What makes a hypothetical construct “hypothetical”? Tracing the origins and uses of the ‘hypothetical construct’ concept in psychological science

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A B S T R A C T

The “hypothetical construct” has been an important concept in philosophy of science for the past half century. References to the concept date as far back as 1943 (Loomba, 1943). Inconsistencies in the use of the term and the related ‘intervening variable’ concept prompted MacCorquodale and Meehl (1948) to distinguish the two concepts and propose conventions for their employment in psychological discourse. They recommended that ‘hypothetical construct’ designates theoretical concepts that “refer to processes or entities that are not directly observed” and, thus, fail to meet the requirements of intervening variables (p. 104). It is interesting to speculate what makes a hypothetical construct “hypothetical.” The motivation for attaching “hypothetical” to constructs is not always immediately apparent. The aim of this paper is to trace the origins of the expression ‘hypothetical construct’, delineate its employment in psychology, and explore the ontological and epistemological presuppositions that underlie conceptions of hypothetical constructs.

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The “hypothetical construct” is and has been an important concept in the philosophy of psychological science for the past half century. References to the concept date at least as far back as 1943, when Loomba appealed to the fact that sensations are hypothetical constructs and thus could not cause perceptions, as had been a premise of the Woodwardian position on the relationship between perceptions and sensations (Loomba, 1943). MacCorquodale and Meehl (1948), based on what they took to be a commonly occurring confusion between “abstractive” and “hypothetical” concepts, suggested that psychological theorists adopt the linguistic convention that ‘intervening variable’ (after Tolman, 1938) be used in reference to quantities obtained from the manipulation of empirical (i.e., observed or potentially observable) variables; they claimed ‘hypothetical construct’, conversely, should be used to designate theoretical concepts that “refer to processes or entities that are not directly observed” and, thus, fail to meet the requirements of intervening variables (p. 104). More recently, Colman (2006) describes a ‘hypothetical construct’ as “a conjectured entity, process, or event that is not observed directly but is assumed to explain an observable phenomenon”, with the further caveat that “It is not merely a summary of the relationships between observable variables but contains surplus meaning over and above such relationships” (p. 359; emphasis added). In comparison, he defines ‘construct’ as “a model based on observation guided by a theoretical network”, but also as a “psychological attribute, such as intelligence of extroversion, on which people differ from one another”, or “more generally any complex concept synthesized from simpler concepts” (p. 166). In current psychological research it is rare to see references to intervening variables but the term ‘hypothetical construct’, and especially the diminutive ‘construct’, is referenced frequently.

In light of this, it is interesting to speculate as to what makes a ‘hypothetical construct” “hypothetical.” The hypothetical construct concept is clearly presumed to be related to the notions ‘theoretical concept’, ‘theoretical term’, ‘hypothetical entity’, and the like in important ways. However, the motivation for attaching “hypothetical” to
constructs is not always immediately apparent. It appears that sometimes what makes a construct hypothetical is simply that it appears in a scientific hypothesis. In other contexts, the role of the hypothetical rider is to convey the property of unobservability with respect to an entity which is theorized to exist and, typically, to have generative powers in reference to a particular set of observable phenomena. In such a case, the hypotheticallyness presumably is a consequence of the fact that its referent is unobservable and, so, its existence may not be directly and conclusively demonstrated. The “hypothetical” descriptor at other times seems intended to convey a merely abstracting or heuristic role, wherein constructs are explicitly created by the scientists in order to make theories more efficient and facilitate ease of communication about a given class of phenomena. The possibility of there being multiple senses of hypotheticallyness where constructs are concerned raises a further question about the extent of overlap between these various senses. In this present paper we will trace the origin of the expression ‘hypothetical construct’ in the philosophy of science, delineate the various ways in which it has been and is currently employed in psychological science, and explore the ontological and epistemological presuppositions that might underlie different conceptions which are held regarding the nature of hypothetical constructs.

However, before attempting a description of the various ways in which the ‘hypothetical’ descriptor appears to operate, it is of course first prudent to remind the reader that the more general concept ‘construct’ has been employed in various ways in scientific discourse and has both a longer history and broader scope of use than does ‘hypothetical construct’. In the most general sense, constructs constitute a general class of scientific concepts, including but not limited to hypothetical constructs, intervening variables, operational definitions, and other classes of theoretical concepts (e.g., technical concepts, names of apparatus, etc.). Although we recognize that the notion of ‘hypothetical construct’ is related in a very clear way to current conceptualizations of psychological “constructs”, here we will not explicitly examine the relationship between the two. Rather, the major aim of the current work is to explore the history of the hypothetical construct concept and determine what advantage, if any, the ‘hypothetical’ rider provides in specifying the role this particular type of scientific concept is meant to play.

1. The historical context: intervening variables and hypothetical constructs

Although we note a single reference to the term ‘hypothetical construct’ prior to 1948, this particular employment of the term appears to accord more with what others referred to as an intervening variable (cf. Loomba, 1943). To our knowledge, MacCorquodale and Meehl are the formal originators of the term that has been in use within psychology (and in a limited way also within the philosophy of science) since they introduced it in their well-known 1948 paper.

1.1. The philosophical and disciplinary context

The earliest papers on hypothetical constructs contain implicit and explicit references to the disciplinary and philosophical context that forms the backdrop for the development of this concept in psychological discourse, including the growing influence of empirical (scientific) realism as a general approach to science and within psychological science the emergence of neobehaviorism and neuropsychology. At the time, the influence of logical positivism and strict operationism, which had been the predominant philosophy of science underlying most psychological theory for several decades, was slowly waning. A growing recognition of the limitations of operationalist reductionism precipitated a move towards empirical realist conceptions of science and an attendant emphasis on and appreciation for the importance of theoretical concepts. The latter, it was now thought, could not be strictly reduced to observational terms and played an essential role in denoting those entities (or properties thereof) that featured in theoretical explanations for the existence of particular phenomena.

At the same time, psychological scientists were losing faith in the purely behaviorist approach that had dominated psychological practice in North America for several decades and that restricted explanations of behavior to series of direct stimulus–response relationships. The failure of traditional behaviorist paradigms to provide adequate explanatory frameworks contributed to a general shift towards neobehaviorism, which allowed for investigations of the roles motivational or cognitive variables had to play in stimulus–response relationships. Psychology thus required a language to describe variables and their role in previously established stimulus–response relationships. Finally, the commonly held belief that observable behavior constitutes the only legitimate unit of analysis was challenged through the development of new technologies for making “observations” (e.g., neurosurgical or brain imaging techniques) and thus recognition of the role of neurological determinants of behavior. Attention to neurological processes further necessitated consideration of the legitimacy of real but unobservable psychologically relevant entities and a way to talk about them and distinguish them from operationalized variables. We contend that the promotion and development of the hypothetical construct concept provided a means of denoting real but potentially unobservable structures, mechanisms, and processes that might play a mediating role in stimulus–response relationships. Furthermore, in contrasting hypothetical constructs from intervening variable constructs, a clear distinction could be made between theoretical concepts that are reducible to observables and those that are not.

1.2. The early theories

Within this historical context, theorists such as Tolman (1938) and Hull (1943) began to champion the use of

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1 Orton (1987) speculates that the origins of the former may lie in Russell’s (1929) plea to philosophers to attempt whenever possible to “construct” individual terms by logical operations from concrete experiences.
“logical or theoretical constructs” and “intervening variables” to liberate psychological science from the strict confines of behaviorism, which reduced all interesting questions to explicitly defined stimulus–response relationships. In his 1938 paper, “The Determiners of Behavior at a Choice Point,” Tolman characterized intervening variables as intermediaries in the relationship between independent and dependent variables; he argued that a “theory is a set of intervening variables” and “intervening variables are ‘constructs’ which we, the theorists, evolve as a useful way of breaking down into more manageable form the original complete function.” (p. 9). Hull (1943) in his Principles of Behavior argues that logical constructs or intervening variables facilitate scientific thinking and that an “intervening variable is never directly observed but is an inference based on the observation of something else and the inference is critically dependent upon the experimental manipulations (operations) which lead to the observations.” (p. 30). Although both theorists assigned intervening variables a central role in psychological theory, Tolman defined intervening variables by their functional role in the relationship between independent and dependent variables whereas Hull characterized unobservability as their hallmark feature.

The concept of the ‘hypothetical construct’ itself arguably entered theoretical psychological discourse most formally with the publication of MacCorquodale and Meehl’s (1948) paper, “On a Distinction Between Hypothetical Constructs and Intervening Variables”, which was expressly aimed at clearing up conceptual confusions plaguing the use of the term ‘intervening variable.’ MacCorquodale and Meehl suggested three formal ways to state the distinction between hypothetical constructs and abstractive concepts such as intervening variables: a) Whereas abstractive concepts contain only words which can be explicitly defined in terms of empirical relations, hypothetical constructs contain words that cannot be defined strictly in terms of observables in this way; b) the truth of the empirical laws that justify sentences containing hypothetical constructs is necessary but not sufficient to establish the truth of the sentence; however, in the case of sentences containing abstractive constructs, the truth of the empirical laws is both necessary and sufficient for the truth of the sentence; c) for abstractive concepts, the construct itself is reducible to the quantitative representations of the construct but the hypothetical construct is not reducible to its quantitative representations (i.e., laws of relations between empirical properties can be deduced from a hypothetical construct but the construct cannot be deduced from the laws); in other words, explicit definitions of a hypothetical construct convey at best only part of the concept’s meaning. MacCorquodale and Meehl also argued that the use of intervening variables is justified by their utilitarian value while the use of a hypothetical construct is justified by its truth (i.e., the actual existence of that which it denotes). Thus, MacCorquodale and Meehl recommended the above mentioned convention of using the expression ‘hypothetical construct’ to denote in principle observable but currently unobservable theoretical entities and ‘intervening variable’ for concepts which fulfill a strictly heuristic or summarizing function.

Far from providing but a simple conceptual clarification, MacCorquodale and Meehl’s account spurred a lively debate that quickly illuminated further dimensions of the problem that would require explication and clarification. Some theorists (e.g., Krech, 1949; 1950; Tolman, 1949) thought MacCorquodale and Meehl’s account implied that hypothetical constructs designate neurological or physiological entities,2 and promoted the use of such constructs in psychological discourse. However, others voiced concerns either about the legitimacy of admitting into science terms that contain “hypothetical content”, i.e., theoretical terms which cannot be sufficiently operationalized (Marx, 1951), or of the constrained conception of theoretical concepts as falling into only the two classes identified by MacCorquodale and Meehl (Lindzey, 1953). Still others (Adcock, 1955; Plutchik, 1954) defended the value of both hypothetical constructs and intervening variables for scientific practice on grounds of parsimony and simplicity of theoretical explanations. Finally, attributing much of the intervening variable-hypothetical construct debate to conceptual confusion and logical inconsistency, theorists such as Ginsberg (1954) and Hilgard (1958) suggested alternate ways of conceptualizing the difference between hypothetical constructs and intervening variables, e.g., emphasizing their role in relation to theories and laws as opposed to predominantly with regard to interpreting empirical observations. From these early debates, however, it is clear that in the decade following the publication of MacCorquodale and Meehl’s paper, the presumed nature of hypothetical constructs and their role in psychological science was still unclear and therefore subject to debate.

Interestingly, by 1955 when Cronbach and Meehl published what would become a much more influential work, “Construct Validity and Psychological Tests”, outside of theoretical discourse the ‘hypothetical’ descriptor had been all but dropped in favor of adopting the diminutive ‘construct.’ Whether this was the result merely of a relatively natural “pruning” that tends to occur with expressions over time, or an attempt to define a broader class of concepts of which hypothetical constructs are to be considered merely a subclass, is difficult to extrapolate from the vague characterization of hypothetical constructs provided by Cronbach and Meehl in their 1955 paper.

### 2. What makes a hypothetical construct “hypothetical”?

We suspect that part of the equivocation regarding the appropriate role of hypothetical constructs within psychological science (and by pain of contrast that also of intervening variable constructs) is that what is to be taken

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2 It should be noted that in much of the literature pertaining to hypothetical constructs, both historically and currently, the hypothetical construct concept is conflated with the class of theoretical entities for which such constructs are reserved as designators. That is, many will speak of a hypothetical construct as being an “entity”, “mechanism”, or “process”, etc., which exists but cannot be observed. We believe that this common conflation betrays certain confusions regarding the proper roles of definitional, ontological, and epistemological issues in psychological science, a point to which we return later in the paper.
as the “hypothetical” part of a hypothetical construct is not abundantly clear. A variety of characterizations have been given of hypothetical constructs, and these are not always consistent with respect to what feature or component of a hypothetical construct is hypothetical—some aspect of the construct (i.e., as a concept) itself, or of the entities (processes, states, mechanisms, etc.) that are in the construct’s extension, or some combination of both. Such inconsistencies imply multiple and possibly distinct senses of ‘hypothetical’ when it comes to hypothetical constructs.3 The task here is to attempt to shed light on these different senses and to reveal certain philosophical presuppositions on which they are based.

A perhaps sensible starting point to an explication of the meaning of ‘hypothetical construct’ is to elaborate the distinction that has been made within the philosophy of science between so-called “empirical” and “theoretical” constructs. Although there exists some equivocation over what constitutes an empirical construct, in general terms one could take empirical constructs to be concepts which are defined in terms of observation predicates; theoretical concepts, conversely, are not defined explicitly, i.e., strictly in terms of observables, and thus may be characterized as involving some degree of abstraction. The relationship that is presumed to exist between these two classes of concepts varies, with some (e.g., Bergmann & Spence, 1941) taking empirical constructs to be strictly reducible to the observation language with no further implicit reference to unobservable entities and theoretical constructs as a class of concepts reserved for referring to such unobservables. Others (e.g., Chaplin, 1968; English & English, 1958; Hempel, 1950) assume a greater degree of overlap between empirical and theoretical constructs, with the former essentially providing a mechanism for defining theoretical concepts in terms of observation predicates, but whose reference is not restricted to the realm of observable entities. The relevant question for the current work is where hypothetical constructs are presumed to reside with respect to this distinction. We believe the answer hinges in important ways on what is meant by “hypothetical” in this context and aim to explore this question.

In service of this aim, we examined definitions and uses of the ‘hypothetical construct’ concept in dictionaries and encyclopedias of psychology, psychological measurement texts, and various published works within the philosophy of psychological science. We found that, indeed, hypothetical constructs might be considered “hypothetical” in a number of different senses, which are briefly summarized below.

2.1. Hypothetical = theoretical, constructed, heuristic

In the most general sense, hypothetical constructs may be characterized as a class of theoretical concepts that are used by the scientists of a given discipline or research domain to communicate about some phenomenon or set of phenomena of interest. In this case, what makes them “hypothetical” is that they occur in scientific theories (and in the propositions deduced from them), and scientific theories themselves are tentative descriptions of some possible state of affairs. If true, the latter are correct descriptions, but if false they are not. From this perspective, hypothetical constructs are the core concepts that appear in scientific propositions which once subjected to empirical test may change from hypothetical descriptions to factual (or, more realistically, empirically supported) ones. Definitions of ‘hypothetical’ appearing in dictionaries of psychology—e.g., “still unproved” (Drever, 1952, p. 126), “characteristic of ideas or explanations which are tentative or which take the form of ‘as-if’ propositions” (Chaplin, 1968, p. 244)—appear to be consistent with the notion that one aspect of the hypotheticality of hypothetical constructs is that they appear in theoretical propositions and thus are a class of theoretical concepts.

In a related way, the hypotheticality of hypothetical constructs could refer to the constructed nature of these concepts, i.e., that the terms in which they are expressed are to a large extent chosen by a community of scientists for the explicit purpose of designating some constituent of the domain under study. Similarly, hypothetical constructs are sometimes credited with having a heuristic value, in that they enable the scientist to designate in an efficient manner a particular class of observations whose underlying origins are as yet not well-specified but which are presumed to have a common causal source. Hence, hypothetical constructs are “hypothetical” in the sense that they are created by scientists to function either as linguistic summaries of classes of observables or as linguistic placeholders of sorts for yet to be discovered entities. Along these lines, hypothetical constructs have been said to be “literally constructed” (Thorndike & Hagen, 1969, p. 174), or the “products of...informed scientific imagination” (Crocker & Algina, 1986, p. 4).

Importantly, hypothetical constructs are characterized as being “heuristic” in two different senses: First, as indicated above, they are characterized as being “summary concepts”, “fictions”, or “stories” which help to put a label on an otherwise large and difficult to interpret set of observations. Statt (1998) for example, defines the hypothetical construct as “a fiction or story put forward by a theorist to make sense of a phenomenon.” (p. 67) In this case, no or little existential importance is placed on the referent. In the second case, hypothetical constructs are heuristic in the sense of being useful, or even essential, to science because they “allow investigations to be made which would otherwise be virtually impossible” (Eysenck, Wurzburg, & Berne, 1972, p. 97) due to the largely unknown and thus tentative nature of the phenomena under study.

2.2. Hypothetical = unobservable, existential, inferred

The senses of hypotheticality that have been thus far described imply that hypothetical constructs are, first and foremost, of a linguistic nature in that they are theoretical concepts which are created and used by scientists to communicate about particular objects and/or areas of

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3 For expository purposes, in the sequel we shall employ “entity” to represent generally both spatio-temporal entities and states, processes, mechanisms, etc.
study. Up to this point, it may be surmised that their hypotheticality comes primarily from the fact that they feature in scientific theories from which descriptions of proposed but perhaps not actual states of affairs or predictions are deduced, i.e., that they appear in statements whose content is of a hypothetical rather than established nature. However, more commonly the hypotheticality of hypothetical constructs is implied to be a feature not of a particular class of scientific concepts, but of those entities to which hypothetical construct concepts are thought to extend. Specifically, hypothetical constructs are thought to constitute a special class of theoretical concepts by virtue of the fact that the entities (or properties thereof) to which they refer are unobservable. In some cases, these entities are characterized as being real, but in principle unobservable, as in the following definition of a hypothetical construct as: “any concept referring to a process or phenomenon, the existence of which cannot be empirically demonstrated but which nevertheless seems to be required on theoretical grounds or for pragmatic descriptive purposes” (Richards, 2009, p. 99). In other cases, hypothetical constructs are taken to denote entities that have spatio-temporal existence, are in principle observable, but have yet to be observed directly (e.g. English & English, 1958; Reber, 1985). English and English for example, define the hypothetical construct as “a construct referring to an entity or process that is inferred as actually existing (though not at present fully unobservable) and as giving rise to measurable phenomena, including phenomena other than the observables that led to hypothesizing the construct” (p. 116).

Importantly, what makes hypothetical constructs a special class of theoretical concepts is not simply that they do not have observable referents, but rather that they refer to real but unobservable entities or processes. In other words, they are not merely theoretical abstractions—which either do not refer at all, or refer only to circumscribed sets of observables—but are instead “abstract” only in the sense that the real entities and processes to which they refer are, for whatever reason, perceptually remote and our knowledge of them thus necessarily partial. Furthermore, it is these very entities and processes whose existence is hypothesized to explain the observable behaviors that gave rise to the initial articulations of the hypothetical construct, i.e., those phenomena which the scientists seeks to explain in his or her theories. Thus, whereas as truly abstractive concepts (such as intervening variables) merely provide the theorist with efficient descriptive aids, hypothetical constructs enable him or her to test existential hypotheses about the entities and processes which are theorized to underlie the relevant observables. It is for this reason that hypothetical constructs are described as having “factual reference” and “surplus meaning” (Cronbach & Meehl, 1955; Feigl, 1950; Reichenbach, 1938).

It is clear from this perspective that hypothetical constructs are presumed to fulfill some sort of inferential role in scientific theorizing: If the entities in their extensions truly exist but are unobservable, then their existence must be inferred by the observed phenomena to which they are hypothesized to give rise. In contrast to intervening variables, which may be explicitly defined strictly in terms of empirical relations, hypothetical constructs are defined in terms of entities that can only be indirectly measured, viz., in terms of the empirical variables to which they are theoretically connected, either causally or concomitantly. Thus for example, MacCorquodale and Meehl (1948) argue that the resistance of a wire, an intervening variable, can be strictly empirically defined by the flow of an electric current through it, which can be measured empirically, while a hypothetical construct such as an electron can only be defined by its hypothesized causal relations with various empirically observable variables but cannot itself be directly observed. MacCorquodale and Meehl themselves explicitly tie hypothetical constructs to Reichenbach’s “illata”, or “inferred things” (1948, p. 96).

The fact that the existence and properties of hypothetical entities must be inferred as opposed to directly accessed attaches to them a certain degree of uncertainty and the perception that their designation be restricted to a special class of theoretical terms. Thus, it would seem that here hypotheticality pertains not to the class of constructs per se, but to the class of entities these constructs are meant to signify and is an ontological hypotheticality in the sense that claims about the existence of those (presently or in principle) unobservable entities remain at least to some extent provisional.

2.3. Hypothetical = conjectural, provisional, “open”

Hypotheses are by nature conjectural in the sense that they are propositions whose truth or falsity has up to this point been neither confirmed nor falsified. Thus, it is not surprising that hypothetical constructs are frequently touted for the indispensable role they play in enabling the scientist to posit the existence of entities whose presence would explain the occurrence of particular observable phenomena. However, because these entities are (as yet) unobservable, their existence remains as conjectural as the propositions which contain the terms and expressions (i.e., the hypothetical constructs) that denote them. It is for this reason that hypothetical constructs are often described as having “explanatory” value or power—if a given hypothetical construct in fact denotes the actual entity that is hypothesized to underlie the relevant set of observable phenomena, then this entity is in reality as it has been hypothesized to be. Such conceptions are apparent in some definitions given of hypothetical constructs. For example, Colman (2006) defines a hypothetical construct as “A conjectured entity, process, or event that is not observed directly but is assumed to explain an observable phenomenon.” (p. 359). Richards (2009) argues that “Many scientific concepts begin as hypothetical constructs, in the physical sciences however these typically end by being empirically confirmed or validated, or, alternatively, abandoned”(p. 99). Both explicitly and implicitly, the hypotheticality of constructs is thus often taken to be related to their provisional and conjectural status. Unlike intervening variables, which denote mathematically defined functions among observables, hypothetical constructs are reserved for representing entities that are not strictly reducible to such formalized empirical relations, but have existence independent of them. Rather, their relations are ontological
in nature in that the hypothetical entities denoted by
hypothetical constructs are those that, if they do, in fact,
exist (and they may not), would provide an explanation for
the particular observations which have been made in the
specific scientific context at hand. However, because the
existence of the theorized entities designated by hypo-
thetical concepts cannot be settled merely by appeal to
observable phenomena, these concepts are thus said to be
“open.” In other words, because these concepts designate
unobservable (and thus potentially non-existent) entities,
their meanings are at least to some extent ineffable—we
cannot define them in explicit terms and thus their
meanings are “fuzzy” and difficult to articulate in exact
terms. Furthermore, as a science progresses and more is
learnt about the hypothesized entities themselves, the
meanings of the corresponding hypothetical construct(s)
becomes progressively more complete. The hypotheticality
of these constructs captures their preliminary and tenta-
tive, but revisable, nature.

It would seem from our survey that the above-described
senses of hypotheticality do not stand alone, but rather
overlap substantially. Taken together, hypothetical
constructs are theoretical concepts that have real, but
unobservable referents whose existence is posited to explain
the relations among a specified class of observable variables.
What makes them “hypothetical” and thus distinguishable
from other theoretical concepts is that they are neither pure
abstractions from nor reducible to a specified set of observed
variables. Rather, knowledge of the existence and properties
of their unobservable but real referents is still at the earliest
stages of accumulation and thus their full meanings cannot
be completely articulated at this time. As long as the exis-
tential status of the denoted theoretical entity in question
remains hypothetical, the extent to which the complete
meaning of the associated construct may be articulated will
be constrained. Both the existence of the theoretical entity
and the meaning of the construct denoting it must be
inferred and thus remain “hypothetical”.

3. Taking root: the philosophy of hypothetical
constructs

Despite the debates surrounding the particular role
played by and importance placed on hypothetical
constructs, MacCorquodale and Meehl’s original charac-
terization appears to have held up over time. Hypothetical
constructs are thought to fulfill an essential role by virtue of
denoting those entities which, if they truly exist, would
explain the occurrence of particular relations among
observed variables. However, given the unobservability of
their referents, and the fact that they cannot be defined
simply in terms of empirical relations, their meanings are
to some extent open to revision as science progresses and
more is discovered about the entities they denote. This
characterization of the special nature of hypothetical
constructs carries with it the following implications: First,
the meaning and definability of a given theoretical concept
is contingent on both the ontology and observability of the
theoretical entity (process, mechanism, relation, etc.) it
denotes; that is, the extent to which it can be defined will
depend on whether it refers to some real entity—in the
sense of existing autonomously of the scientist’s imagi-
nation—and also whether that entity is observable or is
merely inferable from other observables. Second, the
meaning and definability of a theoretical concept admits of
degree—the greater the knowledge of the theoretical entity
which it designates, the more completely (i.e., explicitly)
can the concept be defined. And, third, the full meaning of
a theoretical concept is given by complete knowledge of the
theoretical entity it denotes with respect to its existence,
properties, and relations to other entities.

We contend that this conceptualization is tied not only
to a realist ontology, but also to a particular conception of
language and meaning and of the nature of concepts
generally and, furthermore, fuels certain common
misconceptions about the proper roles of definitional (i.e.,
conceptual or grammatical), ontological, and epistemo-
logical dimensions of science. We further contend that this
conception underlies the common practice of conflating
theoretical concepts and their referents. In the final section
of the paper, we briefly describe a particular picture of
language in which the received view of hypothetical
constructs is firmly embedded and then attempt to
disambiguate the definitional, ontological, and epistemo-
logical dimensions of science and the role each plays with
respect to treating hypothetical constructs as a special class
of theoretical concepts.

3.1. The meaning and definability of hypothetical construct
corcepts

It is argued here that the view that hypothetical
constructs constitute a special class of theoretical concepts,
whose semantics cannot be fully explicated, is reflective
of particular commitments regarding language and the nature
of concepts. Specifically, it relies on a general picture of
language known as the Augustinian conception of language
(ACL; cf. Baker & Hacker, 2005; Maraun, Slaney, & Gabriel,
2009), the contours of which were first sketched by Witt-
genstein in his later work (e.g., Wittgenstein, 1953). The
ACL is based on three fundamental beliefs: a) all words are
names, b) word meaning is assigned by correlating a word
with the thing(s) it names and, therefore, c) ostensive
definition is the fundamental form of explanation of words.
A corollary of the ACL is that there are two types of words:
so-called “indefinables” (e.g., ‘red’), which denote imme-
diately and directly observable phenomena and “definable”
words, whose meanings may only be explained via an
analysis of other words and expressions (e.g., ‘colour pre-
ference’). Whereas the meanings of indefinables are under
ACL deemed unproblematic, the extent to which definables
have meaning is contingent on whether they can be defined
strictly in terms of indefinables. In other words, if a defin-
able term is reducible to a set of necessary and sufficient
indefinable terms, its meaning is clear; otherwise, its
meaning is at least to some extent “open.” According to this
view, the full and complete meaning of a word is contained
in the entity to which it refers—i.e., the meaning of a word
is the thing to which it refers.

The ACL has the following implications for how the
hypothetical construct concept is conceptualized: First,
since hypothetical constructs are reserved for denoting real
(but unobservable) theoretical entities, all such concepts are names, and an explicit definition of the concept is given by the theoretical entity it denotes. From this standpoint, there would be little need to distinguish between a hypothetical construct and its referent. Thus, common references to hypothetical constructs themselves being “actually existing” or “real”, but “unobservable” or “inferred” entities would not be cause for alarm.

A second implication of the ACL is that, whereas the semantics of intervening variable concepts are clear, hypothetical constructs are semantically underprivileged because they refer to unobservables and cannot therefore be defined strictly in terms of indefinables (as can intervening variables). This points to a third implication: As a science advances and more and more discoveries are made about the theoretical entity denoted by a hypothetical construct, the full meaning of the construct will be progressively more completely defined. Thus discovery of the meaning of a given hypothetical construct is part and parcel with discoveries made about the theoretical entity denoted by the concept. The ultimate aim would be to give a complete definition of the hypothetical construct by ostension, i.e., by direct reference to the previously unobservable but now observed theoretical entity in question. However, in cases in which hypothetical entities are in principle unobservable, the aim would be to provide an explicit definition of the hypothetical construct in terms of an articulation of the network of empirical relations into which the relevant theoretical entity enters (i.e., strictly in terms of the full set of indefinables to which the hypothetical construct is theoretically connected). The latter aim, in fact, provided the motivation for Cronbach and Meehl’s well-celebrated endorsement of the nomological network view of theories.

Finally, these three implications together imply a fourth implication of the ACL, viz., the common practice in psychological scientific discourse of using ‘hypothetical construct’ (and more recently ‘construct’) to refer simultaneously to a class of theoretical concepts and the class of theoretical entities to which such concepts refer. On the one hand, hypothetical constructs are characterized (properly) as the linguistic theoretical concepts that are used to refer to the entities, or abstract classes thereof, which are focal to a given hypothesis or theory more generally. On the other hand, hypothetical constructs are frequently explicitly defined or otherwise characterized as “unobservable” or “inferred” entities that give rise to the observable phenomena and thus have existential status over and above those observable effects. Examples of the latter abound in both the theoretical and applied literature (e.g., Colman, 2006; Helmhstadter, 1964; Moore, 1998).

Here, we contend that the intervening variable-hypothetical construct distinction, and so too the ACL which informs it, betrays a confused conception of the proper roles of definitional, ontological, epistemological dimensions of scientific theorizing and of how to appropriately construe the relations among them. We now briefly describe each in turn and the implications of their relations—properly construed—for the legitimacy of distinguished hypothetical constructs as a special class of theoretical concept.

### 3.2. The definitional dimension of science

Definitional issues are conceptual in nature, as definitions are explanations of meanings of concepts and their modes of expression. They need not—and, in fact, seldom are—expressible in terms of necessary and sufficient criteria and, as a result, the grammars of some concepts can indeed be very difficult to lay down in explicit terms. Rather, the meanings of concepts and the words and phrases in which they are expressed are manifest in their use within a given language. Concepts can, and in many cases do, denote objective entities, some of which cannot be observed for one reason or another. However, denotational relations are grammatical and, thus, must be settled by conceptual rather than empirical investigations. Likewise, the specification of denotational relations between a concept ‘X’ and an entity X is logically prior to empirical claims about X and thus one cannot appeal to the empirical in order to settle definitional matters (i.e., “We will know what ‘X’ means once we’ve clearly identified X’). For these reasons, it makes little sense to say (or imply) that the meaning of a concept, and so too the word that expresses it, is contained in the referent. This is to confuse the matter of clarifying the meaning of a concept (a definitional and thus conceptual matter) and the task of making discoveries about the existence and properties of an entity (a bona fide empirical matter). And, although one is free to cast one’s empirical net far and wide in service of the latter, one cannot do so fruitfully until one has clarified the meanings of the relevant concepts—i.e., no amount of empirical observation or experimental test will clarify what ‘X’ means. This does not, however, preclude the possibility that empirical discoveries about X will lead to changes or modifications in the concept ‘X’ (Baker & Hacker, 1982), but this is to say only that the impetus for conceptual change was some empirical discovery (or set of discoveries) and not that the meanings of the concepts are themselves those empirical facts.

### 3.3. The ontological dimension of science

With respect to the ontological dimension, one must distinguish between the reality of theoretical concepts and that of the theoretical entities they denote. The former is trivial—as long as there are rules for the use of a given concept (i.e., as long it has a grammar in one or more languages) then the concept “exists”. Here ontological claims about concepts are really definitional and are thus conceptual in nature. From the current authors’ perspective, the only meaningful sense in which one could speak of an “ontology” of concepts (theoretical or otherwise) is to note that there are different types of concepts and that these different types may play distinctly different roles within a language (e.g., subject versus predicate nouns, etc.). Conversely, the ontology of theoretical entities is a different matter. Whereas one cannot dispute the existence of a concept (if one is using it), the existence of a theoretical entity or of some subset of properties thereof is a disputable matter, and the existence of a theoretical concept is of course insufficient for making existential claims about entities that are designated by them. Such
ontological questions are properly construed as being empirical in nature and thus are part and parcel with the aims of science. However, one cannot embark on such ontological queries in the absence of concepts which denote the particular entities under investigation, otherwise how would one identify or recognize the entity when one came across it? This does not mean that all the concepts that will ultimately become relevant to the entity (e.g., those signifying particular properties, etc.) need to exist prior to such investigations, or that new entities will not be discovered and subsequently named. Science is in the business of discovery and novel concepts are frequently created in order to communicate scientific findings and name discovered entities. Here, we argue only that the reality of theoretical concepts be kept distinct from the reality of theoretical entities and that the existence of the latter is not sufficient for the “truth” (i.e., meaningfulness) of the former.

In the same vein, concepts can refer to entities that have objective existence, and may be observable or unobservable, or may merely be abstractions over classes of observations or serve some other summary function. The meanings of concepts, however, are not compromised by the observability or nonobservability of their referents. That is, their meanings—which are manifest in their use—are no less “complete” than the meanings of concepts which refer to observable entities. To believe otherwise is to confuse definition with existence, grammatical criteria with properties of objects, and the conceptual issue of clarifying the meanings of theoretical concepts and terms with the epistemological problems that may be encountered when attempting to describe and explain the properties of theoretical entities which may be denoted by such terms.

3.4. The epistemological dimension of science

In the most general sense, science is in the epistemology business, i.e., it is driven by the fundamental aim of generating and accumulating knowledge. In service of this aim, theoretical concepts are articulated and developed such that propositions can be put to the empirical test. However, as with the ontological dimension, the extent to which any importance may be attached to epistemological claims is contingent on the conceptual clarity of the relevant propositions and their constituents. Furthermore, although it is true that epistemological problems can and do arise from observability problems, this pertains to the entities under study and not to the particular class of concepts that may be used to denote them. The history of science is replete with examples of difficulties encountered by scientists interested in studying entities, properties, mechanisms, etc., which are unobservable and indeed many clever apparatuses have been developed in order to circumvent such problems (e.g., alpha chambers, electron microscope).

Another such strategy, one that has been wholly embraced within psychological science, has been to operationalize the theoretical concepts of interest, by laying down stipulative definitions so as to render the relevant theoretical propositions empirically testable. However, for some—viz., positivist thinkers— operational definitions and other “empirical constructs” are sufficient for defining the phenomena of interest. In this case, operational definitions are viewed as a means of giving explicit definitions to an otherwise abstract theoretical concept which does not itself refer to an unobservable theoretical entity but, rather, to a class of related observations. Here, operational definitions may themselves be considered theoretical concepts in that they provide a heuristic or summarizing function.

Realist thinkers, on the other hand, view operationalization of theoretical concepts as an epistemological tool that provides a means of studying those unobservable or otherwise inaccessible theoretical entities which “underlie” the observations resulting from the measurement operation. Here, operational definitions satisfy merely an epistemological aim and are not meant to replace the relevant theoretical concepts and are certainly not meant to be taken as a sufficient definition of the phenomena under study. In such cases it is thought that, although concretely defined, the operational definition gives only partial definition to the theoretical concept at hand and, as such, it is insufficient for specifying its (complete) meaning, the latter of which may only be specified by discovering the theoretical entity to which the concept refers (Hempel, 1965).

Thus, it would seem that operational definitions may serve more than one role in scientific theorizing—sometimes they are used to denote a (hypothesized) theoretical entity and at other times they merely designate a relatively abstract class of observations or relations among them, the former motivated by the desire to circumnavigate epistemological barriers, the latter by the need to communicate scientific findings in an efficient and consistent manner. It would seem that the impetus behind MacCorquodale and Meehl’s paper hung on this distinction.

4. What really makes a hypothetical construct “hypothetical”: meaning, existence, and observability

A number of important implications for commonly held notions regarding hypothetical constructs follow from the characterization of the definitional, ontological, and epistemological components of science that have been provided above: First, irrespective of the entities that hypothetical constructs may denote, definitions are embedded in linguistic practices, or conventions, and thus are not contained in the referent of a concept. Even ostensive definitions, i.e., those given by pointing, are themselves rules and as such are autonomous of the objects defined. Although concepts (and their particular modes of expression) are, to be sure, internally related (i.e., conceptually) to their referents, they are not the same thing as their referents and, so, their meanings are not given completely by their referents. Furthermore, unless one is speaking about the different roles that different types of concepts fulfill in a language, there is no ontology of concepts, per se, outside of the trivial sense in which a concept either has

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4 Although, they may certainly be impossible to lay down in terms of necessary and sufficient criteria. This fundamental point was elaborated by Wittgenstein (1953) in his well-known work on the family resemblance nature of most concepts.
a sense (i.e., a use in a language) or it does not. There may be concepts for which no object referent exists; there may also be an objectively existing object for which there is no concept. But, in the latter case, we can say nothing about the object.

A second implication is that meaning and ontology are separate and need not inform one another at all. A theoretical construct may well refer to something real but unobservable, or may refer to nothing at all. But, its meaning and any definitions that are given of it are quite autonomous of the existence, or observability for that matter, of its referent. On a related note, the meaning of a concept is not contingent on the status of knowledge about its referent, the former being a conceptual issue, the latter an epistemological one. But, this is not to say that linguistic conventions do not change or that empirical discoveries cannot motivate conceptual change (Baker & Hacker, 1982): particular modes of expressions which were once in common use may cease to be used and other, perhaps new, modes of expressions may be adopted; the empirical grounds typically appealed to for ascribing a given concept at one point in time may be abandoned in favor of other grounds due to some relevant empirical discovery. Empirical discovery may alter or influence the meaning of a construct, but such discoveries themselves presuppose that the concept has a meaning.

Third, although operational definition may serve multiple functions in science, as with any concept, the specific role a given operational definition plays in a given context has no bearing on its meaning. Regardless of whether it denotes, or merely designates, specifying and clarifying its meaning is a definitional (conceptual) issue which is separate from the ontology of its referent and from the epistemological problems (or ease) the scientist encounters when engaged in scientific inquiries into the nature of its referent. Once again, epistemological issues concerning the empirical accessibility of a theoretical entity, however it may be defined, do not bear on the definitional dimension. Said another way, stipulating what a hypothetical construct concept means in a given research context is distinct from specifying the properties of the entity to which it is thought to refer. Thus, although operationalization may render an unobservable theoretical entity epistemologically accessible, it need not fulfill only this role—i.e., it can serve a merely heuristic or summarizing function—and specification of its meaning is not constrained by the particular role it serves. In the case of hypothetical constructs, we believe that it is important to remember that if epistemological properties such as unobservability are posited, those are relevant only to the entity denoted by a given hypothetical construct and not the construct itself.

Finally, clearly one cannot sort out the epistemological issues relevant to a given hypothetical entity until one clarifies the meanings of the terms and expressions employed in the theoretical propositions involved. In other words, in order to even recognize that one may encounter difficulties in confirming the existence of some entity or in describing its properties one must already be in possession of concepts that denote the entity and its various properties. Moreover, the epistemological issues that bear on investigations of a theoretical entity do not impinge on conceptual matters regarding the clarification of the meaning of a concept. Laying down or stipulating definitions, clarifying the meaning of a given scientific term or expression, and explicating the relations among different kinds of scientific concepts is a conceptual matter. Discovering the features or properties of a given scientifically relevant entity is an empirical matter. However, empirical investigations presuppose conceptual clarity.

From this vantage point, there is nothing hypothetical about hypothetical constructs; rather, what is hypothetical is the existence of the entity or class of entities designated by such constructs. The meaning of a hypothetical construct is no more semantically "open" than the meaning of any other concept and although the unobservability of the referent of a hypothetical construct (an epistemological issue) may limit the kinds of definitions that can usefully be provided for such a construct (e.g. it cannot be given strictly in terms of indefinables), as long as there are conventions regarding the correct employment of a concept, those conventions constitute the meaning of the concept. Scientific discoveries about the referent of a hypothetical construct do not bring to light the full meaning of the concept, since the former is an empirical/ontological issue and the latter a conceptual one. In other words, although one can make discoveries about hypothetical entities, one cannot discover their meanings. Rather, the meanings of hypothetical concepts are given in the grammatical criteria which stipulate their appropriate uses (sometimes but not always in terms of necessary and sufficient criteria). The "surplus meaning" that is often attributed to hypothetical constructs is really a reference to the fact that the existence and description of the full set of properties and relations of the theoretical entities they are believed to denote have yet to be empirically verified.

Clearly, then, the hypothetical constructs cannot simultaneously be a class of theoretical concepts and the class of theoretical entities to which such concepts refer. The properties of a hypothetical construct are separate from the properties of its referent and although it may well make sense to classify hypothetical constructs as a class of concepts that refer to entities which are thought to be real but unobservable, it makes no sense to describe the hypothetical constructs themselves as either real or unobservable. Hence, while a certain amount of conflation between concepts and entities may be trivial in common parlance, the distinction between concepts and entities is paramount in the conceptualization of the definitional, ontological and epistemological issues that pertain to hypothetical constructs.

In sum, it makes little sense to distinguish hypothetical constructs and intervening variables on ontological grounds, as proposed by MacCorquodale and Meehl. A given hypothetical construct has meaning quite independently of whether or not does in fact denote something real, and specifying its meaning is, as with all other concepts, a conceptual matter. Nothing about the class of entities, real or not, thought to be denoted by hypothetical constructs makes them semantically special. We contend that meaning problems do not stem from the ontology or observability of referents and that the intervening variable-hypothetical
construct distinction is based on epistemological constraints as opposed to differences in our ability to specify the meanings of the two different classes of concept.

5. Conclusion

The ‘hypothetical construct’ concept came to prominence in psychology during a time when philosophical shifts away from logical positivism and strict behaviorism towards empirical realism, neobehaviorism, and cognitive and neuropsychological investigations necessitated a vocabulary to distinguish various concepts based on their role in theorized relationships. Early debates surrounding the ‘hypothetical construct’ concept and its distinction from intervening variable constructs raised a number of issues that remained unresolved and are reflected in the multitude of senses of ‘hypotheticality’ that are evident in psychological reference works and textbooks. We attribute this disparity at least in part to some of the definitional, ontological, and epistemological philosophical issues that underlie the various conceptualizations of this concept. In terms of definitional matters, entities and the concepts that denote them are often conflated due in part to the widespread embracing of the ACL as well as confusions concerning the “ontology” of concepts more generally. As regards ontology, it is important to distinguish between the hypotheticality of concepts, which is trivial, and hypotheticality of theoretical entities, which is not. With respect to epistemology, the different roles of operationalization may further contribute to a failure to distinguish epistemological issues related to the entities denoted by hypothetical constructs from meaning issues as they bear on the concept itself. The ‘hypothetical construct’, which has provided a foundation for the currently employed ‘construct’, is a psychological concept with a rich historical, conceptual, and philosophical foundation that, once elaborated, can aid in clarifying the implications of its employment, and that of its successor, in psychological discourse.

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