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When I use a word . . . .Diagnosing definitions

Definitions come in different varieties, as it were diagnostic categories. Here I describe seven types: nominal definitions, which are of two types, word–for–word definitions and word–for–thing definitions; descriptive definitions; stipulative definitions, which can be either intensional or extensional; operational definitions; and ostensive definitions. In each case I give examples from medical practice.

Jeffrey K Aronson

Types of definition

Definitions come in different varieties. Here I discuss seven different types of definitions that are relevant to bioscientific, including medical, terms. They are nominal definitions, which are of two types, word–for–word definitions and word–for–thing definitions; descriptive definitions; stipulative definitions, which can be either intensional or extensional; operational definitions; and ostensive definitions. In medical terms these could be regarded as diagnostic categories.

Nominal definitions

There are two types of nominal definitions, which can be referred to as word–for–word definitions and word–for–thing definitions.

Word-for-word definitions

In word-for-word definitions the word to be defined, the definiendum, is replaced by a word that means the same thing, in effect a synonym. For example, one can "define" the term "an exanthem" as "a rash," which is actually more an explanation than a definition. Translation is another example. For instance, we can replace the old fashioned term "hydrops pectoris" with its modern equivalent, "pleural effusion." This is not a literal translation, but each word in the Latin phrase is replaced by a counterpart in English.

Word-for-thing definitions

Word-for-thing definitions are etymological; they explain the origin of the term being explained. For example, some foreign words that name diseases have come unchanged into English: beri-beri is from the Sinhalese word beri, weakness, the reduplication stressing the intensity of the problem. Itai-itai, the Japanese for "ouch ouch" is a painful condition, due to a form of osteomalacia caused by cadmium toxicity, and moyamoya disease, a cause of stroke in young people, is occlusion of the internal carotid arteries or of arteries in the circle of Willis, causing a collateral circulation, responsible for its typical angiographic pattern, which resembles a puff of smoke (moyamoya in Japanese).[1]

Proper names can also be defined by their origins. This includes, for example, patronymics, metronymics, and papponymics.[2] In most cases these refer back to names from many previous generations. For example, Thomas Sydenham's surname comes from his forebears, who were named after a village in Somerset, the name of which was in turn derived from two Old English words, sīd=wide and hamm=a water meadow.

However, in some languages, Icelandic for example, these forms refer back to the immediately previous generation. If Leifur has a son Eirik he is called Eirik Leifsson, but Eirik's son Harald is called Harald Eiriksson and so on. Daughters are also called after their fathers, but with the suffix *–dottir* instead of *–son* (for example Gudrun Haraldsdottir is the daughter of Harald). This system defines individuals in terms of their fathers.

Descriptive definitions

Descriptive definitions are such as are found in ordinary dictionaries, and they can therefore also be called lexical definitions, although not all dictionary definitions are of this type.

A descriptive definition describes what something is. Neither more nor less. The word "stethoscope," for example, is defined in the *Oxford English Dictionary* (*OED*) as "An instrument used for examining the chest or other part by auscultation, the sounds of the heart, lungs, or other internal organs being conveyed by means of it to the ear of the observer."[3] One doesn't expect other dictionaries to differ much from this formulation. Here, for example, is the definition given in *The Chambers Dictionary*: "an instrument with which to listen to the sounds produced by the heart, lungs, etc, with a hollow circular part that is applied to the body-wall, from which sound is transmitted by tubes into earpieces."[4] And from *Collins English Dictionary*: "an instrument for listening to the sounds made within the body, typically consisting of a hollow disc that transmits the sound through hollow tubes to earpieces."[5] Indeed, the word has never been defined in any other way; here it is in *Webster's Revised Unabridged Dictionary* of 1913: "An instrument used in auscultation for examining the organs of the chest, as the heart and lungs, by conveying to the ear of the examiner the sounds produced in the thorax."[6] The *OED* definition comes from 1916.

The key features in all of these definitions are that a stethoscope is (a) a [medical] instrument, (b) used for auscultation of the sounds arising in organs of the body, which (c) are conveyed to the ears of the listener.

Laennec's stethoscope, invented in 1816, was a tube that allowed the clinician to listen to sounds through one ear. In 1851 the invention was adapted, replacing paper or wood with rubber, by the Irish physician

Arthur Leared, to allow the sounds from a single tube to be channelled into both ears at once. When Somerville Scott Alison invented a new variety of stethoscope, to which he gave the name "stethophone," William Tyndall communicated a description of it to the Royal Society of London in Alison's absence on 28 April 1858.[7] He described it as "An instrument ... for hearing with both ears [that] is specially adapted for the auscultation of differences in the sounds of different parts of the chest." The same words as ever.

Alison adapted Leared's stethoscope, by strapping together two single-eared tubes, each with a bell (a "collecting cup") on the end. Alison claimed that "the stethophone informs us of [the heart's] sounds in a more complete manner than can be otherwise effected." He later reprinted his paper in a textbook on the physical examination of the chest in cases of tuberculosis,[8] but surprisingly did not mention his invention in the body of the text. However, in that text he did refer to earlier stethoscopes as "bin-aural," as did an anonymous reviewer of the book,[9] credited in the *OED* as the first recorded use of the word. The stethophone didn't catch on, but binaural stethoscopes are still with us.

Stipulative definitions

While a descriptive definition simply describes whatever term is being defined, a stipulative definition stipulates what the term should mean. This may differ from definition to definition, depending on who is doing the defining. The term was itself well defined by Richard Robinson in a book titled simply *Definition*: "By 'stipulative definition' I mean establishing or announcing or choosing one's own meaning for a word."[10] When Humpty Dumpty stipulates that a particular term has a particular meaning, that is what it means—neither more nor less.

"There's glory for you." [said Humpty Dumpty.]

"I don't know what you mean by 'glory'," Alice said.

Humpty Dumpty smiled contemptuously. "Of course you don't—till I tell you. I meant 'there's a nice knock-down argument for you!'"

In defining "glory" as "a nice knock-down argument," Humpty is stipulating that that's what the word means. Alice is free to disagree, as she does.

There are two types of stipulative definitions: intensional and extensional.

Intensional definitions

"Intension," from the supine form, intensum, of the Latin verb intendere, originally meant the action of stretching. It was then itself extended to mean strenuous mental exertion. Then, by further intentional extension, it acquired a specific meaning in logic: "The internal quantity or content of a notion or concept, the sum of the attributes contained in it; the number of qualities connoted by a term."[11] Thus, an intensional definition is one that embodies all the attributes contained in the concept being defined. Most bioscientific definitions are intensional.

Take, for example, the problem of defining "polypharmacy." The authors of a systematic review[12] surveyed 110 different intensional definitions relating to three factors:

- the number of medications being used—the authors of 51 articles set the lower limit at five medications, but suggestions varied from two to 11;
- the duration of use—this was mentioned in only 15 articles, some of which set the minimum duration at 90 days, others at 181 or 240 days, while several set vaguer specifications, such as "in the same quarter of the year";
- the setting in which the polypharmacy occurred—a few specified "during hospital stay," but most made no specification.

They also found definitions that referred to different varieties of polypharmacy—major, excessive, persistent, and chronic—and to hyperpolypharmacy. On the other hand, only seven of the studies they included in their review distinguished between appropriate and inappropriate polypharmacy, which is an important distinction to make.[13] In one case it was even suggested that polypharmacy be defined as occurring when a patient visits multiple pharmacies.

Each definition of "polypharmacy" is intensional in its own way, although generally restricted to the numbers of medications used. However, there are many such definitions, and we are no nearer to agreeing on a standard.

Extensional definition

The word "extension" has many meanings, mostly related to its primary meaning of stretching out in some sense (Latin extensum). In logic it is defined as "Of a term or concept: Its range as measured by the number of objects which it denotes or contains under it."[14] So an extensional definition enumerates all the individual components of which the thing being defined consists.

For example, a diary can be intensionally defined as "A book prepared for keeping a daily record, or having spaces with printed dates for daily memoranda and jottings; also, applied to calendars containing daily memoranda on matters of importance to people generally, or to members of a particular profession, occupation, or pursuit."[15] However, I might define a specific type of diary extensionally by describing all the features that it contains. My Oxford University diary includes the dates of the full university terms, calendars, spaces for recording the titles of lectures, the dates of various holidays and religious feasts, spaces for diary entries, the names of university officers, addresses of university departments, libraries, colleges, and other institutions, and details of local bus services. That's an extensional definition.

The genome of a microorganism, such as the coronavirus SARS-CoV-2, can be regarded as an extensional definition of the organism, which can be used to design medicines that might be effective in treating it.[16]

Operational definitions

An operational definition describes how things happen, first one thing, then the next, and then the next. By describing all the processes involved one creates an operational definition.

When I explored the definition of translational research I found it simpler to start by developing an operational definition,[17] from which I then fashioned an intensional one.[18] I did something similar when discussing definitions of research in general.[19]

Ostensive definitions

The Latin word obtendere means to stretch out in front of or to give as a reason. From this comes the post-classical form ostendere, which means to show, indicate, or point out. Thus, ostensive definitions define things by pointing to them. This type of definition was originally defined by William Ernest Johnson in his three-volume work *Logic*, thus: "The appearance of ... an object in perception (or rather of some spatially or temporally limited part of that object) provides the necessary condition for imposing a name in the act of indicating, presenting or introducing the object to which

the name is to apply, and this it is that constitutes ostensive definition."[20]

Some things are most easily defined in this way. Colours, for example. You might define the colour red by referring to the wavelength of light that a red object absorbs. The *OED* describes it as "appearing in various shades at the longer-wavelength end of the visible spectrum, next to orange and opposite to violet."[21] However, it also describes it as "[d]esignating the colour of blood, a ruby, a ripe tomato, etc," which is ostensive, as if one were pointing at a tomato and saying "that's red."

Similarly, you might define an opinion column in *The BMJ* by going online, bringing this column up on your screen, and, pointing to it, say that it's an opinion column. That's an ostensive definition.

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