP is the combining of best research evidence available for choosing treatment modality, the use of the therapist's own experience in guiding the selection of treatment and the treatment process, and including the values and desires of the client in the selection and process of treatment (Sacket et al., 2000). The basic scenario is that the client comes in to therapy, and together with the client, the therapist attempts to diagnose the client, based on the therapist's experience and by consulting the current scientific literature. Next the therapist and the client agree on the treatment, with the therapist again consulting the current literature to select potential treatment modalities, after which treatment begins.

Since the introduction of EBM/EBP, a great deal of literature on the subject has been written. While there have been a large number of articles in favor of EBP, there also have been many articles that are critical of it as well, to varying degrees. Some authors felt that EBP was baseless or invalid, while others felt it needed more structural adjustments as to which aspect should take greater priority, such as placing more emphasis on client driven treatment planning, or more emphasis on the therapist's experience and knowledge. Others argued that there were issues with the nature of evidence, or that certain types of evidence are favored while other types are ignored or even discarded. Most of the favorable articles focused on implementation or organizational policy, or they have been trying to either prove the value of EBP, and/or defend against arguments that oppose it. Here are some brief examples of articles that are in favor of EBP.

Articles In Support of Evidence Based Practice

Haynes's brief editorial (2002) seems directed at making medical doctors, both aware of EBP, and to point out how the original focus of EBM on evidence has shifted in EBP to include not only the doctor's experience, but also giving the patient choices, in addition to using evidence. For example Haynes writes that "The term evidence based medicine was developed to encourage practitioners and patients to pay due respect—no more, no less—to current best evidence in making decisions" (p. 1350) in his argument about how Doctors should use EBP. While the article goes into some of the aspects of practitioner experience, and making choices available to the client, the emphasis was more on the evidence aspect.

Thyer (2004) in his article is very optimistic about the wonders of EBP. The start of his conclusion reads, "We are fortunate in that a growing number of brief treatments and interventions used in crisis situations are being rigorously tested in well-crafted *N*-of-1 and

group research designs and are providing evidence of their effectiveness." (p. 175), and then Thyer proceeded to write about all the short term treatments available to treat this wide range of mental illnesses. Thyer also covered policy implications, including non-clinical applications, such as community practice and managerial practice. The author closes off their article with "EBP presents considerable challenges and opportunities, not only to those of us in the academy who are charged with developing and maintaining state-of-the-science and state-of-the-art clinical-training programs, but also to those providing clinical supervision to practitioners of brief treatments and to those who are healthcare providers themselves." (p. 176). The bulk of his nine page article, however was spent describing the five steps that Thyer feels one must complete in order to successfully make use EBP, written in fine detail.

In the report from The Presidential Task Force on Evidence Based Practice American Psychological Association (Levant et al., 2005), the authors start off by claiming that "psychologists have been deeply and uniquely associated with an evidence-based approach to patient care." (p. 1). Levant et al. then go on to claim that they were always at the forefront for developing EBP a good 50 years before anyone else. They go describe how their EBP is consistent with EBM, and continue to talk further about EBP's history (which is odd as they claim that their EBP goes back 30+ years), and how best to implement EBP in Psychology. The rest of the article goes into detail about what EBP is, how to use EBP, and how EBP will affect policy, including writing about future directions for each aspect of EBP (Evidence, Psychologist, & Client).

Next, we have Thyer (2008) again looking at EBP, with his main assertion being that we (social workers) are all positivists in nature. The crux of his argument is that turning social work into a science has always been a key goal of social work –that we have always aspired to shift

our art into a science, "For over 100 years, from the beginnings of the social work profession, we have adopted a positivistic and scientific orientation to the discovery of knowledge relevant to social work practice." (p. 344). The bulk of the article consists of the Thyer's discussion of the past and present of social work and its positivistic attitude, in order to persuade other readers to adopt EBP.

For a change of pace, Gitterman and Knight (2013), revised the term Evidence Based Practice into Evidence Guided Practice. As they put it, "Social workers are encouraged not only to engage in theoretically informed and evidence-based practice but also to maintain their creativity, authenticity, and flexibility." (p. 70). This statement neatly encompasses the authors take on the subject, in that while they believe in the utility of evidence, they feel it should not be the dominant factor, but simply a part of the clinician's consideration. Gitterman and Knight's argument is quite detailed, going into different research results, and stressing the need for better and much broader levels of research into the more subtle, hard-to-measure variables.

Grady and Drisko (2014) chose instead to look at applying EBP to the assessment process, rather than the standard approach of EBP of applying it to the treatment decision making. Their principle argument is that "Without the skills, knowledge, and supports needed to conduct a thorough and accurate assessment, the EBP process and any proposed plan for intervention will fall short of the potential beneficial impact it could have with the client(s) seeking assistance." (p. 6). Drisko and Grady then go on to write about what is and is not EBP, and spend the majority of the rest of the paper looking at how EBP can be applied to client assessment. Drisko and Grady conclude that the "important role of assessment in this process has not been adequately identified nor well examined in the related literature." (p. 13), and

suggest further research into developing an EBP system for assessment, along with greater focus

in assessment training at schools for social work.

Articles Critical of Evidence Based Practice

Having sampled the side that supports EBP, I will now look at some of the criticisms of

EBP. Webb was one of the earlier critics of EBP, and in this paper, Webb examines the validity

of EBP in social work. After finishing an in-depth review of EBP's history, Webb (2008) starts

with a critique of the scientific basis of evidence-based practice,

> Evidence-based practice proposes a particular version of rational inference on the part of
>
> the decision makers. It assumes that there exist reliable criteria of inferential evidence
>
> based on objectively veridical or optimal modes of information processing. In other
>
> words it creates picture of social workers engaging in an *epistemic process* of sorting and
>
> prioritizing information and using this to optimize practice to its best effect" (p. 63).

Webb then continues to expound on the issues of this rational inference, and goes on to critique

the ideological basis of evidence-based practice. The author then concludes that "social work

should abandon mechanistic approaches, such as evidential practice and those characteristic of

experimental and behavioral research and replace it with a conceptual model that is designed

explicitly to recognize social agency as meaningful, intentional, and interconnected" (p. 76).

White and Willis (2002), on the other hand, posit that EBM is positivism resurgent,

arguing: "(1) that EBM is based on an impoverished account of scientific knowledge; (2) that

this is reflected in its behaviorist and positivistic account of disease; and (3) that while it claims

to grow out of epidemiology it neglects the lessons of the tradition of social epidemiology which

have always posed a challenge to biomedicine" (p. 6). White and Willis go on to outline in detail

the many reasons why EBM is fundamentally positivistic in its philosophical orientation towards

science, and how EBM does not represent a paradigmatic shift that the authors of *Evidence Based Medicine* (1992) had claimed it was. White and Willis conclude that EBM is a regressive step, because it undermines and negates the research carried out by public health epidemiologists, sociologists of health, and philosophers of medicine. Adding that the paper *Evidence Based Medicine* (1992) "has revealed the limited, highly scientific and positivistic characteristics of EBM, and shown how they limit and constrain our knowledge of medicine as a social process" (p. 13).

The next paper (Goldenberg, 2005) analyzes EBP using three separate branches of philosophical thought, which included some Post-Positivist theory, Feminist Epistemology, and Phenomenology of Science and Medicine. The section on Post-Positivism took the position that EBM and EBP are mired in Positivist thinking. Next Goldenberg took Feminist Epistemology, connects with Post-Positivism, and analyzes EBM's positivism from a feminist position, which concludes that empiricism does not yield neutral and universal facts. Then Goldenberg applied Phenomenology of Science and Medicine to the interpretation, stating that "further challenge notions of evidence in EBM by questioning why relevant evidence is assumed to come primarily from clinical trials and other ''objective'' measures." (p. 2628), and argued that the patients personal understanding and experience should be held as valid along with EBM. The conclusion of Goldenberg's paper is that EBM rests on the "unquestioning authority of scientific evidence, a position out of step with current post-positivistic thinking" (p. 2630) along with the thinking of the other theories mentioned. It is worth noting that no mention was made of Popper in this paper, even though he and Critical Rationalism are categorically part of Post-Positivism, and his theories had a direct impact on Positivist thinking, but this does serve to highlight his works present obscurity.

Gray and Mcdonald (2006) examines the limits of EBP, by considering the different aspects and antecedents to EPB, and posits that, "Our fundamental premise is that the ontological (and hence epistemological) assumptions underpinning evidence-based practice are too narrow and, as a consequence, are unable to engage with what is by now well-established bodies of social theory which have appreciably broadened our understanding of social phenomena" (p. 13). Gray and Mcdonald then moves on to what the authors term "the use of ethical reasoning" (p.15) as being the major activity of social work, and goes on to examine the importance of the client therapist relationship. The article concludes with Gray and McDonald's description of how EBP is both positivistic and political in nature, and argues that social work under EBP is too conceptually confined and theoretically impoverished.

The next paper is by Greenhalgh and Russel (2009). Their article is a critique of EBP based policymaking. In the article, they examine the different paradigms within policy research, and then use these to examine the effects of EBP policy. As with the previous articles, Greenhalgh and Russell hone in on EBP being positivistic in nature, before examining selected EPB based policies. Their conclusion is that the EBP concepts of 'getting evidence into practice' is rather seductive in nature when it comes to policy making, "But they are fundamentally inaccurate, because policymaking is not about applying objective evidence to solve problems that are "out there" waiting for solutions. It is about *constructing* these problems through negotiation and deliberation, and using judgements to "muddle through"—that is, to make context-sensitive choices in the face of persistent uncertainty and competing values" (p. 315).

The final article looks at EBP and Person-in-Environment (PiE) (Simmons, 2012). This author uses three different personal vignettes, to explore conflicts that exist between EBP and person-in-environment, and posits that,

High-quality experimental evidence cannot, by definition, include fundamental attention to the many environmental forces that shape our clients' experiences. At the same time, ethical social work practice involves assessment and intervention that recognizes the impact of societal oppression due to factors of age, class, disability status, ethnicity, gender, nationality, race, religion, and sexual orientation and their relationship to the client's experience of her or his problems." (p. 8).

Simmons (2012) concludes by stating that, "Models of EBP that exceedingly privilege experimental evidence may overlook the value of the PiE model of assessment and intervention." (p. 13-14), that clients are inherently complex and that the context the client lives in is an important factor in treatment.

Summary

To summarize, EBP is the current and increasingly the only option for determining the course of treatment using available empirical evidence to guide the therapist. Later on, it was expanded to include therapist experience, and finally client input. While there are many proponents of EBP, and EBP has spread across the first world nations, there are numerous detractors of the theory as well. These detractors label EBP as a positivistic theory attacking many of the basic underpinnings of EBP, both for its theory, and its implementation. In the next chapter I will examine in more detail precisely why EPB is positivistic, but that our research community is still largely positivistic in its pedagogy as well.

CHAPTER FOUR

Logical Positivism and Evidence Based Practice

History of Evidence Based Practice and its Antecedents

In this chapter, I will examine the major Philosophy of Science theories found in Logical Positivism relevant to my thesis, along with the precursors (Positivism and Empiricism) that Logical Positivism based itself on. Before I begin, it is important to note that many people were involved in developing Logical Positivism and contributing to it; people such as, Ludwig Wittgenstein, Rudolf Carnap, A.J. Ayer, Herbert Feigl, Carl Hempel, Friedrich Waismann, Gustav Bergmann, Victor Kraft, Otto Neurath, and many others still, and they together produced large numbers of books, articles, editorials, and etcetera. There are innumerable differences among all the contributors in this branch of Philosophy of Science that are far beyond the scope of this thesis, and would require a lengthy book to properly cover each author, and how their perspectives differed from the others. Therefore, this chapter will cover the general concepts of the theories and will focus only on the concepts relevant to the topic mater of this thesis, rather than focusing on the specifics of an author or group of authors within Logical Positivism. Another point to address is that Logical Positivism is sometimes also referred to as, Logical Empiricism, and that the two terms are interchangeable.

Both Positivism and Empiricism have precursors that go far back into history. For example, the Greek philosopher Plato was writing about some of the concepts behind positivism back around 400 BCE, and the Indian philosopher, Kanada, was the first person known to write about some of the basic concepts behind Empiricism, sometime between 600-200 BCE.

In the case of Empiricism, some of ideas would reemerge in the late Renaissance in Italy with Niccolò Machiavelli and Leonardo da Vinci, only to be forgotten again, until the rise of

British Empiricism in the 17th century; the version that Logical Positivism based itself on. Sir Francis Bacon and René Descartes were the early founders of British Empiricism, roughly in the same period as Sir Isaac Newton's discoveries. Thomas Hobbes and Baruch Spinoza followed later, and though neither directly contributed to scientific empiricism in their books, their ideas about politics and religion contributed to the ongoing development of scientific empiricism. The key authors of British Empiricism were John Locke, George Berkeley, and David Hume, with Locke named as the founder of empiricism, and Hume being its key author. British Empiricism then transformed into Phenomenalism after most of Hume's followers rejected his conclusion that belief in an external world is rationally unjustifiable, and a few decades later the Logical Positivists rejected Phenomenalism, and based their movement on British Empiricism.

Positivism on the other hand, got its start nearly two centuries later primarily due to the French philosopher Auguste Comte, who published from 1830 to 1842 the series *The Course in Positive Philosophy*, followed by *A General View of Positivism* in 1848. Émile Durkheim was another important Positivist, though his interest was focused on Sociology. Durkheim's use of Positivism as a basis for social research was a key part of his efforts to legitimize Sociology as a Science. However a few decades later Positivism was followed by Antipositivism that was led by the German sociologists Max Weber, and Georg Simmel, who rejected Positivism in its entirety and sought to have its concepts removed from Sociology. Other scientists followed suit and accused Positivism of being scientism, and ideologues. Meaning in that they were overemphasizing the importance of science, and that they were dogmatic and would not compromise there perspective in the slightest.

Logical Positivism started in the mid 1800's with Ludwig Wittgenstein being a key founder, with his book, *Tractatus* (1921) being of great importance to the Logical Positivist

movement. In Germany, Logical Positivism of the Vienna Circle grew in response to G.W.F.

Hegel's Metaphysics (a branch of philosophy that explores the fundamental nature of reality),

forming the Berlin Circle. Together in 1929 the Vienna Circle and the Berlin Circle hosted their

first international meeting in Prague, and jointly released a pamphlet bringing together with some

of the major proponents of the movement, and summarized the doctrines of the Vienna Circle

(Stadler, 2001, p. 151-153). Both circles dispersed in the mid to late 1930's due the rise of

Fascism combined with the joining of Germany with Austria, and followed by the start of World

War II. Just before this, Logical Positivism had spread to Britain, thanks to A. J. Ayer and his

book *Language, Truth and Logic*, which was first published in 1933. From England, Logical

Positivism spread on to the rest of the world. Work on Logical Positivism had largely ceased by

the late 1930's. Several decades later, A.J. Ayer rejected his book *Language Truth and Logic*

stating that, "Logical positivism died a long time ago. I don't think much of Language, Truth

and Logic is true. I think it is full of mistakes. I think it was an important book in its time

because it had a kind of cathartic effect. . . . But when you get down to detail, I think it's full of

mistakes which I spent the last fifty years correcting or trying to correct." (Ayer, 1998, p. 49).

Elements of Positivism & Logical Positivism

The key tenets behind Positivism are: 1) the logic of inquiry is identical across all the

sciences; 2) The goal of science is to explain and predict; 3) Research must be empirically

observable using the human senses of the researcher and inductive reasoning must be used to

develop hypotheses that are to be tested during the research process; 4) Science and common

sense are not the same at all and common sense should never be allowed to bias research or

hypotheses; 5) Science must be judged only by logic, and must be free of any personal values

(Comte, 1865, p. 1-7). Positivism also included many of the core concepts from Empiricism in

that that all knowledge is sense experience, and the importance of evidence is based on sense experience (Hume, 1739, p. 6-10) The empiricists also argued that the inductive method is the key division between science and everything else, as only science makes use of the inductive method (Hume, 1739, p. 7, 319). Furthermore, the empiricists argued that scientific investigation must follow a strictly defined methodology. This methodology includes a cycle of deduction and induction, where sensory experience would be accumulated as evidence using the scientific method (as explained further below), and the inductive process or method (Magee, 1973, p. 15,-17). The *inductive process* would create a theory to explain the evidence; the theory would then be turned into a hypothesis via the deductive process, which would then be tested, which would generate new evidence, and the cycle then repeats, as the theory is refined. The *deductive process* uses reasoning and logic to examine the theory for methods to test its veracity. Unfortunately, no philosopher past or present has ever managed to successfully come up with a rational explanation of how exactly the process of induction works, or the mechanics of how we go from evidence to theory, and it is referred to as the problem of induction.

The Logical Positivists took these concepts from the British Positivists, and the earlier Empiricists, and mostly added to them. Some aspects though did change. For example, as the Stanford Encyclopedia of Philosophy (2016) put it in their article on the Vienna Circle,

> Despite the pluralism of the Vienna Circle's views, there did exist a minimal consensus which may be put as follows. A theory of scientific knowledge was propagated which sought to renew empiricism by freeing it from the impossible task of justifying the claims of the formal sciences. It will be noted that this updating did not leave empiricism unchanged. (2.3 Overview of Doctrines, para. 1)

What the Vienna Circle did change in the above, is they rejected Empiricism's separation of the science of nature from the science of man, because they deemed the differences to be merely categorical and nothing else. For the most part these were the types of changes made.

Logical Positivism's key concepts that concern this thesis are: 1) That a proposition only has meaning if it can be proved true or false by observation, and is known as the verifiability principle; 2) That there are only two sources of knowledge, logical reasoning (analytic a priori) and empirical experience (synthetic a posteriori), synthetic a priori or empirical reasoning is not considered possible. Logical knowledge includes mathematics (due to the belief it is reducible to formal logic), and empirical knowledge includes physics, biology, psychology, and other sciences; 3) That Metaphysical statements are disallowed, as they cannot be verified empirically, and Metaphysics is viewed as meaningless. This also means there no philosophical knowledge beyond logical knowledge and empirical knowledge –the purpose of philosophy is analyzing the meaning of statements and their logical interrelations; And 4) that all knowledge can and must be codified into a single standard language of science (which they tried and failed to develop) (Ayer, 1952; Murzi, 2007, p. 7-14; Stadler, 2001; Werkmeister, 1937, p. 357-376; Wittgenstein, 1922, p. 31, 36, 83, 90).

Contained within the different branches of Positivism are the ideas that scientific knowledge is cumulative in nature, that scientific theory can be proven true or false via empirical evidence, and that the more positive evidence you have, the stronger and more reliable the theory becomes (Magee, 1973, p. 14-17). Scientific knowledge is increased by the gathering of evidence and by the discovery of *laws of nature* which would be defined as laws or rules that are found within nature (and also within human behavior and society) that are entirely invariable and thus predictable. According to the Positivists (Positivism & Logical Positivism), laws of nature

are all potentially discoverable and eventually we will understand them in their entirety, via the continued gathering of evidence through experimentation, until they reach the point where the theory and associated law are considered fully researched and proven (Magee, 1973, p. 14). At this point there remains no reason for further scientific investigation –the theory has reached the state of being a fully explained natural law. Positivists also expressed the belief that scientific knowledge is built on the firm foundations of prior scientific discoveries, and that these discoveries represented the truth of the associated theories as expressed by the concept of laws of nature. Discovering laws of nature is considered to be the primary focus of science.

The scientific method, as originating from the Empiricists, is the process of gathering of meticulously measured observations from either experiments or nature/humanity. As large numbers of these observations or facts were gathered and compiled, the belief was that general features or patterns would start to emerge, and that individual scientists could start to generate general hypothesizes about these patterns. These hypotheses would then be developed into a theory using the process of induction, and the scientist would then attempt to confirm his theory by seeking evidence to prove the validity of the theory and establish a new law of nature. If successful, this new law is then used by scientists to discover and exploit new secrets in nature, and expanding the realm of scientific knowledge by adding this new truth to our existing collection of truths and expanding the scope of the existing theory. Scientists then move on to trying to find the next major law of nature. For example, Newton's theory of gravity became Newton's Law of Gravitation. It was considered at the time to be the first discovered law of nature, in that it that it passed all the tests applied to it for hundreds of years and was considered a proven theory or law. It was believed that the Law of Gravitation could predict all outcomes related to gravity with complete certainty, and at the time accurately predicted the movement of

all the celestial bodies, as well as the effects of gravity on earth. So scientists moved on to new areas of research to discover new laws of nature, or to find additional ways the theory of gravity could be exploited.

Another important concept within Logical Positivism is the concept of probability, particularly their concept of *logical probability*, and the application of logical probability to the validity of a theory or hypothesis. Put simply, the greater the quantity of corroborative evidence in support of the theory, the greater the probable validity of the theory logically. As A.J, Ayer put it "Roughly speaking, all that we mean by saying that an observation increases the probability of a proposition is that it increases our confidence in the proposition, as measured by our willingness to rely on it in practice"(1936, p. 60). So a theory that gets tested a 100 times and passes each test is considered logically more probably true, than a theory that has been positively tested twice. It is important to note that this is a logical calculation, not mathematical, so there are no odds given. Fundamentally, it is the assumption that the more a theory has been successfully tested, the more valid and therefore stronger it is.

Connections between Positivism and EBP

So how does all of this relate to Evidence Based Practice? As was mentioned in the prior chapter, this is not the first time the connection has been made between Evidence Based Practice and Logical Positivism, and I would argue that Logical Positivism and its associated ideas had a profound impact on the thought behind EBP. As Bruce Thyer put it,

> Our common field of social work is no longer seen as supportable merely as a manifestation of individual or societal "caring" for those in need, but more in terms of the results, effects, or outcomes it produces among those it attempts to serve. In some ways, this view brings us back to the verificationist principle of the logical positivists of the

Vienna Circle, in their assertion that the only scientifically meaningful questions were those susceptible to empirical verification or refutation. (2008, p. 339).

White & Willis's based their paper on the positivist foundations of EBM, writing "(1) That EBM is based on an impoverished account of scientific knowledge; (2) that this is reflected in its behavourist and positivistic account of disease", that "Virtually 90% of qualitative research is relegated to the dustbin of legitimate science because it is not positivistically executed and statistically based" (2002, p. 6). Qualitative studies are not positivistically executed because the qualitative methodology is not considered objectively measurable due to the inability of the researcher to directly observe the effects; it is invalid because according to positivism, only the researcher's experience can be considered objective; the client or patient's experience has no value because it can't be impassionedly observed by the researcher. The Gold Standard of research, as the Social Work Policy Institute (2008) puts it, are randomized controlled trials. And, while they admit qualitative research has some value, it is best used to aid quantitative research, with qualitative being listed as having the lowest "strength" out of all the forms of research. Fundamentally, this is just a slightly softened positivistic view, as qualitative research is just barely acceptable on its own. It also connects with Logical Positivism's two sources of knowledge, logical reasoning (analytic a priori) and empirical experience (synthetic a posteriori), in the two primary forms of evidence it considers acceptable. Empirical experience is research results, and meta-analysis is logical reasoning. They are the two strongest forms of evidence used by Evidence Based Practice.

As Dana Kovarsky put it,

Drawing upon an epistemology of logical positivism, EBP is dominated by a discourse of objectivity that silences subjective voices from the lifeworld experiences of clients. Here,

the language found in official documents of professional organizations leaves little room

for debate. The authors describing EBP use modal verbs, for example, to convey their

strong sense of certainty about the information being presented (2008, p.50)

In this example, the author described how EBP makes use of the theories of Logical Positivism,

including in their use of language to silence anything that they do not consider completely

objective in research, along with voicing their own certainty in that objectivity, and in the

material being discussed. My own example of this would be the use of language around 'gold

standard' treatments; the absolute certainty with which they are presented, and how rigorously

they have been verified.

One of the key ideas within EBP is that theories that have been tested the most are the

ones we should be using in practice, as those are the theories that have withstood the most

scrutiny and are thus more valid. Cognitive Behavioral Practice is a prime example; as the

Association for Behavioral and Cognitive Therapies puts it "The most commonly used evidence-

based practice approaches for the treatment of psychological symptoms involve cognitive and

behavior therapies (CBT). The efficacy of CBT has been demonstrated for a wide-range of

symptoms in adults, adolescents, and children." (n.d., para. 6). Arguably, CBT is the most

common form of therapy available. It has been extensively researched, there is a huge pile of

supporting evidence for it, several meta-analyses have been performed, and its effectiveness is

proven. Behind all of that is a logical probability calculus from Logical Positivism. This theory

is best, because it is the most successfully predictive, in its extensive testing. The whole

emphasis of EBP is using theories that have been heavily tested, rigorously proven, and solidly

based on empirical evidence, and that is Positivistic thinking.

Evidence Based Policy also has its connections to positivistic thinking. Greenhalgh & Russell (2009) base their paper on this concept. They wrote about how policy makers tend to support only practices with extensive evidence behind them,

> Evidence-based policymaking assumes that the ethical and moral issues faced by policymakers can be reduced to questions of "best evidence," and that what is actually going on in the world can be equated with what the chosen metrics indicate is going on. It also assumes that empirical research, especially on "the impact of intervention X on outcome Y," will provide the answer to most if not all policy questions; that if we do enough research, we will abolish situations in which the available evidence is irrelevant, ambiguous, uncertain, or conflicting; that evidence from research is value-free and context-neutral; and that such evidence is of greater value than evidence from personal experience or opinion. (p. 307-308)

As before, the focus is on the gathering of evidence to show "best practice". Another factor too, which is a latent assumption in positivism, is that research evidence is somehow objective, and thus free from personal values or judgements. This comes out of the assumption that objectivity is possible.

Now obviously Evidence Based Practice is based in Empiricism. It uses Empiricism to justify itself. Empiricism is part of Logical Empiricism, aka Logical Positivism. They all believe in the accumulation of evidence. The more evidence you have, the better that thing is. Evidence creates theory, evidence is used to validate that theory, and evidence is used to show how predictive and wonderful that theory is. The fundamental basis of Evidence Based Practice is to accumulate all the available evidence in support of a practice, to justify the use of that

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practice over other practices that don't have as much evidence themselves. It is Logical

Empiricism on a macro scale.

In the next chapter, I will introduce Karl Popper and look at his theories from Critical

Rationalism that relate to the topic at hand. We will look at Popper's refutation of Logical

Positivism, and introduce his philosophy of science concepts.

CHAPTER FIVE

Karl Popper's Critical Rationalism

The intent of this chapter is to delve into Popper's theories in Philosophy of Science, which are collectively referred to as Critical Rationalism. In this section, we will look briefly at the history behind Popper's theories, and touch on his connections to the Vienna Circle. Following this, we will examine Popper's concepts of evidence and their use in science: how evidence cannot prove theories; how we should seek to refute our theories to improve them; the need to construct our theories so that they can be refuted; his concept of corroborating a theory and the inability to use evidence to calculate the odds of the theory's validity. Following this, we will look at his criterion for demarcation, which defines what separates science from everything else, his concepts of truth, and man's ability to recognize and achieve it. Finally, we will examine his concepts of Objective Knowledge.

Before I launch into Karl Popper's theories on the Philosophy of Science, I wanted first to address an important misunderstanding that has propagated about Popper and his theories –the misunderstanding being that Popper was a Logical Positivist and that his theories are in fact positivistic. Now there is a minute bit of truth to this, in that Popper started his career in Philosophy as a periphery member of the Vienna Circle, which was collectively one of the major contributors to the theories behind Logical Positivism (LP). However, it is important to note that Popper was only very loosely attached to the Circle, and never attended any meetings. He was also nicknamed the 'official opposition' by one of the inner circle members, and was largely the odd man out because of his opposition to the core tenants of Logical Positivism (Magee, 1973, p. 5). Poppers seminal work *Logik der Forschung* or *The Logic of Scientific Discovery*, the first major refutation of LP, had been written along with other books back in the 1930's while he was

still connected with the Vienna Circle. But sadly because of the contents of his works, his

Jewish ancestry, and because he was living in Austria during the rise of Nazism, he was unable

to publish his books at the time, and fled Austria soon after. It was not until 1959 that 'The

Logic of Scientific Discovery' finally was first published in English. Unfortunately, his theories

have not spread very far beyond Europe and he is not particularly well known in North America,

whereas in Europe he is a bit better known.

Popper's Philosophy of Science was the first major challenge to the theories of Logical

Positivism. A challenge that positivist philosophy was unable to effectively counter, so much so

that many philosophers consider both positivism, and logical positivism to be philosophical dead

ends. For example John Passmore found that "Logical positivism, then, is dead, or as dead as a

philosophical movement ever becomes." (1967, p. 57). Of course, there are still those who still

support Logical Positivism, and take the stance that there is simply nothing more to talk about, or

in other words, it isn't philosophy any more, but fact that has ingrained itself within the scientific

community. In a way I agree that this is the case, and in the next chapter I will address exactly

why I think this represents a major problem. The majority of information found in this chapter is

from *The Logic of Scientific Discovery* (2002), except where otherwise noted.

Proof and Falsification

Popper, unlike the logical positivists, argues that evidence can never be used to prove

theories. The only thing that evidence can be used for is to disprove a theory. Popper's method

of demonstrating this concept is by using black and white swans. No number of observations of

white swans, no matter how great the number of observations, can conclusively prove that all

swans are white. Yet a single observation of a black swan would falsify the theory that all swans

are white (Popper, 2002, p. 82-83). Now methodologically it is possible to have errors or to

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refuse the conclusion, based on established concepts and definitions (this black bird is not a swan because it is black, all swans are white, for example), which creates the opportunity to methodologically reject any observation that may conflict with the theory.

Popper therefor proposes, as an article of method, that we do not systematically avoid refutation, whether by adding ad hoc hypotheses, or ad hoc definitions, or by always refusing to accept the reliability of inconvenient experimental results, or by any other such device; and that we formulate our theories as unambiguously as we can, so as to expose them as clearly as possible to refutation. (Magee, 1973, p. 19)

In addition to the above, Popper also speaks of our not letting go of our theories too quickly either, as it is also important to remain critical of the tests and presumed evidence, while we attempt to make an honest attempt to poke holes in our theory.

Applying these concepts, Magee (1973, p. 19-20) offers the example of the theory that water boils at a 100° centigrade. Our first duty is to seek out examples of where the theory fails, in the hopes of improving the theory if and when it does, or creating a brand new theory that is more accurate. Now in the case of this theory there are cases where water will not boil at 100° C, such as when the water is placed in a closed vessel. Therefore, the theory we had developed which we thought was a natural law is disproven, and either needs to be improved to account for this discrepancy, or abandoned in favor of a theory with greater explanatory power. In this case we choose to rewrite the theory so that it now includes the condition that the water not be in a closed vessel, and again look to refute this. This then leads us to find out that changes in altitude again disprove the theory, so the theory gets rewritten again to add another condition, so that the theory now reads, water boils at 100° C, when not contained in a closed vessel, and when at sea level atmospheric pressure. This process continues onward until the theory can no longer be

adapted to accommodate all the discrepancies, and a new theory must be developed. A real

world example of this process is Newton's Law of Universal Gravitation (the law of Gravity),

which was believed to be a natural law for over two hundred years, until Einstein's theory of

Relativity eventually overthrew it, due to the increasing number of problems that Newton's

theory could not account for, that Einstein's theory did (and much more beyond that). Einstein

also firmly believed that his theory is flawed as well, and spent decades trying to perfect it. So in

all likelihood, his theory will be eventually overthrown as well.

Corroboration

While Popper did state that evidence maybe be used to corroborate a theory (basically,

the theory has been vigorously tested, and not have failed as of yet), his argument is that

evidence cannot be used for any kind of proof or probability calculation towards a theory's

veracity, no matter how much evidence is gathered that is in support of the particular theory. In

other words, because theories cannot be conclusively proven with evidence, it is not possible to

evaluate or calculate its veracity or probability of being correct, no matter how much evidence in

the theory's favor is gathered. While the evidence may corroborate (fail to disprove the theory),

it adds no weight at all to the theory's validity.

Criterion of Demarcation

This leads us to Popper's criterion for demarcation between science, and everything else.

For a theory to be scientific, it must be testable in its entirety and it must be falsifiable, or in

other words, that the theory must contain clear conditions where the theory will fail. There can

be no ambiguity in the theory's statement. Theories also do not need to be complex in nature,

quite the opposite, the simpler the theory's formulation the more readily testable it is. For

example, the statement 'It will rain' is useless as a theory, as there are no limitations on the

statement at all, as obviously it will rain someplace, at some time eventually. This theory is not

quantifiable, and thus not scientific, and is useless. As Popper points out, any idiot can come up

with an unlimited number of such statements that have the near certainty of being true. The

statement that, 'it will rain in New York City at noon tomorrow', however, has specific

limitations, and can be falsified. This is starting to have some potential due to its informational

content, but again, any fool can create an endless number of such statements, if they are not

concerned about the end results. What is desired are statements, with a lot of information, and

low probability that come close to the truth in their predictions. This is the basis of useful

scientific theory according to Popper. If these statements can be tested, they can be falsified.

The other key thing that this criterion of demarcation achieves, is that it shifts the focus in

science from actively attempting to prove theories (which is an impossibility, as all theories have

the possibility to be falsified at a later point), to actively trying to disprove theories. This

liberates the scientist, as the failure of a theory becomes a good thing, instead of a bad thing,

because it helps us move forward towards a better understanding of the phenomena attached to

the theory. As Magee states, "according to Popper, falsification in whole or in part, is the

anticipated fate of all hypotheses, and that we should even rejoice in the falsification of an

hypothesis that we have cherished as our brain child" (Magee, 1973, p. 36), because these lead us

to new possibilities. In other words, disproving your theory is a good thing, not a failure.

Scientific Advancement

Popper argued that the process of scientific advancement is not based in the accumulation

of knowledge. While successive theories can contain aspects of the prior theories, it is the

theories that break away from past understanding while offering greater explanatory power than

the theory that came before it that are the most interesting. Such theories offer the possibility of

radically changing our understanding. Above all, Popper stressed the concept that it is the failure of our theories that drive scientific knowledge forward, not the supposed successes. As demonstrated before, failure is what drives the need to improve or replace the fallen theory, for until a theory fails, we do not know what is wrong with our existing theories. Popper suggests that theorists should be bold with their theorizing, as boldness offers the greatest opportunities for the advancement of scientific knowledge, assuming the theory can stand up to rigorous attempts to test (disprove) said theory.

Knowledge is Theoretic

Another key aspect of Popper's theories is that human knowledge is entirely theoretically based. As Popper puts it,

> Science does not rest upon solid bedrock. The bold structure of its theories rises, as it were, above a swamp. It is like a building erected on piles. The piles are driven down from above into the swamp, but not down to any natural or 'given' base; and if we stop driving the piles deeper, it is not because we have reached firm ground. We simply stop when we are satisfied that the piles are firm enough to carry the structure, at least for the time being (2002, p. 94).

The fundamental meaning behind this is humanity's utter inability to know the absolute truth about anything. While science helps better our understanding of things, this understanding lacks solid foundations, as it is impossible for us to know the truth, as we have no way of knowing if and when we have arrived at the truth; there is no possible way of gauging where it is or how far away we are from it, or if we went right past it. Our understanding is mostly of a predictive nature; our theories are useful to us, as they help us make predictions about outcomes to events, with some vague degree of certainty, at least until the theory fails in its predictions.

This is why Popper refers to them as piles, as piles are not always entirely stable, unlike natural laws and bedrock.

Objective Knowledge

The final major theory from Popper that we will examine is his concepts of Objective Knowledge, which was first introduced as a paper in the book *Physics, Logic, and History: based on the First International Colloquium held at the University of Denver, May 16-20, 1966* (1970). The formula he uses to explain objective knowledge is $P_1 \rightarrow TS \rightarrow EE \rightarrow P_2$. P_1 represents the initial problem, TS is the trial solution proposed to solve the initial problem, EE is the process of error elimination applied to the trial solution, and P_2 is the resulting situation once the solution is applied, with any new problems.

> It is essentially a feedback process. It is not cyclic, for P_2 is always different from P_1; even complete failure to solve a problem teaches us something new about where it's difficulties lie, and what the minimum conditions are which any solution for it must meet –and therefor alters the problem situation (Magee, 1973, p. 66).

This also ties into Poppers assertion that one needs to be bold in one's imagination, and in one's theorizing, if one wants have the possibility of causing a dramatic change in the problem. Virtually all major new theories that caused major changes in our theoretical conceptualization were incredibly bold in their assertions –so much so that it often took decades before these theories were eventually accepted by the greater community; theories like Freud's Psychodynamic theory, Copernicus's Heliocentric theory, Newton's theory of Gravity, Einstein's theory of Relativity, to name a few. All such theories radically changed human understanding, and were incredibly bold in their assertions. Moreover, while many of these theories were eventually supplanted by theories with better explanatory power, again in virtually all cases, the

theories that supplanted them were also bold in their assertions as well. Even bold theories that fail rigorous scrutiny are still valuable, because while they did not succeed, they can often point us in new directions, or identify theoretical dead ends, which also can point us in new directions.

The next chapter will examine how Popper's theories overturn most of the relevant theories in Logical Positivism, and will examine how Popper's theories impact Evidence Based Practice, and also how science is presently being conducted in general, and in particular to the field of clinical social work, and how it ties in to Logical Positivism. Finally, I will look into the implications of all of these things combined, on the application of Evidence Based Practice, its implications for clinical practice, and offer some thoughts about applying Popper's Critical Rationalism, to Evidence Based Practice.

CHAPTER SIX

Discussion

The purpose of this thesis is to examine Evidence Based Practice by looking at its theoretic foundations in Philosophy of Science, to connect it to Logical Positivism, and then analyzing Evidence Based Practice using Critical Rationalism, the branch in Philosophy of science that falsified Logical Positivism, with the expectation that Critical Rationalism will expose problems with the concepts and application of EBP. In the prior chapters I have introduced and examined Evidence Based Practice. I have introduced the concepts behind Logical Positivism and its extensive history including the antecedents of Positivism and Empiricism that Logical Positivism based itself upon. I have made the connection between Logical Positivism and Evidence Based Practice. And finally, I have gone through the history and the relevant theories from Karl Popper's Critical Rationalism.

In this chapter, I will give a brief overview of the theories, I will examine the specific ways that Critical Rationalism falsified Logical Positivism, and how those same theories affect Evidence Based Practice, I will discuss the strengths and weaknesses of this thesis, I will then consider the implications involved, and finally I will offer my conclusion.

Evidence Based Practice, Logical Positivism, and Critical Rationalism

The definition for *Evidence Based Practice* is "the integration of the best research evidence with clinical expertise and patient values" (Sackett et al., 2000). We need to use the best available research evidence with our experience while considering our client's values when determining treatment. In chapter three, I posited the connection between EBP and Logical Positivism. That both LP and EBP tend to reject anything that is not empirically derived or not observable directly by the researcher, such as qualitative studies. Only logical reasoning and

empirical experience are deemed valid. Extensively tested theories are considered more valid than theories that have only been tested a few times, and those extensively tested theories are probably true because they have been rigorously proven with a solid empirical foundation, and that all of this is a logical probability calculus (a calculus in Philosophy is a logical calculation), which comes from Logical Positivism. This is also the same with EBP based policy, in that its decisions on policy are also based on the accumulation of evidence. I also wrote about EBP's obvious connections to Empiricism (which itself is also part of Logical Positivism), as Empiricism is EBP's justification for us to use EBP. Empiricists (and by extension the Logical Positivists) believe in the accumulation of evidence –the more supporting evidence you have, the stronger the theory is. Evidence spawns theory, evidence validates theory, and evidence shows how predictive the theory is. EBP fundamentally accumulates evidence and uses it to base choice in a theory, and justify its use over other theories.

Popper's Critical Rationalism argues against these concepts. He rejects logical probability, arguing that it is impossible to logically calculate any sort of probability of a theory being valid, no matter how many times it has been tested, as the theory can fail testing at any point in the future –because of new tools of measurement, or in testing a new area the theory should predict, or problems with the internal validity of the prior tests, and etcetera. Popper's (year) criterion for demarcation separates science from everything by requiring that all theories must be clearly and fully testable and therefore falsifiable; there must exist ways to completely disprove the theory. Popper also shifts the focus away from attempting to prove theories, to attempting to disprove them as the major focus of science. Popper also argued against the concept of accumulating knowledge, instead focusing on trying to break away from past understanding and to theorize boldly in the hope of gaining new ground. It is the failure of a

theory that advances science not the supposed success. The failures give us the opportunity to create better theories. Our knowledge is entirely theoretical; it rests on pillars driven into the swamp of the unknown. Poppers concept of objective knowledge is a feedback process, $P_1 \rightarrow TS \rightarrow EE \rightarrow P_2$. P_1 represents the initial problem, TS is the trial solution proposed to solve the initial problem, EE is the process of error elimination applied to the trial solution, and P_2 is the resulting situation once the solution is applied, with any new problems.

Analysis & Synthesis

Evidence Based Practice's major focus is obviously evidence. The more a theory or therapy is tested, the better it is. Yet there is not really a way of demonstrating that it is, because successful testing is just proof that it has not failed… yet. Logically you cannot predict its ultimate success because we cannot see into the future. Furthermore, an untested theory cannot be assigned probability either. It may be just as successful as the current favorite, it might exceed it, or it might fail immediately. The heavily tested theory is in the same situation as the untested theory in that it has the potential to succeed or fail too, we do not know. We just have some confidence in the theory. Furthermore, an untested theory has unlimited potential, meaning that we do not know what its potential is, because we have not tested it all, and it has not failed yet, it may contain the ultimate truth, not that we could ever be sure, however. This is why Popper used the example of the pillars driven into a swamp, as you never know when something you thought was solid might suddenly sink into the mud. Therefore, while it is tempting to believe in our evidence, we can never be sure of it.

There are concerns with the research used as evidence too. Arguably, the emphasis in research is to prove theories, not disprove them. In general, funding is often dependent on getting positive results; with the negative results, falsifying the theory is viewed as a failure.

This again stems from the belief that theories can in some way be proven, and that good results are positive results. This belief is also held within the public at large, among whom are people that drive policy. Critical rationalism does not agree at all with this perspective, and argues we should be trying hard to falsify our theories, so that we can then work on finding new stronger theories, or fixing the existing ones. In history, most major advancements in science happen when the old theory fails. Eventually a new more powerful theory arises from the ashes as Einstein's Theory of Relativity overthrew Newton's Law of Gravitation. This is why Popper argues that we should be bold in our theorizing, to create the greatest possibilities for scientific advancement if that theory can withstand attempts to falsify it. Falsification, barring errors in testing, is the closest thing we can have to certainty, as all theories have the potential to be falsified down the road.

Another concern is the potential for a chilling effect in the creation of new forms of therapy. People working in therapy generated many of the therapeutic models we use today. Sigmund Freud developed psychoanalysis, Carl Rogers developed person-centered therapy, Albert Elis developed rational emotional behavioral therapy, Aaron Beck developed cognitive therapy, Marsha Linehan developed dialectical behavioral therapy, and so on. Many of these therapies were developed as part of that person's approach with clients. These personal approaches are then later developed into a theory, tested, and some are eventually manualized. With the advent of EBP the focus has shifted to using existing manualized approaches, in particular cognitive behavioral therapy (CBT), as it has the greatest body of research behind it. I remember in one of my placements being told, partially as a joke, that I could use any form of therapy I liked, as long as it was CBT. The reason for this was that CBT was the only accepted treatment for most presenting issues by the insurer, Medicaid. If therapists are pushed into using

primarily (or only) manualized treatments, where are the revolutionary new therapies going to come from? How will therapists develop their own methods, and boldly theorize on them, if they are being pushed into using only the EBP approved therapies.

EBP also has the potential to cause harm when combined with policymaking. EBP can be used as a justification for only permitting certain preferential treatments, particularly if that treatment is well researched with a multitude of positive results. Even better if that therapy does not cost as much, it could mean all kinds of savings for the insurers. EBP's main emphasis is on the use of evidence-backed treatments, meaning treatments with generally overwhelming results. Anything else is arguably frowned on by EBP. What is even more concerning is when you have policy makers who may know little about EBP, EBP's foundations, or the treatments being pushed forward by the different groups associated with EBP, such as when government politicians or policy makers from insurance companies get involved. So not only do we have the problem of the use of evidence in a way that cannot be entirely supported logically (evidence cannot prove things), but on top of it you have people who may know little about the issues, issuing policy.

Popper was one of the first in modern Philosophy who successfully challenged the concepts of objective knowledge, which comes from the Empiricists, in part with his formula $P_1 \rightarrow TS \rightarrow EE \rightarrow P_2$, and with a multitude of logical arguments such as,

> We may know or understand a man's system of dispositions pretty well; that is to say, we may be able to predict how he would act in a number of different situations. But since there are infinitely many possible situations, of infinite variety, a full understanding of a man's dispositions does not seem to be possible. Theories are similar: a full understanding of a theory would mean understanding all its logical consequences. But

these are infinite in a non-trivial sense: there are infinitely many situations of infinite variety to which the theory might be applicable; that is to say, upon which some of its logical consequences may bear; and many of these situations have never been thought of; their possibility may not yet have been discovered. But this means that nobody, neither its creator nor anybody who has tried to grasp it, can have a full understanding of all the possibilities inherent in a theory; which shows again that the theory, in its logical sense, is something objective and something objectively existing - an object that we can study, something that we try to grasp (1966, p. 15).

Put simply, it is impossible for us to objectively test a theory, because we cannot possibly grasp all the possibilities as we cannot understand the entirety of the theory, and thus cannot formulate all possible tests. It is in part because of this, that theories can eventually fail hundreds of years later; because we cannot not know, what tests would break the theory. Furthermore, this is also an important reason why Popper told us that our theories are always on shaky ground, as you never know when they will fail you.

Adding to this, we have the massive problem of investigating the human mind itself, because we do not yet have the tools that let us directly investigate it. Sure, we have functional magnetic resonance imaging, and we have electroencephalograms, and all kinds of cutting-edge technology that are helping us study the brain. But we know virtually nothing about the mind, not how it works, not where it is, or even if it is found in the body or not. There is a veritable mountain of theories about this, but no supporting evidence for any of them. My former mentor spent his career studying the mind. He liked to say, half joking, that the mind was attached to the body on some other plane or dimension as a bluish ball that attached to us kind of like a tail, and he called it Smurf energy. The reason why he said that is that everything science tells us about

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how the brain works, tells us the mind cannot reside there, as the brain is as far as we know, is

nothing but an organic computational machine that processes conditional statements (if x number

of signals are received then send signal y, otherwise wait). Put simply we have no way of

directly studying the mind, and we are not yet at the point where we can directly interpret the

brain's computations. This is a huge problem because it means we do not have much primary

source evidence yet, because what we have evidence of is synaptic activity that we think

correlates with reports from the subject, and we have patterns of activity that correlate with

stimulus. We do not have capability to observe directly. This also means we don't really have

primary evidence when it comes to researching mental illness, because at best we have evidence

of differences in brain structure or differences in patterns of brain functioning, and at worst we

are relying on behavior and responses from research subjects, which can easily be misattributed;

our foundational pillars are tenuous. This does not mean that social work practice does not have

a scientific foundation, but we do need to keep in mind the tenuousness of the evidence we use in

our therapeutic decisions.

Popper's criterion of demarcation (what separates science from everything else) requires

that all scientific theories have to have ways of being clearly and completely refutable, for

everything contained within the theory. You have to be able to refute the entire theory with

sufficient appropriate evidence, and the theory cannot contain any elements that allow it to

obfuscate itself, or that do not enable falsification. The question is –do our theories meet that

criterion?

Strengths and Weaknesses

As I said in chapter 2, this entire thesis is theoretical, but then so is human knowledge.

So naturally, this thesis too suffers from the shaky pillars that all science suffers from. A.J.

Ayer's version of Logical Positivism (Ayer, 1952) is very well known within North America, and still believed in to this day, even despite the author's later total rejection of his own book. Karl Popper and his theories are virtually unknown in North America, and he has only recently been catching on in Europe, decades after his book *The Logic of Scientific Discovery* (1934) was published. Popper's theories are probably not perfect either, and he knew there are likely problems. But, I think there are some really good ideas in Popper's theories, even if I am a bit biased. Another consideration is that it is incredibly difficult to pin down exactly what Logical Positivism is, even for many of its antecedents. Many people theorized about it, there were countless disagreements between the proponents, and as a result there are many ways of looking at the whole concept. My rendition of it in this thesis is a very coarse overview, due to the extreme degree of material published.

Implications

As with most human endeavors, there is often good mixed with bad. At its heart, EBP is not a bad idea; but I think the emphasis is skewed too far towards the evidence part, and too far away from the others, which I argue are equally important. From my own experience as an intern, I had a substantial number of clients that came to me not wanting CBT. The reason was that every time they went seeking therapy, they got CBT; it did not work for them even after several treatment programs with it, and they had had enough. On top of all that, they were having difficulty finding a therapist who would not just give them CBT again, because of their health care coverage.

I, however, am not knocking CBT. It is a very good treatment approach, which works for many people. However, CBT does not work for everyone –depending on which meta-analysis you choose, its success rate ranges from about 60-80%, and may range even lower in other

populations. Using available research is a great idea, and I cannot think of a therapist that would object to using the available research (when time permits), but therapists also have to be able to throw out the research when it is not working for their client, or when their client wants something else.

Above all, I feel that EBP should not be pushed as policy, as these sorts of policies have an innate tendency to push specific treatments, even to the exclusion of all else. This approach throws out everything else in EBP about therapist experience, and client beliefs. Worse, EBP has the potential to be detrimental to the development of new forms of therapy, by not allowing therapists to develop their own methods while working with clients. Given the history of psychotherapy, it is highly likely we are making huge mistakes right now, either the way we think about theory and/or therapy is all wrong, or we find out treatment x we thought was great was really doing long term harm. It is pure hubris to somehow think we got it right finally. Yet still, only the extensively empirically tested treatments are pushed, and they are extensively proven into the ground with endless research, while quietly ignoring the rest, the non-empirical studies, and the theories/treatments that do not have the funding to be tested. We might be missing the next big revolution in our understanding, with our obsession to prove everything.

Conclusion

This thesis was the examination of the theory of Evidence Based Practice (EBP), using Logical Positivism (LP), and Critical Rationalism (CR). My argument is that EBP's foundations are based on LP and its antecedents Positivism, and Empiricism. I chose CR because of its extensive refutation of LP, which in turn points out problems with EBP. In this, I covered EBP, its history, and its theory. I broadly covered the relevant theories of LP and etcetera, and

connected it to EBP's theoretic standpoint and its pedagogy. Next, I delved into Popper's CR and its relevant theories.

My key arguments are that this extreme focus on positive results (proof) is deeply flawed. Compounded positive evidence is not particularly useful because it offers no predictive power. Logical probability is a fallacy because that theory could fall apart at its very next test, or any test after that. Popper argues stringently that our aim in science should be putting all our efforts into trying to refute our theory, not prove it, as refuting the theory creates the opportunity for a new stronger theory to replace it, or for the existing theory to be further improved. Another key CR argument is about objective knowledge, which Popper argues is impossible, as there is no way for us to entirely comprehend the entirety of a theory and all of its possible implications, and thus be objective in our approach to it.

I think we social workers should be careful with our use of EBP. While research can be a great aid to treatment, we need to balance that with the other two perspectives of the therapist's experience, and the client's rights. EBP should not be used in policy as a basis for enforcing specific treatments, as we risk causing a chilling effect on new avenues of therapy, if therapists are being pushed into using manualized treatments, over their own developing treatment concepts; not to mention trampling over therapist experience and client rights.

I think the most important concept to take away from this is that positive proof is largely irrelevant and a logical impossibility. The only thing one can hope for is to disprove a theory, and thus create the possibility for the advancement of science, and our fallible understanding. As the Nobel Laureate and neurophysiologist, Sir John Eccles put it "according to Popper, falsification in whole or in part is the anticipated fate of all hypotheses, and we should even rejoice in the falsification of an hypothesis that we have cherished as our brain-child. One is

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thereby relieved from fears and remorse, and science becomes an exhilarating adventure where imagination and vision lead to conceptual developments transcending in generality and range the experimental evidence" (1970, p. 107). Second, for us to remember Popper's description of the foundations of science and how unstable those foundations are, even perilously so, driven into the muck of the unknown.

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