# Psychometrics: Signs of Pathology, Anxiety or a Misdiagnosis?

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**ABSTRACT** Michell's criticism of the methodology of measurement theory is examined and the conclusion reached that his ontological, epistemological and overarching meta-theoretical assumptions inevitably lead to an indefensible situation. It is suggested that psychological research should be undertaken within a systems-theoretical constructivist approach. One can thus imagine a researcher, embedded in an environment, using his/her mind and senses to co-construct reality with other researchers, and in doing so creating knowledge of a social world and a scientific world of which we are an integral part.

## MICHELL'S CRITIQUE OF MEASUREMENT IN PSYCHOLOGY

Joel Michell's book *Measurement in Psychology: Critical History of a Methodological Concept* (Michell 1999) represents a comprehensive and detailed account of the development and implementation of measurement theory in psychology. In the preface, however, he already sounds a warning about a deficiency in the practice of scientific psychology: "This is a book about an error, an error in scientific method fundamental to quantitative psychology. This error became locked into established ways of doing things in that science, that is, it became systemic" (Michell 1999: xi).

A few years later Michell (2008: 7) again refers to this error, but here he typifies psychometrics as a scientific endeavour, as "pathological": "Pathology of science occurs when the normal processes of scientific investigation break down and a hypothesis is accepted as true within the mainstream of a discipline without a serious attempt being made to test it and without any recognition that this is happening." The hypothesis that Michell (2008: 8) believes is not being tested, is "the conviction that psychological attributes – such as cognitive

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abilities, personality traits, and social attitudes – are quantitative."

Nevertheless, this oversight in the practice of psychometrics is not enough for it to be called pathological, unless a "positive factor, one deflecting attention from relevant questions" (Michell 2008: 8) is also present. Michell (2008) believes that there are two kinds of vested interest served by this pathology, one ideological and the other economic. On the ideological level, measurement is seen as an essential prerequisite of science and, if psychology wants to be regarded as a science, scientists should be able to measure the constructs relevant to the domain. Regarding the economic interests, Michell only peripherally refers to the marketing and selling of measuring instruments, while he believes that the funding of research results in the bigger economic spin-off. As psychology claims to have developed a rigorous scientific methodology, which is to a large extent due to its ability to measure relevant constructs, it is fortunate enough to demand more substantial grants for research projects than other enterprises (see Michell 2008).

Although Michell (2008) admits that this pathological state has been in existence for more than 100 years and despite it, or perhaps because of it, psychology has been doing reasonably well in practice as well as in research. He nevertheless warns that "[a] cognitive system is pathological when it prevents rather than promotes acquisition of relevant knowledge" (Michell 2008: 7). He also refers ... to his literature survey of psychometrics which "reveals a body of theories, methods, and applications premised upon the proposition that psychological attributes are quantitative but is devoid of serious attempts to consider relevant evidence for that premise" (Michell 2008: 8). He is

thus concerned that no plausible attempt has been made or is being made to determine whether psychological traits are in fact inherently quantitative and as such measurable.

"If you are going to seriously test the hypothesis that some latent trait, X, is quantitative, then X must be specified in sufficient detail for its hypothesized quantitative structure to have a theoretical interpretation in terms of item structures and the psychological processes" (Michell 2008: 15). Consequently, according to Michell (1999), there are two tasks to be performed in measurement. Firstly, there is the scientific task to discover the quantitative structure of the attribute to be measured, and secondly an instrumental task to construct an instrument to measure the relevant attribute. But, he concludes, "if Stevens' definition of measurement is accepted, then the scientific task of quantification is cancelled and only the instrumental task remains" (Michell 1999: 77).

What does Michell mean by the "quantitative structure" of an attribute? In order for an attribute to be measured, one should be able to link units of the attribute to corresponding (usually positive) real numbers to form ratios (see Michell 2005: 287). "This position entails that *measurement is the attempt to estimate the ratio between two instances of a quantitative attribute, the first being the magnitude measured, and the second being a known unit*" [Italics in the original] (Michell 2005: 287).

From Michell's exposition it is clear that he is a proponent of realism and as such believes that a spatiotemporal reality exists, independent of observations, and that this reality is of such a nature that its characteristics can be measured by assigning numbers, which also exist in reality, to corresponding units of these characteristics. Michell (2005: 287) explains his view as follows: "To summarise the realist position: understanding measurements under the umbrella of the realist concept of truth, commits us not just to the logically independent existence of things in space and time, but also to the existence of quantitatively structured properties and relations, and to the existence of real numbers, understood as relations of ratio between specific levels of such attributes".

According to Michell (2008), one can at best assume that the attributes that are measured in psychology have an ordinal structure. For example, in the case of intelligence, where one would require a higher level of intelligence to complete a specific item compared to an easier one, it would be impossible to specify the exact quantity (in order to form a ratio) of intelligence that is required to complete any particular item (see Michell 2008). Consequently the attribute intelligence does not have a quantitative structure and as such cannot be measured.

## REALISM, REPRESENTATIONALISM AND PHENOMENALISM

Traditionally the question about what can be known about the external world may be addressed in three different ways that represent: i) direct realism (also called naive or common sense realism), ii) representationalism, and iii) phenomenalism respectively (Pojman 2006). Proponents of direct realism claim that the immediate objects of our perception are physical objects that exist in the world independent of our awareness of them (Pojman 2006). From the viewpoint of representationalism and phenomenalism, the immediate objects of perception are sense data (or impressions) that do not have an existence independent of our awareness of them (Pojman 2006). Pojman explains that in terms of both latter viewpoints, sense data are internal representations, such as colours, shapes and sizes, of appearances in the human mind, but representationalism and phenomenalism differ from each other with regard to the nature of the relationship between sense data and the physical world. According to proponents of representationalism, the physical world exists independently of our perceptions and causes our perceptions whereas supporters of phenomenalism assume that there is nothing besides sense data in the world.

Proponents of direct realism find it difficult to bridge the gap between physical objects that exist in the world, independent of our senses, and our representations of these objects. It is apparent from physics that our senses do not give us an exact replica of the things in the real world. For example, colour is not a property of things around us, but rather the way our eyes experience the reflection and refraction of light travelling at different frequencies and what appears to be the most solid structure, such as a wall, actually consists mostly of space filled with subatomic particles perpetually in motion. Inevitably supporters of realism cannot justify their belief in the independent existence of the real world or their knowledge of it with the result that acceptance of realism predictably leads to scepticism.

As far back as the 16th century, German philosopher, Immanuel Kant (1724 – 1804), addressed the predicament of attaining knowledge of what lies beyond human experience (Law 2007). Kant differentiated between, on the one hand, the real world that lies beyond our experiences, and of which we cannot have definite knowledge, and on the other hand, the world as it appears to us and of which we can have knowledge (Pojman 2006; Law 2007). He called the former "noumena" and the latter "phenomena" (Pojman 2006:239; Law 2007:297). Kant presumed that, although the external reality has a structure of its own, we as human observers actively impose a structure upon reality by means of the internal categories of our mind such as space, time and causality (Delanty 1997). Kant's philosophy represented such a paradigm shift from the views of previous philosophers that it was likened to the Copernican revolution in astronomy. Copernicus (1473 – 1543) caused a revolution in astronomy when he postulated that instead of explaining the movement of the sun, stars and planets around a fixed observer on earth, it should more readily be acknowledged that the observer is also revolving with the other heavenly bodies around the sun (Pojman 2006; Law 2007).

In terms of the distinction between realism, representationalism and phenomenalism, Kant's philosophy characterizes representationalism, because he believed that the physical world exists outside and independent of our experience and that we do not have direct access to it. According to him, we understand the world in terms of the categories of the mind such as space, time and causality that we impose on the totality of our experiences (Pojman 2006).

Therefore, in terms of Kant's epistemology, the human observer knows things in the world by means of structures in the mind while, in terms of his ontology, the things in the world have an existence independent of the human observer in the sense that they cannot be accessed directly by such an observer. Most of Kant's philosophy concerns the limits of epistemology and the fact that in terms of his ontology the real world (noumena) cannot be studied directly. Eventually he developed his own version of idealism which, as explained above, led to a revolution in Western philosophy.

## JUSTIFICATIONISM

Ever since the time of the Greek philosophers (from about 600 B.C., See Law 2007), viewpoints alternating between idealism (reality is a creation of the mind and one should study these ideas to know reality) with a corresponding rationalism (the mind is the source of knowledge and through innate ideas and reason (logic) alone knowledge is created) and realism (reality exists independently of the mind where it should be studied) with a corresponding empiricism (experience is the only source of all knowledge and there are no innate ideas to serve as a source of knowledge) were advocated.

In this ongoing debate, Kant's philosophy represented a turning point, as he offered a way of reconciling idealism and rationalism with realism and empiricism, and in addition he reserved a major role for the investigator. Subsequently a number of viewpoints, for instance positivism, logical-empiricism, phenomenology, hermeneutics, constructivism, systems theory and post-modernism, to name but a few were developed to address philosophy's never-ending quest for indisputable knowledge.

From these meanderings of epistemology and ontology a number of authors have identified a particular pattern of thought that occurs at a meta-theoretical level (cf. Bartley 1962; Weimer 1979; Bernstein 1983; Van Lill 1987). According to Weimer (1979: ix), this pattern of thought, which underpins a number of philosophies, represents a meta-theoretical structure that he calls "justificationism". A particular meta-theory provides a perspective on, as well as an explanation of anything that occurs within the domain of that meta-theory (Weimer 1979). Consequently a meta-theory represents an overarching framework that accounts for past and present knowledge and provides the foundation for future knowledge within its sphere of influence.

Weimer (1979) explains that justificationism is characterised by a confusion and conflation of the concepts: knowledge, truth, proof and authority. A knowledge claim cannot thus be accepted as knowledge unless it can be proved to be true or probably true by referring to an appropriate epistemological authority. Depending on whether rationalism, empiricism or a combination of both is espoused, logical reasoning, empirical observations or a combination of the two is accepted as the appropriate epistemological authority and as such employed to justify knowledge claims. Science comprises a ra-

tional network of theory and true or probably true facts. The truth status of such facts is justified by means of empirical observations and the network of facts and theory is justified by grounding it in logical reasoning.

According to Bernstein (1983: 18), Descartes' philosophy personifies this pattern of thought which he calls the "Cartesian anxiety". He describes Descartes' anxious search for an Archimedean fulcrum to serve as the foundation of human knowledge and indeed human existence, in order to ward off the threat of radical scepticism and ultimately, total chaos and insanity. Bernstein (1983: 18) demonstrates that Descartes' thought pattern leads to a choice between two mutually exclusive alternatives: "*Either* there is some support for our being, a fixed foundation for our knowledge, *or* we cannot escape the forces of darkness that envelop us with madness, with intellectual and moral chaos" (emphasis in original text).

However, if it is required that knowledge claims or facts have to be justified with reference to empirical observations and/or logical arguments, the choice of these very criteria should also be justified empirically and/or logically. Such an approach always begs the question: How does one know that these are the appropriate epistemological criteria to justify knowledge? Obviously empirical observation and logical reasoning cannot be justified by empirical observations or logical arguments as such a strategy would imply a circular argument or an infinite regress of epistemological authorities. Both these strategies are irrational and as such not justifiable as knowledge in terms of justificationism's own criteria.

Furthermore, what is "given" in sensory observations, cannot be employed as an independent, neutral foundation to justify the truth status of statements (Weimer 1979). Observed events and phenomena do not simply morph into statements of fact and knowledge per se. "Facts" are statements about empirical events, but such statements derive meaning from the theoretical structure within which they are embedded. The empirically "given" and "statements of fact" about these have no meaning without the underlying theoretical structures and thus cannot function as an independent base and criterion to verify statements (cf. Royce 1978; Weimer 1979; Popper 1980).

In an effort to escape the "Cartesian anxiety" proponents of justificationism constantly try to make use of infallible algorithms, based on traditional logic, which, if they are employed correctly, will lead to "true knowledge". Defenders of justificationism thus equate rationality with logic and with an algorithm which is applied mechanically in order to evaluate any statement on the basis of the requisite proof (cf. Brown 1977; Weimer 1979).

However, logic reflects the relationship between statements and thus the relationship between concepts appearing in such statements (Kistner 1984). Logic cannot be used to link empirical phenomena with statements (cf. Weimer 1979; Popper 1980) because the relationship between objects and events are spatiotemporal by nature while relationships between statements and concepts are not spatiotemporal (Kistner 1984).

It is therefore evident that logical arguments and the application of algorithms cannot justify the "factual status" of observed phenomena and events, and logic also cannot serve as epistemological foundation to justify scientific knowledge. It is also clear that rationality entails *more* than mere logic (cf. Bernstein 1983) and consequently that justificationism misrepresents rationality, epistemology and ontology (Van Lill 1987).

## Elements of Justificationism in Michell's Views

According to Michell (2000: 643), science is a cognitive enterprise: "By cognitive enterprise, I mean that science is an activity undertaken believing that certain ways of doing things will (at least sometimes) result in knowledge of how natural systems work and that does (at least sometimes) result in knowledge of this sort being attained. Furthermore, by knowledge I mean true belief, and I hold the realist view that a belief is true when and only when things are as believed." It is evident from these statements that Michell conflates the concepts of truth and knowledge - like the proponents of justificationism - and that he believes the truth exists in reality and that it is the task of scientists to uncover the truth.

Michell further states, "Considered at its most general, science has but two methodological devices, *observation* and *reason,* and as anyone familiar with its history knows, these are sufficient to deal with hidden causes... By *observation* is meant the process whereby knowledge of things is achieved via the senses, augmented, perhaps, by scientific instruments, such as telescopes, etc., and by *reason* the process whereby knowledge advances through deriving implications of propositions already accepted as true, using patterns of

deductive and probable inference" [emphasis in original text] (Michell 2011: 4). He thus believes that a combination of logical reasoning and empirical observations serves as an epistemological authority to justify knowledge.

Michell would argue that he does not claim that scientific knowledge is infallible: "Because these processes of observation and inference are fallible, any claims they have to superiority over other forms of inquiry (for example, appeals to authority, conformity to established ideas) depend upon processes of error-correction. The method of critical inquiry deals with the possibility of error by attempting to put hypotheses to the test; in the first instance, to the test of logical coherence, and, in the second, the test of empirical adequacy. Critical inquiry involves two forms of test because in general there are two kinds of error that can be made in conjecturing: logical and empirical" (Michell 2000: 641). However, unlike for example Kant, Michell believes that the reality exists, independently of the researcher, and that true knowledge about this reality can be unveiled by using the above "error-correcting methodological devices" (cf. Michell 2000, 2011) and that makes him a proponent of justificationism.

## CONSTRUCTIVISM

As a starting point one can learn from Kant that an investigator cannot access the reality "as is", because s/he plays a significant role in shaping observations. In this regard Delanty (1997) explains that, in terms of constructivism, social reality[1] is not seen as something external to scientific discourse, rather it is constituted, that is, constructed by science. The investigator plays an active role in creating scientific knowledge in contrast to justificationistic philosophies in which knowledge already exists in the world and the role of the investigator is to unveil it objectively, without prejudice. Social scientific knowledge is not purely a creation of the mind as is the case in idealism, but it is knowledge created by mediation between the structures of science and reality and as such it is a construction designed to produce knowledge of its subject matter (cf. Delanty 1997). Furthermore, the generation of social scientific knowledge is always restricted by the confines of its own methodology and consequently constructivism "entails a degree of 'self-referentiality' or 'reflexivity'" (Delanty 1997: 112).

Luhmann (2003) believes it is not helpful to begin the quest for knowledge with Kant's question about the possibility of knowledge, as the argument might grind to a halt prematurely. As indicated above, one would also be trapped in the justificationistic pattern of thought. Consequently it would be more appropriate to ask how one can distinguish knowing from what it is not (Luhmann 2003). Luhmann (2003: 438) argues as follows: It is not useful to begin the analysis with the age old question whether the knowing system is a subject or an object. The dilemma for proponents of subjectivism is to demonstrate how it is possible to know the world of others from the reference point of one's own mind. The idea of knowers sharing inter-subjective knowledge does not overcome this problem. On the other hand, the claim of supporters of objectivism that a particular object or organism can be known completely without referring to its relationship with its environment is also indefensible.

In order to sidestep this dilemma, Luhmann (2003: 438) suggests that both the subjectivist and objectivist theories of knowledge be replaced by a system-environment distinction which would make the subject-object distinction irrelevant. However, Luhmann warns, this does not mean that the existence of reality is questioned, for such a denial would also undermine constructivism. What is questioned is the epistemological relevance of a specific ontological representation of reality.

How is scientific knowledge generated within a systems-theoretical constructivist approach? As gathering knowledge is a cognitive programme, the brain of the knower serves as the instrument of cognition. According to Luhmann (2003), most of the stimuli reaching the brain are erased within fractions of a second while very few are retained for longer periods. This implies that the brain is instantaneously and continuously selecting and rejecting stimuli. Furthermore, it seems essential for the functioning of the brain that selected material is isolated "[a]s if it were already information (or data) before it motivates the brain to form a representation" (Luhmann 2003: 439).

To understand the process of generating perceptible knowledge further, it becomes necessary to distinguish between operation and observation: "An operation that uses distinctions in order to designate something we will call 'observation'. We are caught once again, therefore, in a circle: the distinction between operation and observation appears itself as an element of observation. On the

one hand, an observation is itself an operation; on the other hand, it is the employment of a distinction" (Luhmann 2003: 440). Luhmann (2003: 439 - 440) explains the role of operations and observations within the system as follows: "Operations of this kind are only possible within the context of a network of operations of the same system towards which they point and on which they are founded. There is no single operation that can emerge without this recursive network. At the same time the network itself is not an operation. 'Multiplicity does not act as a relay.' The whole cannot as a whole itself become active. Every operation reproduces the unity of the system as well as its limits. Every operation reproduces closure and containment. There is nothing without an operation – no cognition either." Science is a closed system (having no connection to things that are not science) that is self-perpetuating in the sense that it is self-generating or "autopoietic" (Delanty 1997: 124).

## CONCLUSION

Michell's claim, that researchers are neglecting to investigate the quantitative structure of psychological characteristics, is indicative of a flaw in the methodology of psychometrics. However, underpinning his claim are specific ontological (realism) and epistemological (empiricism and rationalism) assumptions as demonstrated above. Furthermore, as argued above, at a higher level of abstraction, the meta-theoretical framework that provides support for some of these ontologies, epistemologies and methodologies is known as justificationism. The discussion above represents an attempt to discredit the notion of justificationism and to demonstrate that the anxious search for a fixed foundation for scientific knowledge is fruitless.

Thus, instead of falling into a justificationstic trap, one can imagine a researcher, embedded in an environment, using his/her mind and senses to co-construct reality with other researchers and in doing so creating knowledge about a social world and a scientific world of which we are an integral part. Our methodologies, theories and meta-theories should reflect this.

## NOTE

1. Constructivism is being developed within the ambit of social sciences and as such the reality under consideration is a social reality.

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