

Commentary

What are constructs? Ontological nature, epistemological challenges, theoretical foundations and key sources of misunderstandings and confusions

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Abstract

Constructs are central to psychology. And yet, relevance and role of constructs for psychological theories, findings and practices are still debated and even questioned. What actually are constructs? Why are they so central to psychology? What is their explanatory value? (How) can we ‘measure’ constructs? And why are there so many misunderstandings and confusions about them? These are obvious questions for which many psychologists are still seeking answers— such as De Boeck and colleagues in their target article (this issue).

Keywords

Construct; Operationalization; Theory; Measurement; Assessment; Psychometrics; Replicability; Validity; Construct hierarchy

What actually are constructs?

Ontology and theory of constructs

We owe to George Kelly (1955), pioneer of psychological construct research, the most comprehensive and sophisticated theory of constructs that exists today. In a two-volume book, he formalised his theory in a fundamental postulate and 11 corollaries. It states that our psychical processes are channelled by the ways in which we anticipate events rather than by the ways we react to them (fundamental postulate). Given that, in everyday life, events never really identically repeat themselves, we try to discriminate between experiences that are relevant to our own experiencing and behaviour. From our current interpretation of these experiences, we construct abstract ideas—constructs—about those kinds of experiences that we believe may occur again in similar ways. Hence, we anticipate events by construing their replications (construction corollary). These constructs are not exact copies of the events experienced. Rather, they are individual constructions and mental representations—thus, abstractions of the experiences that we have made with people, objects, situations, etc. These constructions involve intuitive assumptions, implicit theories and descriptive summaries for which we mostly use words from our everyday language.

From these constructs, we derive hypotheses and project potential scenarios of what may happen again—we anticipate possible future events. We use these anticipations to choose and adapt our current actions. From new, concrete experiences that we can make, we evaluate our constructs’ ability for making useful predictions in our everyday life. This provides us with a sense of control—a fundamental human

motivation. Thus, we empirically test our constructs' viability (experience corollary) and we strengthen, modulate and refine our constructs accordingly in iterative processes of hypothesis derivation, empirical testing and theory modification. In this creativity cycle, as we successively construe the replication of events, our constructs become more varied and refined, and our hypotheses may change. Thus, as individuals, we all proceed like scientists to master the challenges of everyday life (Kelly, 1955).

We develop our constructs from similarities and dissimilarities that we identify in our experiences. By contrasting what two experiences have in common as opposed to a third, we develop dichotomous constructs (dichotomy corollary). When using constructs, we chose that pole of a construct dichotomy that enables better prediction of future events (choice corollary), which may lead us to further refine or expand our constructs. We organise our constructs and their interrelations hierarchically by their level of generality (organisation corollary) as well as by their range of applicability (e.g., job, family) because constructs are suitable for anticipating only a finite range of events—some are broad, others narrow (range corollary). With new experiences, we modify our existing constructs and their interrelations. Some constructs are permeable, can be expanded, differentiated with new experiences and be integrated into our construct system more flexibly, allowing for change and growth (modulation corollary). Other constructs, by contrast, are more impermeable and rigid. New elements cannot be easily integrated, which may result in undifferentiated, loose and disconnected constructs. Kelly (1955) highlighted that not all experiences can be related to one another. Some may not be perceived as (dis)similar to others and therefore cannot be integrated in our constructs. That is, our mental construct systems need not be logically coherent. They may also contain inconsistencies and breaks; some sub-systems may be incompatible with one another, which reflects the complexity of the reality experienced (fragmentation corollary).

As individuals, we all construct and anticipate events differently. Our constructs and construct systems are therefore individually unique and personal (individuality corollary)— therefore called personal constructs. But given our socially shared experiences, we can also understand other individuals' constructs and the actions that they derived from their constructs. Kelly (1955) assumed that such socially shared constructs reflect similarities in our psychical processes and individual constructions of experiences (communality corollary). Adequate social relationships require the ability to put ourselves in others' shoes— thus, to understand others' constructs systems. This is a prerequisite for our abilities to develop joint understanding, to coordinate our actions and thus, to play a role in the social processes involving these others, such as in psychological practice (sociability corollary).

Our constructs are often only implicit; they may be even preverbal or non-verbal. Kelly developed a suitable empirical method (repertory grid technique) to help individuals to make their constructs explicit, and thus accessible for conscious reflection as necessary to stimulate their reorganisation (e.g., in psychotherapy). In his theory, Kelly also developed further concepts for therapeutical applications, such as on the impact of viable and non-viable constructs on individuals' mental and social well-being, the role of emotions as sign-posts of non-viable constructs as well as constructs concerning the self. Kelly's (1955, 1963) theory describes the ontology of constructs as central phenomena of mind explains the processes of their genesis, change and development as well as the meaning, use and utility of constructs in everyday life, applied psychological practice and also in science. This theory lays essential foundations for construct research. The connections to concepts of scientific constructs (e.g., 'personality' constructs), complex construct systems with interrelated, partly overlapping yet also domainspecific constructs, organised hierarchically by their level of generality (e.g., taxonomies of 'personality', hierarchical models of 'intelligence'), nomological networks, construct validation, hypothesis generation, theory testing and modification are obvious. Kelly's theory has a well-deserved place in our textbooks of psychology (Maher, 1969; Bannister & Fransella, 1980; Uher, 2021a, 2022a; Winter & Reed, 2016).

Compare this to De Boek and colleagues' proposal to "reformulate the construct notion to accommodate complexity and uncertainty" by stating that constructs denote hierarchically organised, variable composites of heterogeneous overlapping content. What is new in asserting "that constructs are abstractions that have integrative and explanatory roles in theory and practice, while not excluding

prediction and description roles”? Conceiving constructs as “areas to represent ... content of constructs” is circular. The authors discuss the heterogeneity and compositeness of content. But what actually is this “content”? What is it about? In what ways are psychological constructs conceived as “content” different from the concepts used in library and information science? The geometric analogies of constructs as “areas” and observables as “points” introduce a physical but generally vague jargon (e.g., “residing in hierarchies”, “macroscopic outcomes”) that further obscures what constructs and psychology’s objects of research actually are. So, what actually are constructs?

Concrete concepts and abstract concepts

Constructs are concepts, from Latin *concipere* for ‘conceive, take an idea into mind’. Concepts are phenomena of the mind. We construe concepts about everything that we can conceive of. We construe concepts about concrete ‘objects’ or events accessible to our senses. By generalising what many concrete ‘objects’ of a given kind have in common, we construe concrete concepts, which conceptually represent the essence of these ‘objects’ (e.g., concept of a ‘table’ as horizontal plate supported by legs). Concrete concepts thus refer to homogeneous groups of entities—their referents. Concepts and their referents are not the same. The concept of ‘table’ is not the same as the physical object in a room. For concepts of physical objects, this distinction is obvious. But it is far more difficult for concepts of concrete psychical phenomena (e.g., perceptions, emotions) and for abstractions of them, such as concepts of mind and abstract concepts.

Abstract concepts refer to heterogeneous groups of entities (e.g., ‘furniture’), which thus comprise concrete concepts as well (e.g., concepts of tables, chairs), leading to nested conceptual structures. Abstract concepts can also refer to entities that are just imagined (e.g., deities) or just conceived of as entities (e.g., ‘nation’, ‘populism’, ‘heritability’, ‘animals’, ‘poverty’, ‘weather’). In abstraction, we focus on just a few characteristic qualities of an ‘object’ of consideration rather than viewing it as a whole group of characteristics. This reduces the complexity of entities by emphasising some of their features while deemphasising others—depending on their ascribed relevance or irrelevance for a given purpose, meaning, aim or goal (e.g., ‘furniture’ refers to heterogeneous movable items that make rooms suitable for living). The meaning of ‘furniture’, as it is abstracted from concrete perceivable ‘objects’, does not allow us to trace back any concrete objects to which it may refer (e.g., if table, bed, or chair; Peirce, 1958; Whitehead, 1929; Vygotsky, 1962; Zeman, 1982). To understand how we abstract, we must understand language and how we use it—such as to develop constructs.

Language, abstract thinking and semantic networks: Foundations for constructs

To be able to attribute meanings to objects and to mentally handle abstract concepts, language is indispensable. Language is a sign system. A sign, from Latin *signum* for ‘a mark, token’, is an entity that can stand for or refer to something else—the sign’s referent. The connection between sign and referent arises from a causal relation (e.g., symptoms as signs of disease), socio-cultural convention or individual habit. We often use graphemes (e.g., written words such as TABLE), phonemes (e.g., spoken words such as the one transcribed as /ˈteɪbəl/) or iconic signs (e.g., T) to stand for referents (e.g., tables in room) and for our concept of them (e.g., what a table is). Thus, a sign is anything that can convey meaning. To make this possible, a sign involves—1) that what it refers to (the referent, designatum, e.g., a table), 2) that what is used to signify it (the signifier, sign-vehicle, e.g., phonemes transcribed as /ˈteɪbəl/), and 3) the meaning that we attribute to both (the sense, e.g., what a table is; Ogden and Richards, 1923; Morris, 1938; Dewey, 1946; Peirce, 1958; Vygotsky, 1962; Rød, 2004; Uher, 2022a, Valsiner, 2021)

The representational function of sign systems, such as language, is essential for abstract thinking because it allows us to turn—on mere conceptual levels—perceivable properties (e.g., blue) into hypothetical objects (e.g., ‘blueness’). This linguistic reification (from Latin *res* for ‘thing’, meaning ‘turning into a thing’; also objectification or entification for turning into an object or entity, respectively) makes perceivable properties conceptually independent of their embodied experience. The reified (objectified) properties can then become objects of consideration in themselves (e.g., ‘colour’) and can be

linked to other perceptions, 'objects' and meanings (e.g., 'blue' as emotional category). This allows us to mentally handle abstract ideas and to abstract them further. More abstract words thus refer to ideas and concepts that are more distant from immediate perception and that cannot be easily traced anymore to their formerly concrete references and contexts. Hence, words embody our generalisations, abstractions and categorisations. Therefore, every word is a concept (Altmann, 2002; Deutscher, 2006; Peirce, 1958, CP 4.227; Vygotsky, 1962).

We create different kinds of meanings. A word's most primary, literal meaning is its denotative meaning (e.g., rose as flower). Words can also have additional, implied meanings that are socio-culturally attributed—their connotative meanings (rose for 'love', 'passion' or 'beauty'). In this way, we develop ever more complicated systems of interlinked words, each of which can carry different fields of meanings, resulting in nested structures (Deutscher, 2006). Thus, abstract words of abstract concepts have nested fields of meaning that are drawn from a language's logico-semantic space, which can be shown in semantic networks. These are logicbased formalisms to describe the mental organisation of knowledge representations and information retrieval pathways. The mental association strength between concepts (studied, e.g., with reaction times) is determined empirically and illustrated in nodes and directed edges in semantic networks. These describe the multidimensional association networks between words and thus between the concepts signified (Khanam et al., 2019; Pirnay-Dummer et al., 2012). Hence, words are basic linguistic units carrying meanings that are drawn from a language's logical, semantic and meaning-making structures. These follow certain rules (language-games; Wittgenstein, 1922) established in linguistic communities to enable communication (Arnulf, 2020; Maraun & Gabriel, 2013; Neuman, 2012; Peirce, 1958; Vygotsky, 1962; Uher, 2015a,c, 2016b; Smedslund, 2016).

A word's field of meaning comprises the context-dependent interpretations that are collectively ascribed to it. Language thus requires interpretation from its users. The specific meaning that a word can have in a sentence is constraint by the logico-semantic meanings of the other words in that sentence as well as by the context in which it is used, the interpreters' previous experiences, knowledge of the content and their perspective on it. From the range of a word's possible meanings, language users consider just a particular one in the given context. Therefore, the same statement can be interpreted differently both, by different persons and by the same persons (Peirce, 1958; Vygotsky, 1962) as has been shown for standardised rating items (e.g., Arnulf et al., 2014, 2020, 2021; Lundmann & Villadsen, 2016; Rosenbaum & Valsiner, 2011; Shweder, 1977; Uher, 2018a; 2023a; Uher & Visalberghi, 2016; Wagoner & Valsiner, 2005). This highlights that language-based methods are inherently interpretive.

But how do we actually use language? When we construe for words some meanings and referents to which these refer, in our minds, we do not view these referents as 'objects' that are just represented by a token (the word) and that may be absent while we are thinking of them. Rather, we tend to treat our spoken and written words as if these were the referents for which they stand in themselves (e.g., tables, behaviours, persons). That is, we presentify—bring into the present—these referents as our immediate psychical reality in the here-and-now. We experience the referents that our words represent and the meanings that we construe for them as if these were states of the 'world' rather than states of our mind (Salvatore, 2019).

Hence, our relation with the 'world' is mediated by signs. This facilitates and enables abstract thinking, communication and coordinated action (Valsiner, 2001). Yet we commonly do not notice this sign-based mediation. This entails typical fallacies in daily life and in science because we intuitively tend to assume that our words carry the meanings that we ascribe to them in themselves (signifier–meaning conflation). Therefore, we often think and act as if spoken or written words could stand directly for their referents (signifier–referent conflation). We presentify the meanings that we construct for these referents as our lived psychical reality in the here-and-now. Therefore, we also tend to forget, or may not even notice, that these meanings are not inherent to the referents in themselves (e.g., behaviours) but are only attributed by us (Altmann, 2002; Maraun & Gabriel, 2013; Uher, 2021a, b, c). These fallacies entail common misunderstandings and confusions about abstract concepts, such as constructs.

Constructs: Conceptual systems that are multi-referential and thus complex

Constructs are abstract concepts of particular complexity. Constructs, from Latin *constructus* meaning ‘heaped together, built, made’, are—literally—constructed, made by human minds. “A construct is a conceptual system that refers to a set of entities—the construct referents—that are regarded as meaningfully related in some ways or for some purpose although they actually never occur all at once and that are therefore considered only on more abstract levels as a joint entity (Uher, 2022a, p. 14). In constructs, we consider particular referents jointly—not because these are necessarily directly related or may have even common causes and functions—but because we attribute to them a common meaning. Which particular features of a construct’s multiple referents we choose to (de)emphasise, depends on their ascribed (ir)relevance for a given meaning (e.g., moral, ethical or cultural values; social norms) or particular purpose (e.g., differentiating individuals, imposing normativity, making social comparisons or predictions) that these may have for us. This entails manifold variations in the meanings that we attribute to constructs and their referents (therefore also called attributes). Thus, constructs reflect the very aims and purposes for which we consider sets of entities jointly across time and context—thus, an inherently pragmatic perspective (Uher, 2022a).

For example, ‘personality’ constructs (e.g., ‘extraversion’) refer to specific behaviours, thoughts and emotions that we consider jointly given some shared meanings that we ascribe to them (e.g., for social interactions) and their utility for discriminating between individuals. But these different referents need not and do not occur all at once. Individual specificity is not directly observable but requires studying many individuals over time (Uher, 2011, 2013, 2015a, b). Thus, the essential features of ‘extraversion’ never occur all at once. But in our minds, we can conceptually integrate them into the same construct. Such conglomerates of heterogeneous referents are blended concepts—they are multi-referential concepts (Uher, 2018a, 2018b, 2022a, 2024). This entails challenges for empirical studies as shown below.

We can construe constructs on all levels of abstraction—from referents concretely perceptible at a moment (e.g., behavioural acts), over referents conceptual and generalised in themselves (e.g., ‘sociability’) up to referents only imagined (e.g., future society). Thus, constructs can refer to other constructs as well, representing their contents on higher levels of abstraction (e.g., a construct ‘sociability’ may refer to more specific constructs such as ‘gregariousness’, ‘approachability’, ‘talkativeness’). This entails nested conceptual structures (construct hierarchies) symbolised by words. Each word carries a field of meaning with its connections to specific referents as well as to other words and their referents. Hence, abstract words first enable our abilities to mentally construe abstract construct systems in which meanings and referents can be ‘inherited’ from the more specific constructs that they comprise (Kelly, 1955; Uher, 2022a). The meaning of a construct as a whole emerges from the joint consideration of the referents and the meanings that we attribute to them for a given aim or purpose. Therefore, a construct does not reflect its referents in the same ways in which we can perceive them—constructs have more (surplus) meaning (Vygotsky, 1962; Whitehead, 1929).

Like many psychologists, De Boeck and colleagues do not distinguish between the construct and its referents, meaning and term, thereby omitting vital conceptual foundations. What do they mean by “retaining the abstraction borne by constructs”? No construct is without abstraction. Their discussion of heterogeneity and homogeneity seems to touch on the different levels of abstraction in construct systems. But it misses out on the core features of constructs, in particular, their multi-referentiality, the purposive emphasis and deemphasis of particular features of their various referents, the meanings construed for these referents considered jointly as a whole, and the complex nested structures in which meanings are also inherited from the more specific concepts that they integrate as well as from the construct terms used at any level of abstraction. The authors discuss the “implicit ideal of constructs as perfectly homogeneous”. This applies to concrete concepts referring to entities of the same kind but not to constructs as abstract, multi-referential and complex concepts.

Emergent complexity view versus mechanistic ‘componential’ view on constructs

De Boeck and colleagues mention ‘complexity’ yet without specifying what they mean by it nor considering its actual meaning. Complexity is a fundamental philosophy, theoretical framework and practical approach concerned with a special kind of systems. These systems are organised as wholes composed of differentiated, not centrally controlled and integrated parts. From their interactions, new properties emerge not contained in the parts and thus not predictable, but that can feed back to and change the parts from which they emerge. This leads to continuous processes of change and irreversible, unpredictable development. Such systems are not just complicated but complex. Complexity theories are essential to study psychical, social and societal systems, in which, on different levels of organisation, countless (often hidden) processes occur that are interacting in non-linear feedback dynamics and context-dependent ways with one another and also with our physical ‘realities’ (e.g., individuals’ bodies, behaviours, technologies). As these complex systems are derived from human experience and social interactions, manifold variations in meanings are attributed to them, each construed for certain goals, purposes, times and contexts, which diversify these systems, their structures and workings (Byrne & Callaghan, 2022; Morin, 1977, 2008, 2023; Cicourel, 1964; Gueastello, 2009; Gershenson, 2007; Uher, 2024; Ramage & Shipp, 2020).

Constructs, as well, are complex systems. By considering the referents of a given construct jointly, meanings emerge that are not contained in the single referents and that endow the construct with additional (surplus) meaning. Hence, constructs are more than the sum of their referents. Complex constructs are essential to study the complex systems of mind and society. These constructs cannot be static but must be variable and heterogeneous—as De Boeck and colleagues correctly state, yet without explaining why this is necessary. They offer a “componential view” of constructs as “a composite in a structure that usually consists of more elementary and less abstract components... Having a componential structure is an essential and desirable feature of constructs: constructs inherently lose their meaning when stripped of related components”. This implies that the meaning emerges from the entirety of a construct’s components and that it changes with any change in their composition, thus reflecting some basic features of complexity. The authors apply a system view when likening their “componential view” to network concepts (Borsboom, 2017) and the family-resemblance-like Ballung concept (Cartwright & Runhardt, 2014). But these are mechanistic system concepts in which elements and their interrelations remain rather static (similar to semantic networks). These concepts do not conceive of emergence—qualitative, discontinuous transformations of properties arising from dynamic interactions between elements and their feedbacks—the hallmark of complex systems and pervasive in psychical, social and societal systems. In complex systems, contextdependence is not just “variability of content” as the authors write but changeability and transformation.

Why are constructs so central to psychology?

Constructs as important study phenomena in themselves

Constructs, like all concepts, are products of the human mind. As Kelly (1955, 1963) highlighted, not just scientists but all humans intuitively develop constructs. Our abilities for abstract thinking, for filtering from the manifold ‘realities’ that we encounter features that are relevant for our aims, goals and purposes, while ignoring others, and for developing abstract words enabling efficient communication of complex ideas are defining characteristics of humans. These higher-order mental abilities enable us to make sense of and to navigate through the complexities of our everyday lives. Therefore, constructs are important study phenomena in themselves. Constructs provide important insights into the ways in which we think, how we conceptualise our knowledge of the ‘world’, how we make decisions etc. Folk constructs (e.g., Tellegen, 1993), everyday knowledge (e.g., Laucken, 1974), and cognitive dissonance (e.g., Festinger, 1957), to name just a few classics, are important study phenomena in many fields of psychology (e.g., social and personality psychology) and applied psychological practice (e.g., coaching, counselling, education, industry).

Constructs as important means of exploration

But constructs are also important means of exploration. De Boeck and colleagues correctly ascertain that abstract and heterogeneous constructs are necessary to “reflect the true complexity of psychological phenomena”—yet without specifying which particular phenomena they mean. Psychologists study a broad range of phenomena, including but not only psychical (e.g., thoughts, emotions, beliefs), behavioural (e.g., movements, acts), social (e.g., stereotypes, values, norms), cultural (e.g., language systems), sensory (e.g., sound perception), physiological (e.g., neuroelectric potentials, hormones) and morphological phenomena (e.g., brain structures and circuits). In the authors’ view, for the exploration of which of these different kinds of study phenomena are constructs necessary and why?

Constructs are required, for example, to study phenomena that are processes by nature (e.g., experience, behaviour). Because only parts of processes exist at any given moment, processual phenomena can be conceived only by generalising and abstracting from their occurrences over time—using constructs (Whitehead, 1929). Constructs are also necessary to study phenomena that we can only infer from observable phenomena, such as intellectual abilities thought to underly performances construed as ‘intelligence’ as well as many other multireferential phenomena studied in psychology (e.g., ‘stereotypes’, ‘identities’, ‘personality’).

The constructs that scientists develop of their study phenomena differ from people’s everyday constructs by their level of systematicity and the coherence of their linguistic codification and use. But both scientific and everyday constructs can be thought and conceived of only by persons—and both even by the same person. This highlights again that constructs are mental phenomena by their ontology—a fact that other sciences (e.g., physics) can conveniently ignore and therefore clearly oppose their objects of research to the concepts designating them. But for psychologists, making this distinction is challenging (Uher, 2022a). Psychologists’ cardinal error: Conflating the study phenomena with the study means

Key scientific activities—generalising, abstracting, testing hypotheses and developing explanations, theories and complex conceptual systems—are all abilities of the human mind. Empirical research is experience-based by definition (from Greek *empeiria* for ‘experience’). For psychologists, as scientists exploring minds and experience, this complicates the logical distinction of, on the one hand, their study phenomena (e.g., experience, reasoning abilities, everyday constructs) from their means of exploring these phenomena (e.g., terms, methods, data, scientific constructs) on the other. Failure to distinguish the study phenomena from the means of their exploration—psychologists’ cardinal error—is reflected in many established practices and psychological jargon (Uher, 2022a). For example, the English-language terms ‘psychology’ and ‘psychological’ are often used indiscriminately to refer to both the study phenomena (psyche, psychical) and the means of inquiry (psychology, psychological)—a distinction made in many other languages (e.g., French, Italian, German; Lewin, 1936; Uher, 2016a, 2021b). For example, the psychological problems with constructs discussed here are problems of the scientific discipline. But psychical problems concern people’s mental health.

Naming both as ‘psychological’ cannot express this important difference (Uher, 2022a).

Ambiguous jargon underlies many misunderstandings and confusions around constructs.

Conflation of constructs with their referents

De Boeck and colleagues do not mention the vital role of language in the generation of constructs and the many fallacies that it entails for construct research. Our intuitive use of language, in which we presentify the meanings that we construe for words as our psychical reality in the here-and-now, lets us easily overlook that words only signify their referents, but they are not these referents in themselves (signifier–meaning conflation, signifier–referent conflation, see above). In everyday life and in science, we therefore tend to believe that just because we have a word for something that it denotes a concrete thing (James, 1890; also Ashworth, 2009, Valsiner, 2017)—the fallacy of misplaced concreteness (Whitehead, 1929).

This leads scientists to treat constructs (e.g., ‘traits’) as if these constitute concrete entities (objects) existing in nature ready to be ‘discovered’ or ‘identified’ like our DNA. This entification (turning into an entity, also objectification) promotes the conflation of a construct (e.g., ‘intelligence’) with its referents (various intellectual performances)—the actual study phenomena. This construct–referent conflation occurs, for example, when scientists interpret constructs as “attributes” or qualities that individuals “possess” (Cronbach & Meehl, 1955) rather than as “a conceptual term used to describe a phenomenon of interest” (Edwards & Bagozzi, 2000). Analogous conflations occur with the term ‘variables’, which are also often treated as both the actual study phenomena (e.g., behaviours, beliefs) and the semiotic entities (signs) analysed statistically (variable–referent conflation; Danziger & Dzinas, 1997; Maraun & Gabriel, 2013; Slaney & Garcia, 2015; Toomela, 2008; Uher, 2013, Uher, 2021a, b, 2022a). De Boeck and colleagues exemplify such conflations, often in the same sentence, such as by stating that “the reality of constructs cannot be captured in one or a few dimensions because constructs refer to a highly complex reality”. On the one hand, the “reality of the construct ... cannot be captured” implies that here constructs are the study phenomena. On the other hand, “constructs refer to a highly complex reality” implies their notion as a means of study.

The challenge lies in the fact that constructs can be study phenomena but also means of exploration. But in the same study, the same construct logically cannot be both the study phenomenon and the means of its own exploration. When (unwittingly) making these conflations, in their minds, researchers mentally flip back-and-forth between the two different roles that constructs can generally have in research. This entails logical and conceptual errors in which ontological terms are conflated with epistemological and methodological terms. This makes the distinction of disparate scientific activities technically impossible and distorts basic conceptions and procedures of science (Uher, 2021a, b, 2022a, 2023a). The construal of constructs allowed psychologists to turn abstract ideas into entities, thereby making them conceptually accessible to empirical study. But this entification led them to overlook the constructs’ constructed nature (Maraun et al., 2009; Slaney & Garcia, 2015); Slaney, 2017) and to focus on methodological and methodical approaches, ignoring the necessity to develop their epistemological and ontological foundations as well (Hanfstring, 2019; Uher, 2021d, 2024).

Conflation of description with explanation

Construct–referent conflation implemented the logical errors of operationalism into psychological research. For example, when reasoning ability is operationally ‘defined’ as test performance, this ability cannot also be used to explain this performance. A phenomenon cannot be defined by its effects; such approaches conflate cause with effect (Hibberd, 2019). Construct–referent conflation often misleads many psychologists to interpret, for example, judgement-based ‘personality traits’ (e.g., Five Factor Model) as reflecting “psycho-physical mechanisms”, thereby turning a study phenomenon’s description into its explanation, leading to explanatory circularity (Mischel & Shoda, 1994; Uher, 2013). Explanation informs about a fact to be explained (explanandum) by informing about other facts explaining it (explanantia). The information explaining a fact cannot also be explained by this very fact (Faye, 1999). Explanation presupposes description. Without first describing and theoretically defining the study phenomena and without developing an understanding of the meaning of the concepts therefore used, we cannot even begin empirical inquiry, hypothesis and theory construction (Maraun, 1998; Uher, 2016b, 2024). De Boeck and colleagues’ claim that “something with predictive value but no meaningful explanatory function does not qualify as a construct” overlooks these points. We develop constructs about the phenomena to be explained as well as constructs about the phenomena explaining those phenomena. Constructs are complex conceptual systems regardless of the role that we may assign to them in a research design.

Can we ‘measure’ constructs?

Construct operationalisation is not measurement

Theoretically defined constructs must be operationally defined in concrete entities accessible for empirical inquiry. Constructs are conceptual entities the meaning of which arises from the joint consideration of their referents for given purposes, goals, etc. Therefore, constructs have no counterpart in experience. Constructs cannot be identified experimentally and cannot be fully operationally defined by ‘observables’ in principle (Kaplan, 1998). From the universe of a construct’s theoretically possible referents, scientists must choose some to serve as indicators. Because it is always persons who are construing constructs, the decisions about which specific referents and in which specific ways these are being considered in a given construct of a given construct to consider vary considerably. An example are the well-known debates about which abilities form part of ‘intelligence’, and which ones not. The relations between the theoretical and the empirical, thus between theoretical and operational construct definition, concern the correspondence rules (Kaplan, 1998; Torgerson, 1958; Uher, 2020a) to which De Boeck and colleagues refer to as “construct-OD gap”. Their statements that “the full meaning of a construct is broader than its observables” and that “ODs necessarily cover only parts of constructs and in a variable way, which results in apparently non-robust and imprecise findings” acknowledge the challenges involved in scientists’ decisions on the operational definitions of their constructs, yet without specifying any reasons why these are variable, always just partial and imprecise.

For construct operationalisation, scientists must make interpretive decisions about which indicators are representative of a construct given some theories, common-sense or face validity—thus arbitrarily, by decree. Therefore, this approach is called ‘measurement’ by fiat (from Latin fiat for “let it be done”); Cicourel, 1964; Torgerson, 1958; Uher, 2020a). Construct operationalisation by decree is an unavoidable necessity. But contrary to common beliefs, it is not measurement. Constructs are multi-referential conceptual entities—they refer to qualitatively heterogeneous referents. Scientists must decide which particular qualities are representative of a construct. ‘Extraversion’ may be operationalised with various behaviours, thoughts and emotions, thus qualitatively different phenomena. The joint consideration of their different qualities defines the construct’s meaning. But measurement is the determination of quantities of one specified quality. Quantities are divisible properties of the same kind, thus the same quality. But what divisible properties could there be in qualitatively heterogeneous multi-referential conceptual entities (Hartmann, 1964; Uher, 2020a; 2022b, 2023a)?

Psychologists commonly derive from quantifications of their different indicators an overall quantitative construct index (‘measure’; e.g., by averaging). But different kinds of phenomena require different methods of inquiry (Uher, 2019). Behaviours are publicly accessible; thus, they can be observed. But emotions and attitudes are accessible only privately; they require selfreport. Physiological phenomena, in turn, require physical measuring devices (e.g., EEG). Hence, the construct of ‘extraversion’ cannot be studied with just one method. But how can we meaningfully merge quantifications of different qualities and different types? How can we average behavioural durations and frequencies arithmetically? How can we merge these with emotional intensity scores? If we look at ‘weather’, it is crystal clear that measurements of temperature in °C Celsius, humidity in % and wind strength in km/h cannot simply be averaged to obtain an overall ‘weather score’. Rating methods seem suited to straightforwardly generate numerical data on any phenomenon describable in brief colloquial item statements and these rating data seem to be directly comparable and thus suitable for arithmetic merging. But they only obscure the problem that we actually aim to merge quantitative scores of qualitatively different phenomena (Brower, 1949; Uher, 2018a, 2020a, 2020b, 2023a).

Language-based methods are inherently interpretive. Psychologists capitalise on this fact by using broadly worded rating items that are applicable to a broad range of individuals, phenomena and contexts without specifying any particular ones and that also require judgements (e.g., implicit comparisons with other individuals and over time, social valence). That is, many rating items are constructs themselves. But commonly, psychologists interpret ratings as if these reflect quantifications of the described phenomena in themselves—another instance of construct–referent conflation. When using words, as we presentify their

referents and meanings, bringing them into our immediate psychical reality in the here-and-now, we tend to forget that these are just states of our mind and that the words' referents are actually not present and thus not available for inquiry. In fact, ratings are typically provided in situations (e.g., at desk) in which the phenomena inquired (e.g., social behaviours, emotions) are typically absent. When constructs constituted by words are studied with methods constituted by words, it is difficult to distinguish the methods from the study phenomena—psychologists' cardinal error. Rating-based research runs the risk of studying just linguistic propositions (Wittgenstein, 1922)—that is, individuals' constructs of the phenomena inquired but not these phenomena in themselves, the fallacy of constructification (Uher, 2022a).

Ergodic fallacy: Inter-individual and intra-individual variations are non-isomorphic. Psychologists' common approach to arithmetically merge quantitative data about qualitatively different phenomena are differential analyses. Quantitative construct indices are thereby derived by studying not absolute scores but relative between-individual score differences. As De Boeck and colleagues note "the methodological approach to construct validation through psychometrics (correlations, factor analysis methods, group differences, etc.) has dominated psychological research for 70 years with little debate". For example, covariations across individuals for a set of responses are interpreted as reflecting an 'attitude'. But inferences from sample-level results to individual-level phenomena entail the ergodic fallacy. Ergodicity is a property of stochastic processes and dynamic systems where synchronic and diachronic variations are isomorphic. This fits all invariant phenomena (e.g., gases, matter). But it does not apply to psychology's study phenomena, which undergo change and development and in which inter-individual and intra-individual variations are therefore not equal. Sample-level findings can be generalised to individuals only if 1) each individual obeys the same statistical model (homogeneity assumption) and if 2) the statistical properties (e.g., factor loadings) are the same at all times (stationarity assumption). But these conditions are rarely ever met in psychology (Danziger, 1985; Molenaar & Campbell, 2009; Molenaar, 2008; Salvatore & Valsiner, 2010; Uher, 2022a, 2023a, 2024; Valsiner, 2014). Therefore, the results obtained from statistical analyses can be attributed neither to the constructs nor to the phenomena to which these refer. The numerical values created are arbitrary and useful only within the given sample. But they have no quantitative meanings with regard to the actual study phenomena as required for measurement and can reflect at best only pragmatic quantifications. Psychologists' common 'measurement' jargon is misleading. De Boeck and colleagues employ this jargon without mentioning any of these or further problems (Barrett, 2003; Uher, 2020a, 2022a, 2022b, 2023a).

Epistemological mismatches: Conflating ontology with epistemology

Like all scientists, psychologists have a basic ontological orientation—they aim to understand individuals' experience and behaviour as their objects of research. Ontology is the philosophy and theory of all that is or exists. Ontological concepts are, for example, those of objects, processes, properties, quality and quantity. Like all scientists, psychologists are also concerned with their knowledge of these research objects, kinds of knowing and knowledge generation. This concerns the relations of the scientists' minds to the ontological reality that they aim to explore, such as the methods to access the research objects (e.g., perception), the thought processes involved (e.g., logic, inference, generalisation) and the justification of knowledge claims (e.g., regarding their 'truth', validity). Examples of epistemological theories are realism, rationalism, constructivism, relativism or dialectics (Poli, 2001; Uher, 2024).

Ontology and epistemology are the most basic foundations of every science. Many psychologists, such as De Boeck and colleagues, deal with their foundations only implicitly. Others discuss only their epistemology. But without explicit elaboration, the ontological and epistemological assumptions made may involve mismatches, especially in construct research. Constructs are constructed by and for humans—they are phenomena of mind by their ontological nature. Constructs always involve attributed meanings that imply particular ways of interpreting the phenomena to which they may refer. These attributions depend on the construer, such as the researchers themselves who always approach their study phenomena from their specific views as humans, as members of their specific socio-cultural, linguistic and scientific communities,

and as individuals (Fleck, 1979; Kuhn, 1962; Uher, 2020b, 2021d). Differences in the particular referents, the particular aspects that are being (de-)emphasised and the particular levels of abstraction that researchers (implicitly) consider enable unlimited changeability and diversity in the constructs created. This led to the proliferation of overlapping constructs, operationalisations (e.g., item lists) and terms with countless jingle-jangle fallacies (different term, same construct, and vice versa) that exist in psychology, each favoured by particular (groups of) researchers. This reflects the mental construction processes that Kelly (1955) described and the inherent anthropogenicity of science (Uher, 2022a, 2023a, 2024).

Constructivist epistemologies, which consider these peculiarities of constructs, are most suited to explore constructs and their meaning structures in themselves. These constitute our psychical reality as human individuals. But many psychologists overlook these important points (and the etymology of the word ‘construct’) and reject constructivism in favour of a realist epistemology originating from physical science. Such epistemologies may be applicable to some of the construct referents studied in psychology (e.g., behaviours, neurophysiological circuits) and this is what these researchers may have actually in mind. But construct-referent conflation, naïve language use and psychologists’ cardinal error led to the naïve realism prevailing in many fields of psychology in which constructs are assumed to exist like invariant physical objects endowed with a universal mechanistic functioning that is to be ‘uncovered’. Science concerns the generalisation and abstraction of particulars, which exist in the real ‘world’ independently of human minds. But abstractions and generalisations do not. These are products of human minds who aim to understand the ‘world’ consisting of particulars. Therefore, science cannot be mindindependent (Locke, 1999). Abstraction inherently involves language with its manifold variations in implicit socio-cultural norms, valences and meanings—human reality is “semantically rich” (Bhaskar & Simon, 1977; Kelley & Krueger, 1984). More suited for its exploration are therefore the epistemologies of critical realism (Bhaskar & Danermark, 2006), pragmatism-realism (Guyon et al., 2018) and others, which emphasise the reality of the research objects and their knowability but also that our knowledge about this reality is created on the basis of our practical engagement with and collective appraisal of that reality.

Misunderstandings and confusions derive from lack of critical self-reflection and selfreflexivity

De Boeck and colleagues “raised the question of what is to blame for the current concerns and challenges facing psychology? Would it be the methods and common approaches or the variable and complex nature of psychological phenomena?” They argue for the latter and call for suitable approaches. But psychologists must start with themselves.

“Dissatisfactions with the vagueness of constructs, variable results, lack of progress in accumulating knowledge, and numerous calls for direct rather than conceptual replications in addressing failures to replicate” result from the lack of theorising in psychology (Thelen & Smith, 2006; Witherington et al., 2018). Cronbach, Meehl and Stevens with their ambiguous terminology, which masks many conceptual conflations and logical errors, perpetuate the misunderstandings and confusions that exist around constructs in psychology. Like other scientists, psychologists should move on when their pioneers and classics turned out to be erroneous. Instead, psychologists should do their own thinking and invest efforts to develop their ontological and epistemological foundations as well as a precise terminology. It is perplexing to see intensely many psychologists are still struggling with constructs although constructs are central to psychological research and although sophisticated theories exist for 70 years already but have been largely ignored. The peculiarities of constructs in psychology are challenging because they require critical self-reflection and self-reflexivity about our own thinking as scientists, our own knowledge and ways of doing science (Jamieson et al., 2023; Uher, 2024). But this is needed to overcome psychology’s current crises and to solve the problems and misunderstandings around constructs.

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