

Achieving consensus, coherence, clarity and consistency when talking about addiction

Progress in addiction science is hampered by disagreements and ambiguity around its core construct: addiction. Addiction Ontology (AddictO) offers a path to a solution of the kind that has addressed similar problems in other areas of science: a set of clearly and uniquely defined entities to which terms such as 'addiction', 'addictive disorder' and 'substance dependence' can be applied for ease of reference while recognizing that it is the construct definitions and their unique IDs that are central, not the terms.

THE PROBLEM

Scientific study serves to provide useful, generalizable and enduring knowledge. In addiction science that knowledge is often imprecise because of the complexity of the subject matter, but we should strive to make it as precise and accurate as possible. This is not helped by ongoing disagreements over many of its constructs, including addiction. Moreover, prevailing conceptualizations change over time and differ between cultures, and constructs and terms that are prevalent in one culture may not exist in another [1]. For some researchers, addiction is a chronic disease of the brain resulting in psychological and physical symptoms [2], whereas others suggest that addiction is a normal feature of the human condition [3]. For some it involves mental processes, whereas for others it involves patterns of behaviour [4]. For many it represents a real phenomenon, while for others it is a construction that serves a social function [5]. For some, it is synonymous with dependence [6], while for others it is distinct from it [7]. Some researchers propose that addiction be regarded as something that is either present or absent, while for others it is something that exists in one or more dimensions [8]. For some, it is characterized by chronic physiological adaptation to the presence of a drug, while for others such adaptation is not essential [9]. For some, there has to be harm associated with it, whereas for others this is not necessary [10]. Finally, for some researchers but not others there has to be motivational conflict, or 'akrasia' [11].

Widely used diagnostic systems such as DSM-5 [12] and ICD-11 [13] have achieved a degree of consensus at defining 'disorders' related to addiction, but even these are disputed, change over time and are designed to serve particular purposes such as generating billing codes in health-care systems.

The issue is not unique to addiction science or even disciplines that deal with unobservable constructs such as psychology and psychiatry; it has arisen in clinical sciences and biosciences more generally.

These differences of view are hampering scientific progress in several ways. First, they limit how far data from different studies can be compared and synthesized. This includes data regarding: (1) prevalence, where questions such as 'what is the prevalence of cocaine addiction?' either make no sense or have different answers depending upon what is meant by the term; (2) the effectiveness of treatments and policies aimed at combating the problem where the same policy can be regarded as having succeeded with one definition but failed with another; and (3) the role of addiction as a causal factor in other problems such as crime and ill-health, where different conclusions can emerge depending upon how addiction is defined.

Secondly, differences of view regarding what constitutes addiction impede the development of theories and models that seek to explain it. Developing, comparing and evaluating theories and models requires agreement as to what phenomena the theories and models are seeking to explain.

Thirdly, different conceptualizations of addiction result in different measurement approaches that lead to apparent contradictions. For example, if addiction is construed in terms of the presence of a constellation of cognitions and behaviours that risk or cause harmful consequences, as in the DSM-5, this will result in one type of measure. If however, it is defined in terms of strength of desire to perform a behaviour, that will result in different types of measure with different results.

Fourthly, differences of view regarding the 'true' nature of addiction can result in a failure to appropriately evaluate research findings. For example, reviewers may dismiss study findings because the authors have used a measure that conceptualizes addiction differently from the reviewers' views.

MOVING TOWARDS A SOLUTION

The problem of conceptualizing addiction can be resolved if it is recognized by the wider research community that the practice of science requires coherence and clarity in its constructs, and consistency in the way that we refer to those constructs. The terms we use to refer to those constructs are secondary, and it is perfectly reasonable to want

to focus upon different, although related, constructs and adopt different perspectives. Therefore, the question ‘what is addiction?’ is a *non sequitur*. The meaningful question is: what are useful constructs to which we can apply labels such as ‘addiction’ or ‘substance dependence’ and ‘addictive behaviour’? There may be several useful constructs to which people want to attach these labels, and the key is to define each of these constructs carefully using a formulation that makes it clear how they relate to each other.

Thus, the issue becomes: how should we represent constructs that have been given the label ‘addiction’ or related labels. The solution that is becoming widely adopted to questions of this kind in other areas of science is to put ontologies at the heart of the way we represent knowledge.

Ontologies are data structures that represent the world as made up of (1) uniquely defined entities and (2) their relationships with other entities [14]. Each item in the ontology has a unique ID (usually a URL so that it can be found on the internet) and other metadata that help humans and computers to use it. One of the metadata fields is ‘synonym’: this allows users of the ontology to search for terms such as ‘addiction’ or ‘dependence’ that may apply to more than one entity. Another is ‘cross-reference’, which allows links to be made to classification systems outside the ontology such as DSM-5. Moreover, while entities are given formal ontology labels such as ‘addiction’, ‘addictive disorder’ and ‘substance dependence’, these are simply ways for people to refer to them in text. It is entity records with their unique IDs and their definitions that are central.

This means that different constructs to which different people want to apply the term ‘addiction’ in papers can co-exist. Equally importantly, the relationships between them can be specified and there need be no confusion as to which one is being referred to because they each have a unique ID. In addition, good ontological definitions are constructed in a way that promotes conceptual coherence and clarity.

An ontology is being developed specifically for addiction science called the AddictO (<https://addictovocab.org>). It can be accessed using the AddictO Vocab website [15], which also provides guidance on how to use it. Table 1 shows how several addiction-related constructs are labelled and defined in AddictO.

These definitions are not an attempt to dictate the ‘meaning’ of the term addiction, but rather to identify entities that are commonly referred to in addiction science in ways that are sufficiently broad that they can encompass a wide range of uses.

Readers unfamiliar with ontologies will have many questions. It is worth noting that AddictO applies the label ‘addiction’ to a disposition that can exist to varying degrees. It also distinguishes ‘addictive behaviour’ from ‘addiction’ to address a common ambiguity. Thus, in common language ‘addiction’ can be used to describe a behaviour as in ‘smoking is an addiction’; however, this is confusing and so the ontology reserves the term ‘addiction’ for a disposition of a person and uses ‘addictive behaviour’ to refer to classes of behaviour, such as smoking, that can lead to addiction. It also distinguishes ‘addiction’ from ‘substance dependence’ to provide a way for researchers and practitioners to distinguish the motivational dimension from physiological adaptation resulting in impairment on termination or reduction in substance ingestion. Finally, it offers an entity ‘addictive disorder’ that specifically refers to a disorder that can be cross-referenced to diagnostic classifications such as DSM-5 and its successors.

NEXT STEPS

Ontologies evolve over time, with entities being added that may build upon, elaborate or replace existing entities. In this way they can reflect a multiplicity of perspectives and developments in the domain. We hope that this editorial will inspire researchers and research facilitators such as journals and funders to become involved in the

TABLE 1 Addiction Ontology terms relating to addiction.

Label	ID	Ontological definition
Addiction	ADDICTO:0000349 [16]	A <i>mental disposition</i> that results in repeated episodes of abnormally high levels of motivation to engage in a behaviour, acquired as a result of engaging in the behaviour where the behaviour results in risk or occurrence of serious net harm
Addictive disorder	ADDICTO:0000351 [17]	A <i>mental disorder</i> that results in repeated episodes of abnormally high levels of motivation to engage in a behaviour, acquired as a result of engaging in the behaviour where the behaviour results in risk or occurrence of serious net harm
Substance dependence	ADDICTO:0001212 [18]	A <i>bodily disposition</i> that is realized as impaired functioning following reduction or termination of use of a psychoactive substance as a result of long-term physiological adaptation to that substance
Addictive behaviour	ADDICTO:0000350 [19]	An <i>individual human behaviour</i> that is addictive in a significant proportion of people who engage in it
Addictiveness of a behaviour	ADDICTO:0000109 [20]	A <i>behavioural attribute</i> that is the extent to which it results in addiction in people who engage in it

For more information and explanations of the entities and definitions, go to the citations in the ID column. The terms in italics in the definitions are what are known as ‘parent classes’ of the entities—the next level up in the semantic hierarchy. The entities in this table are all what may be termed ‘fuzzy sets’, in that the definitions involve terms that have indistinct boundaries such as ‘abnormally high’ and ‘serious net harm’. This means that the entities need to be operationalized whenever they are used, using criteria that are measurable.

AddictO project and help to grow it and take collective ownership of it, so that it can more effectively serve the needs of the community. At its most basic level this could involve citing existing AddictO entities, if appropriate, as we have done in Table 1. For those who wish to add entities, the easiest starting point would be to contact the authors.

KEYWORDS

addictive behaviour, Addiction Ontology, Addiction, ontology, substance dependence, substance use

AUTHOR CONTRIBUTIONS


Robert West: Conceptualization (equal); writing—original draft (equal); writing—review and editing (equal). **Sharon Cox:** Conceptualization (equal); writing—review and editing (equal). **Caitlin Jade Notley:** Conceptualization (equal); writing—review and editing (equal). **Guy Du Plessis:** Conceptualization (equal); writing—review and editing (equal). **Janna Hastings:** Conceptualization (equal); writing—review and editing (equal).


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R.W. has undertaken research and consultancy for Pfizer, a company that manufactures a smoking cessation medicine. The authors are involved in developing the Addiction Ontology.

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