COMMENTARY

Problems With Measurement in Psychology— Just a Tip of the Iceberg

Aaro Toomela

School of Natural Sciences and Health, Tallinn University

Uher (2021) convincingly demonstrates that psychometrics relies on a network of numerous conceptual fallacies and concludes that there is no measurement in psychometrics. The main part of the commentary is dedicated to the question why psychology is constantly ignoring justified and well-grounded arguments that demonstrate unequivocally the fallacies of quantitative-statistical approach taken by it. I argue that psychology today relies on Humean epistemology according to which only efficient causality is knowable for humans. At the same time, psychology ignores theory that underlies this epistemology; Hume (and also founders of the modern statistical data analysis procedures) fully understood that discovery of efficient causal relations cannot reveal anything about the nature of whatever is studied. Mainstream psychology claims to study and reveal the nature of psyche and psychic processes. This claim is based on a delusion.

Public Significance Statement
Mainstream psychology today is relying on quantitative data analysis methods. These methods do not allow to understand the nature of the studied things and phenomena in principle. It is shown how epistemology that underlies mainstream psychology makes it immune to all justified critique of the methods it uses.

Keywords: quantitative method, psychological measurement, epistemology

Jana Uher (2021) has been among the very few, who analyses methodological questions in great details—and demonstrates also that methods used in psychology today by majority of researchers do not support conclusions that are based on them. Uher reveals fallacies related to quantitative methods as used in psychology. She demonstrates that psychometrics, one of the basic fields that underlies quantitative methodology-as-recipes, is not characterized by just a few easy-to-overcome fallacies but rather by a network of fundamental problems. These problems emerge because the studied phenomenon is not clearly distinguished from the means to explore them. I will, however, focus on the arguments and look for the wider context of Hume.

Looking Beyond the Target Article

Uher's arguments alone would be enough to begin looking for other methods that can be methodologically grounded. However, even the founders of the statistical data analysis procedures were aware that such methods cannot lead to the understanding of the nature of the psychic processes; actually such procedures cannot reveal nature of anything that is studied. An important question to answer is—why quantitative methods are so widely, in many areas even exclusively, used in psychology even though they are so obviously and fundamentally flawed?

Aaro Toomela ⬭ https://orcid.org/0000-0002-8520-9676

Correspondence concerning this article should be addressed to Aaro Toomela, School of Natural Sciences and Health, Tallinn University, Narva Road 29, Tallinn 10120, Estonia. Email: aaro.toomela@gmail.com

Aim of the Mainstream Psychology

It seems to be obvious that users of quantitative methods achieve the results they are looking for. Otherwise methodological crisis would follow fast. So, the question is—what are researchers who seem to use meaningless methods looking for (see, e.g., Toomela, 2019)?

Research psychologists, as many other scientists, usually aim at revealing the causes of the studied phenomena. It is often not realized in psychology that there are several different theories of causality—psychology today relies on one of them that in principle does not lead to any understanding of the nature of the psychic processes. In psychology it is thought that causality concerns only so-called efficient causes, that is, linear cause-effect relationships between events.[1]

This theory of causality that had long lasting effect originates from the ideas of David Hume, who considered efficient causality to be the only kind to take into account. When we compare his theory to that, which underlies psychology today, it becomes evident that psychology has accepted Hume's theory of causality.

According to Hume cause-effect relationship is not something that can be revealed through thinking. It is recognized on the basis of experiencing the world:

> *Cause and effect* are relations, of which we receive information from experience, and not from any abstract reasoning or reflection. (Hume, 1739–1740/2000, 1.3.1.1, p. 50)

Causal relations have four different characteristics recognized via repeated observations of relationships between events. First, causally related events must be contiguous: "We may therefore consider the relation of CONTIGUITY as essential to that of causation" (Hume, 1739–1740/2000, 1.3.2.6, p. 54). Second, cause must appear before effect: "The second relation I shall observe as essential to causes and effects [. . .] 'Tis that of PRIORITY of time in the cause before the effect." (Hume, 1739–1740/2000, 1.3.2.7, p. 54). According to Hume, thirdly, contiguous asymmetric in time sequences of events are not necessarily causally related. It is possible to say that a relationship is causal if in addition to the mentioned two characteristics, the observed relationship between events is necessary: "An object may be contiguous and prior to another, without

being consider'd as its cause. There is a NECESSARY CONNEXION to be taken into consideration (Hume, 1739–1740/2000, 1.3.2.11, p. 55). Even that is not sufficient, however. Causal relations have a fourth characteristic: "relation bewixt cause and effect [. . .] This relation is their CONSTANT CONJUNCTION." (Hume, 1739–1740/2000, 1.3.6.3, p. 61). Hume explained also, what he means by "constant conjunction": "it implies no more than this, that like objects have always been plac'd in like relations of contiguity and succession" (Hume, 1739–1740/2000, 1.3.6.3, p. 62). Observing a sequence of two events does not necessarily imply causal relation between them. The same relationship must be observed again and again.

Now we have the main method of quantitative-statistical sciences: cause-effect relations can be revealed by repeated observation of conjunctions between events. There may seem to be an important requirement that would exclude statistical data analysis procedure as techniques to discover causal relationships: objects in cause-effect relationships are "*always conjoin'd* together" (Hume, 1739–1740/2000, 1.3.7.15, p. 65). If attribution of causality to an observed relationship between events would require that such relationships would have been observed *always*, with no exception, statistical techniques would be useless and even not necessary. Correlation 1.0 would become highly reliable after a few observations. The problem is that there could be no claims for causal relations in psychology because such exceptionless relationships between supposed causes and supposed effects have been, as far as I know, never observed in psychology.

But Hume actually did not suggest that such relations between causes and effects can

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[1] Theory of causality that corresponds best to current scientific theories I have called structural-systemic. This theory is followed by not only majority of physicists and biologists today, it was also followed by continental European psychologists before the Second World War. According to the structural–systemic theory, scientific understanding is achieved, when three questions about the studied thing or phenomenon are simultaneously answered: What are the parts or elements of it?; In which specific relationships these parts are?; and What novel qualities characterize the whole that emerges in the synthesis of the parts? Answering these questions is possible only when emergence and disintegration of the studied thing or phenomenon, that is, its development, is studied and understood (see for more details, Toomela, 2009, 2014a, 2014b, 2015, 2016, 2019, in press).

always be found. Sometimes expected causes are not followed by expected effects because externally identical events may be different in some "secret" aspects that are not available for our senses (Hume, 1748/1999, 6.4, p. 132; see also 8.12–13, pp. 152–153). Therefore causality can be revealed from a covariation of events even in situations when effect does not always follow the expected cause. There can be "measurement errors" and "outliers" that can be just ignored, because the discovered cause-effect relationship will be reflected in the covariation of variables anyway—if, of course, the observed relationships appeared beyond arbitrarily chosen level that is supposed to distinguish random covariation from the "true" one.

Two further characteristics of the mainstream quantitative psychology follow also from Humean program of sciencing. Hume mentioned that externally similar events—observations of which are turned into "variables" by researchers today—can be different in some "secret" aspects, aspects that cannot be distinguished by an observer. It follows that what is observed must always be complex and not a single clearly distinguishable potential cause or effect. Statistical-quantitative science does not have to worry about what exactly is encoded as a variable; if the observed event was experienced as similar by the researcher it can be encoded with the same code, usually a number. And these codes can be treated as if they signify certain definable causes or effects. It can be expected that in some cases, when some nonobservable "secret causes" have been involved so that the observed relationship between events disappears, the codes will be incorrect. But such miscodings can be ignored if, again, nonrandom covariation between observed variables can be observed. This explains why fallacies of so-called "measurement," discussed by Uher (2021), are ignored in mainstream psychology: these are not fallacies but inevitable characteristics of scientific methods that are constrained by human abilities to observe only some aspects of the world.

Hume also notes that it is assumed that it is mathematical analysis (even not necessarily statistical analysis in particular) that allows to reveal causal relations between events. This assumption—which, as much as I know, has never been supported with any sound arguments (cf., Toomela, 2010)—is in full agreement with the Humean view of science. I do not know any basic concept in psychology that could be defined in only one way; all concepts have

many different, often even mutually exclusive definitions (cf., e.g., Toomela, 2020). The same applies to the concept of mathematics—mathematics is (very!) widely used and yet it is not easy to find a definition, what is this "mathematics" that seems to be "the best" method to science for all quantitative psychologists. Yet, there is an important characteristic that applies to all mathematics:

> Mathematicians do not study objects, but the relations between objects; to them it is a matter of indifference if these objects are replaced by others, provided that the relations do not change. Matter does not engage their attention, they are interested by form alone. (Poincare, 1905, p. 20)

Mathematics is about relations between objects; as far as the relations remain the same, it does not care about objects, which relations are described by mathematical formulas. But this is exactly, what Hume proposed about cause–effect relationships!—causation is not about qualities of objects, it is only about *relations* between them. However, if objects do not matter, then obviously any science that follows Humean program—such as mainstream psychology today—is not even attempting to understand the essence of whatever is studied. Therefore, if there is no true measurement in psychology—as Uher (2021) convincingly demonstrates—it does not matter. Revealing (efficient) causal relations, the ultimate aim of quantitative psychology, can be achieved independently of whether something was truly measured or not. Or even whether the studied phenomenon, the psyche, is measurable at all.

According to Hume the only causal relationships that can be known are *observed* relationships between *observed* events. Such relationships can be modelled by several different statistical procedures where one observed event, which is encoded into a "dependent variable," is predicted by one or several observed events that are encoded into "independent variables." But psychology today has gone beyond the analysis of the relationships between observed events. One groups of statistical data analysis procedures is used to discover so-called "latent variables," that is, variables that are not—and cannot be—directly observed. Factor analysis, latent profile analysis, techniques based on item response theory and latent class analysis techniques belong to the statistical methods that are used to discover latent variables. There is another group of analyses where nonobserved relationships between observed (and often also not observed

latent) variables are modelled. Structural equation modeling methods are used to discover nonobserved relationships. Psychologists often declare that such mathematical procedures have revealed real things or phenomena that just cannot be directly observed. Personality theories that rely on factor analysis (so-called Five Factor Theory among them, cf. Allik & McCrae, 2002; McCrae & Costa, 1996, 1999) and theory of general intelligence belong to this class of theories. There are thousands and thousands of studies in many different fields of psychology where "reality" of latent variables and mathematically generated nonobservable relationships is assumed or declared. Indeed—if to *believe* that statistical relations between variables describe causality then there is no obstacle to suggest that creating such mathematical constructs is a way to discover nonobservable real entities and relationships. The problem is that this belief is not grounded with any argument. Rather, as Uher also demonstrated, this belief is wrong.

Hume's epistemology cripples philosophy and sciences that are looking for only efficient causality *if* Hume's understanding is taken out of the context of his theory. Hume was fully aware what limits his view on knowability of the world has and also explained why he selected to stick only to efficient causality and ignore other kinds of it. Hume understood very well that description of efficient causality has nothing to do with the essence or nature of things and phenomena. He just assumed that it is impossible for humans to know the world that cannot be directly observed, the nonsensory world. Hume's requirement of necessity may seem to characterize nature of the relationship between the events, but he, however, had another meaning in mind. Necessity is just the construction of mind:

> Necessity, then, is the effect of this observation, and is nothing but an internal impression of the mind, or a determination to carry out thoughts from one object to another. (Hume, 1739–1740/2000, 1.13.14.20, p. 111) [. . .] necessity is something that exists in the mind, not in objects; nor is it possible for us ever to form the most distant idea of it, consider'd as a quality in bodies. (Hume, 1739–1740/2000, 1.3.14.22, p. 112)

The idea that certain relationship between events is causal and therefore necessary is just a human-made idea. If observed contiguous asymmetric in time (more or less) constant relationships between events seem to us necessary and causal, then this conclusion is based on internal impressions. Today, internal impressions are externalized with the help of statistical mathematical

techniques. The founders of the statistical data analysis techniques understood very well that nothing about the nature of the studied things or phenomena can be revealed by such procedures.

It is not only complex statistical data analysis techniques that have such a limitation. Even the simplest of the techniques, that of correlation, reveals nothing about the nature of the studied things or phenomena. Pearson, who introduced the most common today statistical data analysis procedure into sciences also understood that statistical laws *have nothing whatever to do with any physiological hypothesis* (Pearson, 1904, p. 55, my emphasis). According to him, *the statistical view of inheritance is* not at basis a theory, but *a description of observed facts,* with which any physiological theory must be in accord (Pearson, 1903–1904, p. 509, my emphasis).

Indeed, the only result that is achieved by statistical analyses is a discovery of probabilities and nothing more. It is so because mental processes that are used with the aim of discovering only efficient causality and also mathematical formalization of observations with the same aim are error prone and reflect relatively primitive ways of sciencing. Hume was aware of this also:

> Our reason must be consider'd as a kind of cause, of which truth is the natural effect; but such-a-one as by interruption of other causes, and by the inconstancy of our mental powers, may frequently be prevented. By this means all knowledge degenerates into probability; and this probability is greater or less, according to our experience of the veracity or deceitfulness of our understanding, and according to the simplicity or intricacy of the question. (Hume, 1739–1740/2000, 1.4.1.1, p. 121)

If the only knowledge can be about probabilities then there can be no way to reveal the nature of whatever is studied. Hume thought that non-sensory world is just not knowable in principle and therefore there is no reason to aim at achieving knowledge about it:

> My intention never was to penetrate into the nature of bodies, or explain the secret causes of their operation. For besides that this belongs not to my present purpose, I am afraid, that such an enterprise is beyond the reach of human understanding, and that we can never pretend to know body otherwise than by those external properties, which discover themselves to senses. (Hume, 1739–1740/2000, 1.2.5.26, p. 46)

Conclusions

Uher demonstrates that psychometrics does not measure anything, all talk about measurement in

this field is just a pretend-play. The same applies to all quantitative mainstream psychology that pretends to study "nature and secret causes" of psychic phenomena. This psychology is immune to all argumented critique of their approach, including Uher's well-grounded list of fallacies ignored by them, because Humean epistemology is consistently followed in quantitative psychology. The methods used by quantitative psychology fit perfectly with Humean epistemology and allow to achieve the only kind of knowledge Hume assumed to be possible to achieve. The problem is that Hume turned out to be wrong in his basic assumption and therefore following his research program turns out to be meaningless.

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