Is psychology a pseudoscience?

"Pseudoscience: The conspiracy against science."

(1) Introduction

The book by Kaufman and Kaufman (2018) concerning pseudoscience has 22 chapters on various subjects which reveal many facets of this phenomenon. Pseudoscience is hard to define, as indeed is “science,” because among other things they are linked to personal, social and cultural processes which vary from place to place and over time (see e.g. Lilienfeld; Hecht; Herried; French. Wherever the author’s name appears without the year of publication, the matching chapter by the author appears in Kaufman and Kaufman’s book). Despite this difficulty several instances of pseudoscience can be suggested quite easily: for example, opposition to the explanation that human beings are largely responsible for global warming; opposition to evolutionary theory and support for creationism; opposition to medical immunization because it causes autism; belief in alternative medicine such as naturopathy and homeopathy; physiognomy and astrology. At the beginning of the book Lilienfeld skims over several of the chapter’s subjects and proposes ten statements that it is worth the reader’s to bear in mind when reading the book. An example is that the arguments of pseudoscience differ from mistaken scientific arguments.

First I shall briefly review the 22 chapters, which are divided into to five content groups. Then I shall discuss two important theoretical-empirical problems that entered my mind as I read the book (see below). (My standpoint is that of an experimental psychologist who has conducted experiments in rats’ learning fear and avoidance, through experiments in face perception and recognition, and who is deeply interested in the philosophy of science and mind.)

Review of the chapters
(A) *The basics of pseudoscience* consists of four chapters. Hecht describes the development of pseudoscience in the setting of the development of science and shows that science is based on the former and grows out of it. Lobato and Zimmerman propose a number of psychological, social and cultural factors that are responsible for the pseudoscientific phenomenon. Blanco and Matute suggest that the cognitive process, the causal illusion, are responsible for the development of pseudoscience. Simonton proposes a hierarchy in which academic areas are arranged from the highest level to the lowest -- physics, chemistry, biology, psychology and sociology, and shows that the negative influence of pseudoscience rises as the academic area descends in this hierarchy.

(B) *What does pseudoscience cost society?* has four chapters. Folta suggests among other things that the struggle against genetically engineered changes cause many flaws in the development of this technology, and endanger essential food crops, farmers and poor people. Hermes explains what the damage is with naturopathic medicine: giving strange and harmful treatments especially in cases of serious illnesses such as cancer; acquiring a license for medical practice without medical training; wasting public money; exploiting patients. Kennair, Sandseter and Ball describe the negative effects of overprotective parents, control, the media and the various regulations to prevent harm to children’s development arising in the domain of children’s games. Howard and Reiss query the arguments of the movement against immunization, and show that it has created an alarming rise in illnesses preventable by immunization, such as measles and chickenpox.

(C) *Scientific (or pseudoscientific) soundness* has five chapters. Kozak suggests several factors responsible for our culture being vulnerable to the arguments of pseudoscience: ignorance in scientific knowledge; education that emphasizes repetition over a critical outlook; ignorance of how to evaluate true statements; warping scientific knowledge by means of the media. Orzel discusses the negative effect of failures of scientific experiments (e.g., the mistaken finding that subatomic particles, called neutrinos, move faster than the speed of light) on scientific perception on the one hand and the widening influence of pseudoscience on the other. He posits that these cases should be used to educate the general public that science is a process that self-corrects.
and thereby adds to its value. Gorman deals with several interesting cases in which science becomes pseudoscience as a result of poor use of scientific methodology. For example, he proposes that a mistaken statistical analysis and exclusive publication of articles that support the researchers’ hypotheses, call into question the scientific status of certain fields of research (narcotics, public medicine, psychology) and force them down to the level of pseudoscience. Beall discusses the negative effect of predatory journals on the status of science. These journals are driven solely by the desire for gain, therefore they publish any article for payment when they break the rule of scientific critique (peer review) and thus contribute to the burgeoning of pseudoscience. Marcus and Oransky consider the processes and the different pretexts given by editors (e.g., the editors of *Frontiers*) to retract from the journal articles that are pseudoscience.

(D) *Pseudoscience in the mainstream* has four chapters. Gorski deals with the incorporation of pseudoscientific medicine (e.g., naturopathy, homeopathy, acupuncture, reflexology, holistic medicine) into science-based medicine and with the many harms this incorporation causes. Lynn, Gautam, Ellenberg and Lilienfeld deal with hypnosis and attempt to free this area from all kinds of mistaken opinions and myths (e.g., that hypnosis is a particular conscious state that imparts to the subject extraordinary powers and abilities) in order to approximate it to the social-cognitive sciences. Benisz, Willis and Dumont consider the limitations, the lack of understanding of intelligence tests, and their deleterious effects. Examples are the use of IQ scores to discriminate against minority members, denial of certain immigrants’ entry into the US, and rejection of candidates for jobs and university entrance. French, who himself ran experiments in parapsychology, asks if this field is pseudoscience. He reaches the surprising conclusion that parapsychology meets the criteria typical of science, even though he himself does not believe that a person has parapsychological qualities.

(E) *Science activism: How people think about pseudoscience* has four chapters. Herreid suggests that young people can be educated to distinguish science from pseudoscience by analysis of case studies such as astrology, and shows that not only do these cases fail to uphold several qualities that are characteristic of science, they even harm ethical norms, public health, and environmental safety; and they enjoy considerable
budgets. Kalichman researches the movement that denies that the HIV virus is what causes the dreadful disease of AIDS (AIDS denialism). He finds that proponents of AIDS denialism (primarily its leaders) have a warped notion of reality and a lack of trust in science and in government -- obstinate cognitive properties that are unchangeable. Senapathy is a science communicator that tries to describe how it is possible to fight pseudoscience. It principally takes the example of the anti-GMO (genetically modified food) movement, which ignores the fact that research has shown that food of this kind has no effect negative to health. Viskontas deals with the way we process information through beliefs, attitudes, and schemata. He uses these cognitive processes to explain, for example, belief in miracles that suits the faith in an absolute power and dismisses simple scientific explanations.

In the Conclusion, Barnett and Kaufman summarize the main points of the above chapters, and suggest that in the end truth will prevail and pseudoscience will be vanquished, even though it enjoys support because of the democratic air associated with equality in expressing opinions.

The present book is extremely important because it offers a range of interesting viewpoints about the pseudoscience phenomenon. Still, one short comment may be made here: I would be happy to read in the book a thoughtful chapter on creationism and intelligent design, the pseudoscientific theories that come out against evolutionary theory.

(2) Two theoretical and empirical questions

(a) What is the explanation for the pseudoscience phenomenon?

On this question I would like to make three comments.

The first comment: Lobato and Zimmerman and Blanco and Matute suggest that the processes responsible for science are also the basis for the development of pseudoscience. This idea may be seen as part of the overall approach showing that in a state of uncertainty the human’s behavior is subject to slippage in balanced thought, intuitions and heuristics, and may be evaluated as irrational (e.g. Kahaneman, 2013). There is a good measure of truth in this idea, but it is worth
stressing that one of the purposes of scientific methodology is to overcome these irrational
tendencies. Were we not to follow these methodological rules precisely, we would not grasp that in
many cases a person’s considered opinion is perverse and wrong, and forms the basis for
pseudoscience. No other way exists to reach the assessment that pseudoscience is mistaken than by
examining it with scientific tools. The use of non-scientific tools, based on cognitive processes such
as intuitions and heuristics, would by circularity bring about the view of pseudoscience as right and
true.

The second comment is that the reasons for the above question may be cognitive and
social processes as proposed above; nevertheless, I would emphasize as possible answers qualities
linked to the very structure of science. One of the most important methodological scientific norms is
that science will never arrive at a final uniform theory that explains all behaviors in the world, and
that every scientific theory will in the end be found incorrect (see Popper, 1972/1934). For scientists
it is relatively easy to admit that their favorite theory is in the end liable to be refuted, because they
have internalized the rules of the scientific game which they have acquired over long years of study
and work. However, the public at large will find this norm of “no-attaining to the truth” (and of the
notion of scientific relativism, whereby truth depends on a reference framework) entirely
unsatisfactory, because they want decisive answers and sharp statements. Contrary to science,
pseudoscience provides the individual with answers that are certain. In this sense, science too is liable
to disappoint all who believe that science is an alternative to religion. Religion indeed gives absolute
answers to believers; scientists can only give qualified answers. They are not some sort of
messengers of God or leaders of religious cults.

The third comment: as an answer to the above question, Blanco and Matute propose causality and
the causal illusion, which are kinds of information acquired by associative learning, for example,
learning by way of classical (Pavlovian) conditioning. Here the studies of Michotte and of Heider and
Simmel should be presented (for review see School and Tremoulet, 2000). They conducted
experiments on the perception of causality: for example, the subject sees square A which moves from
left to right along a horizontal line. A reaches square B, touches it, stops, and B begins to move from
left to right on the horizontal line. The subject interprets what he has seen: A pushed B and as a result
B began to move along the horizontal line, that is, A constituted the cause of B’s movement. The
conclusion that arose from an exhaustive review of dozens of experiments on the subject (see School
and Tremoulet, 2000) is that the perception of causality shows innate qualities opposed to the appreciation of causality as a result of learning.

(b) Is psychology a pseudoscience?

From reading Kaufman and Kaufman’s (2018) book, and from other relevant literature, a disturbing question assails me: is psychology a pseudoscience? For example, Simonton says that compared to physics, psychology is highly vulnerable to the effect of pseudoscience. Gorman hints that a wrong use of scientific methodology is liable to turn psychology into a pseudoscience. Pigliucci (2013) suggests that psychology is very low on the dimension of theoretical understanding and medium on the dimension of empirical knowledge. Based on a historical analysis, Green (2015) pointed out that the chances of unifying psychology are very low. Moreover, important theories in psychology such as psychoanalysis of Freud and individualist theory of Adler were found to be pseudoscience according to Popper’s falsification criterion. For years now a large number of articles have appeared regarding the question: is psychology a science? in the professional literature (see Ferguson, 2015; Lilienfeld, 2012), likewise in the general media. It is enough to type in Google this question (is psychology a science?) to elicit several dozens of articles in the professional, popular, and blog journals to understand how relevant and hot this question is still today.

In 1986 Paul E. Meehl, a clinical psychologist and philosopher of science, wrote an important article wondering whether there was a connection between basic psychological science and clinical practice. His answer was that there was no integration between the two. Also a check of research in basic psychological processes (cognitive psychology) raised difficult and real problems. In 1973 Allen Newell, a cognitive psychologist and computer scientist, wrote a famous paper summarizing/criticizing a series of articles presented at a conference on processing visual information. Newell found that all the empirical studies presented there had the same structure: an interesting phenomenon was discovered, and it was given two major, and contradictory, explanations. For example, a single or a dual system of memory; serial or parallel learning; single or multiple coding; decline of memory or interference; an innate or a learned process; a conscious process or an unconscious; gradual learning or in a single trial; and the like (see Figure 2 in Newell). It transpired that these theories contained no cutting empirical solution,
but nor did they unite to create a grand theory. In other words, Newell proposed that this dual theoretical/empirical debate did not advance psychology as a science in the mold of the natural sciences. He held that also thirty years hence what we shall get is another collection of articles arguing dually about new empirical/cognitive discoveries.

The picture that emerged from the above description is that psychology is still at the Kuhnian pre-paradigmatic stage: it has no grand theory and is empirically and theoretically eclectic and fragmented (see Kuhn, 1962).

The absence of development of a grand theory (like Newtonian theory, Einstein’s theory and quantum theory in physics) is an evident and prominent drawback in psychology, which I shall try to explain further on. In addition, it has to be stressed that psychology is unsettled by other drawbacks as well, such as problems in replication and a tendency to publish only positive findings that support the researcher’s theory (see e.g. Ferguson, 2015; Lilienfeld, 2012). The latter problems, however, can be partially corrected in one way or another. But this is not the case with the lack of a grand theory.

Absence of the development of a grand theory may be interpreted as attesting that psychology is liable to decline to the status of a pseudoscience. The tendency to suggests diverse and contradictory explanations for every empirical psychological discovery (à la Newell) is liable to result in the inundation of research with ad hoc explanations, a circumstance that may turn psychology into a bundle of empirical observations explained by several mini-theories which are hard to choose among.

Despite this concern about the deterioration of psychology into a pseudoscience, I do not hold that this is the case. I posit that psychology is not a pseudoscience, but nor is it a science in the mold of the natural sciences. In this sense I agree with Simonton who suggests distinguishing inorganic sciences such as physics from organic sciences such as psychology; likewise with Pigliucci (2013), who proposes distinguishing hard science (physics) from soft science (psychology). But to my mind there is one basic factor that distinguishes physics from psychology and is connected to the theory and the process of measurement in science. While physics has real units of measurement, in psychology, such units of measurement have not yet been found. The units of measurement of psychology are simply theoretical concepts that
constitute a certain part (and usually hidden) of psychological theory. In this sense I would say that the methodology that psychology holds onto is only part of the methodology in the light of which physics advances. To ground this argument I now move on to a brief account of measurement in physics and in psychology (see Rakover, 2012, 2018).

**Measurement in Physics:** I will describe measurement as a procedure in which the relation between a certain quantitative property of a given object and a unit of measurement of this property is revealed empirically (e.g., Coombs, Dawes & Tversky, 1970; Michell, 1999). For example, if we have a straight stick of length A, and we find that another stick of length M (which we arbitrarily determine as our unit of measurement, e.g., the meter) goes into A ten times from end to end, we have discovered that length A is ten lengths M (i.e., A = 10M).

The essential point in this method of measuring is that scientists have found an empirical operation (counting how many times M goes into the length of the measured object) which upholds mathematical properties that define the world of numbers on which the mathematical concepts in physical theories are based. Hence it transpires that what we say by means of numbers will also be said by means of actual lengths. And this, to my mind, is the strongest tie that may be made between theory and observation. The same may be said of several other quantitative properties such as weight and time.

**Measurement in Psychology:** Psychologists connect concepts to observations by utilizing an "operational definition," which holds that the meaning of a concept is obtained by detailing the procedure of observation. Does this procedure establish in psychology the same theory-observation relation as in physics? In my view it does not, principally because of the above difference: for the physical dimensions, real units of measurement have been discovered (e.g., length, weight, time); but for the psychological dimensions (e.g., sensation, perception, memory, i.e., the individual's inner world) no such units have been revealed.

I propose that one of the most important reasons why real units of measurements have still not been discovered in psychology is that it is hard (if not impossible) to discover such units for consciousness. In most cases responses are not a kind of purely motor movements, automatic reflexes, but are responses carrying meaning and consciousness. I raise my hand not as a pointless motor movement but to say hello. Our responses, our actions, and our deeds are replete with intentions, wishes, desires, a feeling of awareness – that is, with conscious experiences. But for conscious
experience no units of measurement have as yet been found as they have for length. Consider for example the emotional behavior of hate or love. It is not possible to define a measurement unit of love (the meter of love, Mlove), and say that John loves Ruth five and a half units of love (5.5Mlove) more than he loves Sarah (say 1Mlove). To speak thus is simply non-sense! By this example I do not mean to suggest that one cannot say that John loves Ruth more than Sarah, only that a measurement unit of love (Mlove) has not been discovered like the natural unit of length (the meter) and in this respect it is not possible to measure John’s love for Ruth and say that it is 5.5Mlove. Here is another example. It is ridiculous to suggest that Einstein's IQ=150 is equal to the IQ=50 of three morons. This shows that a real unit of intelligence has not yet been found as in physics.

In light of the present analysis, I maintain that psychology is not a pseudoscience because it follows strictly the rules of scientific methodology and improves what needs improving, for example, the replication problem (Ferguson 2015). However, because in psychology units of measurement have still not been found just as in physics, it cannot reach the acme of physics: the development of top-theories. These developments are based on the powerful connection between the basic concepts of observation (distance, weight, time) and the theoretical language -- mathematics, so that what we say in mathematical language describes precisely what is happening in reality.

According to this proposal, not everything that can be realized methodologically in the sciences can be realized in psychology, but everything that can be achieved in psychology can be achieved in the sciences. Hence, psychology is a science that is not as strong as physics. It is a "soft" science that can be methodologically characterized as an associational, correlational science. While psychology can build a theory that associates (correlates) stimuli with responses (and responses of one kind with another kind), physics can in addition build top-theories that treat the transformations of one kind of materials and energies to another kind.

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References


