



What Are Abstract Concepts? On Lexical Ambiguity and Concreteness Ratings

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Abstract

In psycholinguistics, concepts are considered abstract if they do not apply to physical objects that we can touch, see, feel, hear, smell or taste. Psychologists usually distinguish concrete from abstract concepts by means of so-called *concreteness ratings*. In concreteness rating studies, laypeople are asked to rate the concreteness of words based on the above criterion. The wide use of concreteness ratings motivates an assessment of them. I point out two problems: First, most current concreteness ratings test the intuited concreteness of word forms as opposed to concepts. This ignores the ubiquitous phenomenon of lexical ambiguity. Second, the criterion of abstract concepts that the instruction texts of rating studies rely on does not capture the notion that psychologists working on abstract concepts are normally interested in, i.e., concepts that could reasonably be sensorimotor representations. For many concepts that pick out physical objects, this is not reasonable. In this paper, I propose a characterization of concrete and abstract concepts that avoids these two problems and that may be useful for future studies in psychology.

Keywords Abstract concepts · Concepts · Concreteness · Abstractness · Natural kinds · Scientific kinds · Imageability · Context-availability · Polysemy

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1 Introduction

Paradigmatic abstract concepts like ART,¹ DEMOCRACY or ETERNITY are usually difficult to make sense of even though we generally find it easy and natural to employ them in ordinary conversations. Sentences like “this is an interesting piece of art” or “Germany is a democracy” tend to be appropriately used and reacted to without requiring much contemplation. This ease of use of abstract concepts and words is puzzling considering that when asked to elaborate on what exactly we mean by these terms we are often unable to produce a satisfying answer. In contrast, paradigmatic concrete concepts like BALL, TABLE, WATER or DOG seem to be much easier to make sense of. If asked what we mean by ‘ball’ or ‘table’, it is usually sufficient to point at instances of the respective category or list typical properties in order to be understood.

Because paradigmatic abstract and concrete concepts are often experienced so differently, it is natural to hypothesize that they are of psychologically fundamentally different kinds. At first glance, the vast majority of research in psychology seems to support this intuition. It is now widely accepted that abstract expressions, i.e., expressions associated with abstract concepts, are more difficult to recognize (James 1975; Strain et al. 1995), recall (Jefferies and Lambon Ralph 2006; Nelson and Schreiber 1992) and understand (Holmes and Langford 1976; Schwanenflugel and Shoben 1983) than concrete words. Moreover, it has been argued that abstract concepts tend to be acquired much later than concrete concepts (Brown 1957; Schwanenflugel 1992) and that they store fundamentally different kinds of information (Barsalou and Wiemer-Hastings 2005).

The question that has occupied many theoretical and experimental psychologists is why abstract concepts and concrete concepts and words are processed so differently (see e.g., Schwanenflugel 1992 and Kiefer and Pulvermüller 2012 for reviews). Three theories have been primarily discussed. According to *dual coding theories* (Paivio 1991; Barsalou et al. 2008), abstract concepts, because they do not refer to physical entities, are associated with fewer sensorimotor-introspective representations and rely more on language-like, dis-embodied representations. Concrete concepts, on the other hand, are thought to be represented both by linguistic and sensorimotor-introspective representations. Dual coding theorists assume that this difference in format and number of kinds of representations (abstract concepts are supposed to only have the dis-embodied type of representation) makes concrete words faster to process.

According to competing theories like the *context-availability theory* (especially Schwanenflugel 1992), abstract concepts are more difficult to process, not because they are represented by means of fewer sensorimotor representations but because it is more difficult to retrieve general world knowledge that could characterize abstract words sufficiently, especially if presented outside of sentence and discourse context. According to a third influential view championed by Lakoff and

¹ I use capital letters as names of concepts, single quotation marks to denote words, and italics to denote properties. As is common in the philosophical literature on concepts (e.g., Fodor 1998), I sometimes use the expression ‘the concept of table’ instead of using the name TABLE. The terms ‘concept’ and ‘notion’ are used synonymously.

Johnson (1999), abstract concepts are primarily represented via metaphorical mappings to concrete concepts. They are thus more difficult to process and acquire because they ultimately rely on a rich understanding of the concrete concepts that they are allegedly understood in terms of.

To test theories of abstract concepts, psychologists usually compare the cognitive processes underlying the use of abstract and concrete words. When generating stimuli for their studies, they normally rely on so-called “concreteness ratings”. Concreteness ratings enjoy a growing interest in psychology and constitute the foundation of most of the studies that claim to have found a processing difference between abstract and concrete concepts. To illustrate this trend, note that when using the concreteness ratings collected in the easily accessible and highly popular MRC database,² researchers are asked to cite either Wilson (1988) or Coltheart (1981). According to Google Scholar, both were cited only 37 times in 2000, 279 times in 2015, 247 times in 2016, 260 times in 2017, 520 times in 2018 and 469 times in 2019.³

The growing interest and use of concreteness ratings call for a discussion of how they work and what exactly they measure. I point out two problems for current concreteness ratings like the ratings collected in the MRC database. First, nearly all current concreteness rating studies present subjects with lexical expressions or “lexical forms”, i.e., physical shapes that are conventionally associated with a meaning or concept. Lexical forms are usually highly ambiguous, and their different meanings may differ with respect to their concreteness or abstractness. For example, the word form ‘table’ is rated as highly concrete in the MRC database receiving a concreteness rating of 604 out of 700 even though the same lexical form may not only apply correctly to physical tables but to more abstract representations of distributions, e.g., in a PowerPoint presentation. I call this property of words and lexical expressions “concreteness ambiguity”.

A second problem with current concreteness ratings is that the characterization of the notion of abstract concept that most concreteness rating studies rely on, e.g., when formulating their instruction texts, does not seem to capture the notion that psychologists are normally interested in when studying the difference between abstract and concrete words. Normally, they are interested in concepts that cannot reasonably be grounded or couched in sensorimotor representations (cp., Löhr 2019). The instruction texts, however, construe concepts as abstract if they do not apply to physical objects that we can touch, see, feel, hear, smell or taste. The problem with this construal is that many concepts that apply to concrete physical objects are not easy to learn or represent in terms of sensorimotor representations alone. For example, the concept of atom (which received a rating of 481 out of 700, i.e., rated as being rather concrete) applies to a physical object, but to learn what the word ‘atom’ means, more is required than pointing at concrete instances or models of atoms.

² https://websites.psychology.uwa.edu.au/school/MRCDatabase/uwa_mrc.htm

³ Note that the MRC database contains more than just concreteness ratings. It also includes familiarity ratings, imageability or meaningfulness ratings, as well as measures with respect to the phonetic form of words taken from a variety of rating studies. Thus, the increase of popularity of the database may be due to the increase of use of the other measures and not of concreteness. However, a quick google search reveals that most of the recent papers who cite the MRC database also contain the keyword ‘concreteness’. Note also that most experimental studies rely on a number of different measures including concreteness along with, say, frequency and imageability.

To overcome both problems, I propose conditions that take lexical ambiguity into account and that better capture the notion of abstract concept under investigation. The result is not a definition in the sense of necessary and jointly sufficient conditions but a kind of heuristic or characterization that may help psychologists select their stimuli and paradigm examples on a more principled basis. Furthermore, it may provide them with reasons based on which they can justify these selections and develop better instruction texts for future concreteness ratings.

2 What Abstract Concepts Are Not

To understand what is usually meant by ‘abstract concept’ in the relevant areas of psychology, especially psycholinguistics, it will help to first understand what is *not* meant. Initially, one might assume that the term ‘abstract concept’ simply picks out concepts that denote abstract objects, where ‘abstract object’ is understood in the sense relevant for metaphysics and epistemology (see e.g., Kousta et al. 2011, for this construal). Paradigm examples of abstract objects are the number ‘2’ or the letter ‘A’. A paradigm example of a concrete object is the computer I am writing on (Rosen 2017).⁴ A second common way one might understand the notion of abstract concept is in terms of the notion of abstraction in the sense of generalization. According to this notion, concepts that are more general (‘animal’ is more general than ‘dog’) are also more abstract because they “abstract away” from details in order to derive a more general category.

Both notions of abstract concept – as concepts of abstract objects or as abstractions – would classify most lexicalized concepts as abstract. Even paradigmatic concrete concepts like TABLE do not refer just to a single concrete table but can be used to think about tables in general. Similarly, TABLE is more abstract, in the sense of more general, than the concept DINING TABLE, although, intuitively, both are equally concrete (Bolognesi et al. 2020). Moreover, while the notion of generality is clearly important for psychology, it is a different question whether a concept is difficult to process because it is more general or because it lacks physical interaction with a referent (see Bolognesi et al. 2020 for empirical evidence for the distinction between generality and concreteness). The literature discussed here is concerned with the latter but not the former question.⁵

Furthermore, we should distinguish the notion of abstract concept from related notions, in particular the notions of complex concept, vague concept or difficult concept. While DINING TABLE is syntactically more complex than the concept TABLE, it is again a different question whether a concept or word is more difficult to process or learn if it is syntactically complex compared to the question of whether it is more difficult to process if it lacks a physical referent. Similarly, the concept HEAP,

⁴ One of the main differences between abstract and concrete objects is that while two abstract objects can be instantiated in the very same concrete object (a ball can be both round and red), concrete objects like my computer cannot be at the very same location as another computer unless it is identical to it or its constituent.

⁵ One might also understand the notion of abstract concept in terms of the countability/mass distinction in linguistics. However, as Zamparelli (n.d.) convincingly shows, abstract and concrete concepts can both be mass and countability terms. This speaks against Borghi et al.’s (2017) recent proposal that abstract concepts can be individuated by means of boundedness.

unlike the concept TRIANGLE is vague (Russell 1923; Williamson 1994). While it cannot be determined when a collection of, say, sand, begins to be a heap of sand, the concept of triangle is clearly defined. This does not mean that HEAP is more abstract than TRIANGLE. Similarly, while DEMOCRACY is normally experienced as a “more difficult” concept than DOG, the question is whether – from the perspective of psychology – this is actually the case and whether the reason for the experienced difficulty is that DEMOCRACY does not pick out concrete physical entities.

In this paper, I am interested in a notion of abstract concept that is particularly relevant to current research in psychology and psycholinguistics on how we process language and thought. Concretely, I am interested in a notion of abstract concept that allows us to test whether concepts that could in principle be represented in terms of sensorimotor-introspective representations alone have a processing advantage.⁶⁷ The way this notion is currently characterized is not satisfactory. Thus, in the fourth section of this paper, I characterize a notion of abstract concept that captures what makes abstract concepts so interesting from the perspective of psychology. In the next section, I point out two problems with the way concreteness is currently determined in the majority of psychological experiments.

3 Concreteness Ratings

To assess whether a concept is concrete or abstract, psychologists typically start with the rough distinction between concepts that do and concepts that do not refer to concrete physical entities. This rough distinction is based on what I call “the current characterization”, which will be discussed in subsection 3.2. In addition, psychologists tend to give some examples of what they take to be paradigmatic instances of each category (BALL versus DEMOCRACY, TABLE versus ETERNITY, for example). However, in order to more objectively determine the concreteness of a concept, most psycholinguists rely on rating studies. These rating studies vary in methodology but almost all concreteness rating studies have in common that an often rather small number of subjects (often not more than 30 undergraduate students) are asked to judge the perceived concreteness of a number of lexical forms on a 1–7 Likert scale. The lexical forms are almost exclusively presented visually without sentence or discourse context.

The currently most popular and widely used concreteness ratings are the ones collected in the MRC database. The MRC database is an easily accessible online tool with a user-friendly interface that helps scientists to determine 26 psycholinguistically relevant variables of a large number of single lexical forms (4292 lexical forms in the case of concreteness). These variables include the number of letters, phonemes and syllables of a word as well as its frequency, familiarity, imageability, meaningfulness, age of acquisition and concreteness. The data is taken from a number of different rating studies and are collected in a single database, which allows the researcher to simply click on the variables they are interested in. The researcher will then instantly receive a list of words for which ratings are available in the database.

⁶ I do not take a stance in this paper on whether introspection should be included or not (see Connell et al. 2018). If this is what we are interested in with respect to abstract concepts, then it should. Otherwise not.

In the case of concreteness, the MRC database merged data from three bodies of concreteness norms: Toggia and Battig (1978); Gilhooly and Logie (1980) and an unpublished extension of Pavio et al. (1968). According to Wilson (1988), the different ratings correlate highly and were merged by adjusting both the means and standard deviations before averaging. The result of the merging process is expressed as integer values between 100 (being highly abstract) and 700 (being highly concrete). ‘Boat’, e.g., received a concreteness rating of 637, while ‘superfluity’ received a rating of 237. Most nouns, especially abstract nouns, received a rating between 250 and 550. ‘Democracy’ for example received a rating of 298, while ‘fact’ received a rating of 332. Most importantly, the different rating studies are all based on the following widely used instructions based on Spreen and Schulz (1966, 460):

Nouns may refer to persons, places and things that can be seen, heard, felt, smelled or tasted or to more abstract concepts that cannot be experienced by our senses. The purpose of this experiment is to rate a list of words with respect to “concreteness” in terms of sense-experience. Any word that refers to objects, materials or persons should receive a high concreteness rating; any word that refers to an abstract concept that cannot be experienced by the senses should receive a low concreteness rating. Think of the words “chair” and “independence.” “Chair” can be experienced by our senses and therefore should be rated as high concrete; “independence” cannot be experienced by the senses as such and therefore should be rated as low concrete (or abstract.)

In the next two subsections, I will argue that there are two serious problems with this instruction text. First, it does not capture the importance of lexical ambiguity, which generates the problem of *concreteness ambiguity* – the phenomenon that the same lexical expression can be associated with two or more concepts that have different degrees of concreteness. Second, I argue that it does not capture the notion of concreteness that psychologists who study concreteness are usually interested in. The current characterization of this notion is extensionally insufficient as it excludes concepts from the class of concrete concepts that we intuitively identify as concrete and it excludes concepts from the class of abstract concepts that we intuitively identify as abstract.

3.1 Concreteness Ambiguity

It is commonly assumed that concreteness ratings assess the concreteness of words and concepts. However, what participants of concreteness rating studies are actually presented with are not concepts but visual de-contextualized lexical forms or shapes. To understand why this is a problem, we need to understand the important distinction between a lexical form, i.e., a certain sound or shape and that which the form is conventionally associated with, i.e., a certain meaning or concept. This meaning or concept can be abstract or concrete. For example, the shape ‘bank’ may be a single lexical expression or form that is used to express two different concepts with different lexical entries (i.e., a homonym), one denoting financial institutions and one denoting riverbanks. Current concreteness rating studies brush over this important distinction by

testing the concreteness of lexical forms (almost exclusively shapes on a computer screen) as opposed to word meanings or concepts.

The problem with presenting participants of a rating study with single de-contextualized lexical forms is that especially abstract expressions tend to be associated with a number of different concepts or meanings (Schwanenflugel et al. 1988; Hoffman et al. 2011), which makes it difficult to determine which concepts or meanings participants had in mind when reporting their ratings. It can also not be ruled out that participants represent two different meanings or senses associated with a lexical expression and report the average of their assessment. This would explain the high variance of subjects' ratings (Pollock 2018). For example, when presented with the word 'bank', subjects may be confused as to whether they are supposed to rate the concreteness of the abstract financial institute or the concrete building that hosts the institute or the riverbank.

The phenomenon of linguistic ambiguity is especially problematic if the same expression is associated with distinct concepts that differ with respect to their degree of concreteness. I call this property of lexical forms "concreteness ambiguity". Examples of expressions that have this property are homonyms like 'chair'. The form 'chair' refers to the concrete object we can sit on as well as the more abstract category *head of a committee*. The problem also applies to polysemes like 'school' that can refer both to the building of the school as well as the more abstract educational institution (cp. Vicente 2018; Löhr 2021a). Finally, concreteness ambiguity applies to general concepts that can be applied to both physical and abstract objects. For example, 'art' applies both to abstract conceptual art and concrete paintings. 'Border' applies both to fences, rivers and mountains (natural borders) as well as abstract borders between two countries.

To appreciate the problem of presenting subjects merely with single word forms consider that the practice of de-contextualizing words is highly artificial. For example, participants do not usually see the word form 'truth' without any discourse or sentence context. This artificiality is especially problematic for studying abstract concepts and words. While one can have a clear sense of what 'ball' means even without the expression being embedded in a sentence, this is not as easy for words like 'impossible' or 'love'. That thinking about the meaning of words out of context is a potential confound was already suggested by the philosopher Gottlob Frege (1884) who argued that presenting words without a sentence context makes it more likely to construe meaning in terms of conscious mental images.

The problem of single-word studies with respect to accessibility of conscious mental images is of course only a problem for concreteness ratings if *imageability* is to be distinguished from concreteness. Imageability is another psycholinguistic variable that is often used in order to identify abstract concepts in psychology, especially by dual coding theorists. The degree to which a word is imaginable is also assessed via ratings, using the following instruction text (based on Cortese and Fugett 2004):

Words differ in their capacity to arouse mental images of things or events. Some words arouse a sensory experience, such as a mental picture or sound, very quickly and easily whereas other words may do so only with difficulty (i.e., after a long delay) or not at all. The purpose of this experiment is to rate a list of words as to the ease or difficulty with which they arouse mental images.

One might argue that imageability ratings usually do not have the same ambiguity problem as do concreteness studies. This is only the case, however, if the respective researcher is merely interested in the degree to which a given lexical expression arouses imagery. Most psycholinguists will be more interested in whether the form ‘table’, understood as correctly applying to the physical object, arouses more imagery than the same expression, understood as correctly applying to the arrangement of data in rows and columns. Current imageability ratings that are based on the above instructions therefore face the same problem as concreteness ratings. Lexical expressions do not only have the property of concreteness ambiguity but also the property of *imageability ambiguity*.

Moreover, even though imageability and concreteness ratings are highly correlated (Schwanenflugel 1992; Koutas et al. 2011), both notions should not be conflated. A word like ‘eternity’, for instance, is a clear example of an abstract concept for which it is relatively easy to form images (think of a lemniscate for example). Unsurprisingly, the word ‘eternity’ received an MRC concreteness rating of 300 out of 700 (again, 700 being highly concrete, 100 being highly abstract) but an imageability rating of 399 out of 700 (700 being highly imageable, 100 arousing very little mental imagery). Similarly, the word ‘etiquette’ received a concreteness rating of 252, but an imageability rating of 388. Participants seemed to agree that ‘etiquette’, even though it is rated as rather abstract, generates a lot of concrete mental imagery.

Furthermore, Kousta et al. (2011) show that imageability and concreteness ratings are differently distributed. Their analysis of ratings of more than 4000 words (derived from the MRC database) shows that imageability has a unimodal frequency distribution, while concreteness is bimodally distributed. This suggests that concreteness is a categorical property with two poles in the frequency distribution, while imageability is a graded property with only one pole. This also fits the observation that the description of imageability in the psycholinguistic literature picks out a vague property without clear boundaries, while the description of concreteness does arguably only ask for whether a concept does or does not denote a physical object.

So, the category of words whose referents are highly imageable is an interesting psychological category in its own right and ought to be distinguished from the category of words whose referents we can directly be perceived. More importantly, concreteness is not on the same explanatory level as other psycholinguistic variables, such as imageability. To construe them on the same level is to commit what philosophers call a “category mistake” (Magidor 2013; Ryle 1949). Concreteness ratings tell us whether a given concept or word refers to a physical object or not. Assuming the finding of a real “concreteness effect” from a well-controlled study, i.e., a real difference in processing between abstract and concrete words, we can then ask: what about the lack of physical referents makes concepts more difficult to process or what explains this concreteness effect? Lack of imageability could offer such an explanation⁷ but an answer in terms of lack of physical referent would be circular.⁸

⁷ For example, it was proposed that mental imagery is more directly connected to or identical with the conceptual system and can therefore allow concrete concepts to be processed more directly (Glaser 1992), assuming that we have more mental imagery of physical objects we can directly see and touch.

⁸ Imageability, too, is an explanandum. It raises the question of why the lack of imageability would have a cognitive effect. But, again, this question is on a different explanatory level as the explanandum of concreteness. The same is the case for other psycholinguistic variables, such as age of acquisition. We can explain age of acquisition for example in terms of difference in concreteness, familiarity or frequency.

To sum up, one major problem of concreteness ratings is that they measure the intuited concreteness of lexical forms when they are supposed to measure the concreteness of concepts. The best, or perhaps only, way to avoid the problem of concreteness ambiguity is to test the concreteness of words not by presenting mere lexical forms, but by presenting lexical shapes in different sentence contexts. For example, in order to test the concreteness of ‘school’ one might present a subject with two sentences “John enters the school after a break” and “The school celebrated its first anniversary”. To test the concreteness of ‘border’, one might present a subject with a sentence “John jumped over the border” and a sentence like “the border between Germany and France is open again”. To test the concreteness of ‘bank’, one might present the participant with the sentences “John sold the bank” and “John entered the bank”.

3.2 Problems with the Current Characterization

Another major problem for current concreteness ratings is that most instruction texts for participants not only ignore the problem of lexical ambiguity – in particular concreteness ambiguity – but also fail to capture the relevant notion of abstract concept. The main reason why abstract concepts are interesting for the study of the mind and language is a long-standing interest in the question of whether it makes an interesting cognitive difference whether a concept refers to an entity that we can directly touch, see, hear, feel, smell and taste (Löhr 2019). The intuition shared by many psychologists is that direct interaction with physical objects makes cognition generally easier and that children are faster at learning words of objects that they can directly touch and see (for a review see e.g., Schwanenflugel 1992). The most basic condition for being an abstract concept is thus that it does not refer to physical objects that we can directly (i.e., without the help of special instruments) touch, feel, hear, smell, taste or see.

Unfortunately, the condition of directly perceivable physical object that current concreteness ratings rely on (see the instruction text mentioned above) is not adequate to pick out the class of concepts that may allow us to study the impact of direct interaction on cognition. The main problem is that many concepts that we intuitively construe as abstract apply to entities that we can directly touch and see. For example, the concept of manager is intuitively rather abstract (a child will not learn this concept by seeing a manager) even though it usually applies to human beings we can directly touch and see (I can literally see and touch a manager). The same goes for SECRETARY OF STATE, PRESIDENT or BACHELOR.

Second, some paradigmatic abstract concepts like ATOM or UNIVERSE refer to physical material things that we can, in a sense, directly see or touch (I can literally see and touch a table made of atoms just as I am literally sitting inside the universe). Both are, however, far too small or far too large for us to conceptualize anything *as* atoms or universes by means of direct perception alone and without additional education. While touching a middle-sized object, say a ball, is arguably sufficient for us to think about something *as* a ball, touching a table is not sufficient to conceptualize this table as a collection of atoms or as a constituent of the universe. The current characterization of the meaning of ‘abstract concept’ that most concreteness ratings rely on cannot capture the abstractness of very large and very small physical objects.

Third, as argued above, many concepts apply both to physical objects as well as more abstract ideas (what I called “concreteness ambiguity”). For example, the concept of border

applies both to fences as well as immaterial borders between countries. The concept of art applies both to concrete paintings, conceptual art, as well as the more general abstract idea of art. The expression ‘book’ applies not only to the physical object but also its informational content (Falkum 2011; Liebesman and Magidor 2017). Thus, it is not clear whether we should judge a concept that applies to a physical directly perceivable object as concrete if it also applies to other entities that are more abstract.

A fourth problematic class of concepts for the current characterization of ‘abstract concept’ are simple adjectives like ‘red’ or ‘tall’ as well as verbs like ‘running’ or ‘climbing’. Intuitively, they seem rather concrete but relying on the current notion of concrete concept as referring to physical objects that we can directly touch and see, neither RED nor RUNNING should be considered concrete. This is a problem for research on the impact of direct perceptual access on cognition because, again, RED and RUNNING seem to be exactly the kind of concepts that could, *prima facie* at least, be acquired, represented and applied by means of perceptual representations alone.

A fifth challenging class of concepts for the current notion of abstract concepts are superordinate concepts like VEGETABLE, FRUIT or ANIMAL. Superordinate concepts often refer to concrete objects we can touch and see and should thus be rated as highly concrete based on our initial characterization above. On the other hand, since superordinate categories are still highly general, more is needed to acquire such categories than seeing instances of fruits or animals. Unlike subordinate and basic-level categories, superordinate categories are impossible to acquire from seeing or touching typical instances because the perceptually accessible properties of superordinate categories are, by definition, not diagnostic of the category (Rosch 1978; Lakoff 1987). Consider for example the category FRUIT. Even typical fruits, such as apples, bananas and pineapples, have superficially little in common from which we could perceptually derive the relevant superordinate category (Löhr 2017).

So, the main problem for the current construal of abstract concepts is that the ability to directly touch or see the physical objects that these concepts apply to alone is extensionally insufficient. Atoms are too small and the universe is too vast for us to conceptualize something in terms of their respective concepts, at least by means of perceptual interaction alone. Being taught what an electron is simply by being presented with a concrete representation of an electron (e.g., a ball) helps little to understand what is meant by ‘electron’ (Schurz 2015). On the other hand, some concepts like RED or RUNNING seem to be rather perceptually accessible without them referring to physical objects.

In order to capture a notion of abstract concepts that allows us to investigate the role of direct physical and perceptual interaction on concept acquisition, representation and processing, more is needed than the current characterization provides us with. What we need is a characterization that captures a class of concepts for which it is at least reasonable to hypothesize that their acquisition, representation and applications (e.g., in categorization) can, at least to a substantial degree, be explained entirely by means of sensorimotor and introspective representations alone. Thus, we want a characterization that picks out only those concepts for which the following is at least plausible: if it is at all true that some concepts could, at least in theory, be represented and applied sufficiently by means of sensorimotor-introspective representations alone, then it should be those concepts that we call “concrete”.⁹

⁹ This of course leaves open the empirical possibility that even concrete concepts require more than just sensorimotor introspective representations.

4 A Characterization of 'Abstract Concept' for Psychology

The aim of the characterization I propose in this section is to capture a certain notion or idea. This description captures that which interests us about certain concepts, i.e., properties that make abstract concepts interesting for the study of the mind. It will allow psychologists to more clearly identify at least paradigmatic instances of abstract concepts taking lexical ambiguity into account and without conflating concreteness with generality, difficulty, vagueness, complexity or imageability. In other words, the aim is to give a theoretically motivated characterization of the phenomenon under investigation that is useful for psychologists to select paradigm cases on a principled basis and to formulate a better instruction text for future concreteness studies. Moreover, it will provide psychologists with potential justifying reasons for their methodological choices (e.g., with respect to selecting stimuli).

I propose that the following characterization of abstract and concrete concepts captures the requirements mentioned above.

Concrete concept: A concept is concrete if

- a) it applies to events, actions, properties, relations, or objects whose diagnostic features are perceptually, motorically or introspectively directly accessible and
- b) it is reasonable that representing these features is sufficient for the possession of the concept.

Abstract concept: A concept is abstract if

- a) it applies to events, actions, properties, relations, or objects that do not share diagnostic features that are perceptually, motorically or introspectively directly accessible or
- b) it is reasonable that representing the diagnostic features is not sufficient for the possession of the concept.

The here proposed characterization differs from the old characterization in three ways. First, in order to avoid the problem caused by lexical ambiguity and concreteness ambiguity, it does not refer to words or lexicalized forms but concepts. Second, it includes concepts that refer to entities that are not objects. This is motivated by the assumption that certain events and actions like running may be just as concrete, in the relevant sense, as tables or dogs. Third, it gives a prominent role to diagnostic features, which is a familiar notion in psychology that is fundamental to theories of categorization like prototype theory (Rosch 1978; Lakoff 1987). The notion that some features may be more or less diagnostic of a category also plays an important role in popular theories of concept acquisition in philosophy of psychology (Fodor 1998; Margolis 1998; Prinz 2002; Margolis and Laurence 2011; Löhr 2021b). The idea that these philosophical theories have in common is that representing certain diagnostic features of a category may suffice for the possession of the corresponding concept, i.e., without having to represent necessary and sufficient conditions that pick out the corresponding referent. Put differently, I argue that whether or

not a concept should be considered as being concrete has to do with whether its diagnostic sensorimotor features may reasonably suffice for concept possession rather than whether it has a physical referent.¹⁰

The notion of concrete concept characterized here applies to concepts like BALL, TABLE and RUNNING, but not to concepts like ATOM, UNIVERSE or DEMOCRACY. Again, in order to acquire and apply BALL it is at least reasonable that all we require is to touch and see balls. This is because balls are not only physical objects we can directly see and touch but also because that which we can directly see and touch is highly diagnostic of the category ‘ball’. It is at least reasonable that what we can see and touch is sufficient to acquire and apply the respective concept. Similarly, even though RUNNING does not pick out a physical object, it still seems reasonable to assume that all we need to do to acquire and apply this concept is to see someone making certain movements assuming the movements are highly diagnostic of the category.

To make the basic idea underlying the proposed characterization more vivid, I consider concepts concrete for which it makes sense to assume that merely pointing at instances (without much knowledge of practices and customs of the respective linguistic community) suffices to be able to learn what the respective word means (cp. Schurz 2015 on the notion of ostensive learnability). Paradigmatic examples of concrete concepts are then EAR, HAIR, WIND, SUN, MOON, NOSE, WATER, TABLE, HAMMER, i.e., everything that a person who is a total stranger to a linguistic community may have less trouble picking up as one of their first words. To acquire the concept of democracy, on the other hand, arguably more is needed than merely seeing people put paper in a box. Similarly, in order to acquire the concept ATOM, more is needed than seeing a ball-like representation of an atom. In order to successfully acquire and apply ATOM we seem to require the information that atoms are incredibly small and that which constitutes all objects we are familiar with (see again Schurz 2015).

Importantly, the characterization proposed here provides a plausible reason to exclude superordinate concepts from the class of concrete concepts. For example, apples share a number of superficial, i.e., perceptually directly accessible properties that are highly diagnostic of the category. The class of apples is relatively homogenous, which allows us, at least in principle, to acquire the category from seeing a few instances (cp. Margolis 1998, Prinz 2002). This ceases to be the case for superordinate categories like ‘fruit’ that are more heterogeneous. Typical fruits like apples share few immediately visible features with other typical fruits like bananas or pineapples. Thus, in order to teach a child the concept of fruit, we arguably need to do more than show them a number of typical fruits. For example, what could be sufficient in addition is to learn practices associated with fruits. In other words, only basic-level and sub-ordinate concepts (Rosch 1978) can be concrete concepts.

Regarding words that are ambiguous with respect to their concreteness (cases of concreteness ambiguity), such as ‘border’ or ‘art’, we can now say that even though a

¹⁰ Some readers may be reminded of a proposal by Della Rosa et al. (2010) who tests the mode of acquisition (MOA) of concepts, i.e., whether a word is acquired merely by means of language. However, MOA is a difficult measure with the same flaws that were pointed out earlier given as subjects are again only presented with single words.

border can be instantiated concretely, the word ‘border’ is a more general term that applies to many different kinds of borders. This is not the case for a concrete word like ‘fence’ which always applies to concrete physical objects. So, it makes sense to hypothesize that we can acquire FENCE simply by seeing, touching and interacting with fences, while this is more difficult for a more general concept like BORDER, which requires more than mere physical interaction even though there can be concrete instances of borders. In the case of expressions that refer both to abstract and concrete objects (such as ‘book’), this issue can arguably be resolved by hypothesizing that a single word is associated with both abstract and concrete concepts.

Finally, with respect to intuitively concrete concepts like RED or ROUND, such concepts can be viewed as primitive in the sense that we can classify something as red without this being mediated by other representations, such as beliefs of what conditions a thing has to meet in order to be red. It is possible that children immediately classify things as red and round simply by means of unlearned innate capacities and it is plausible that especially these concepts can be represented and applied by sensorimotor symbols alone. In this sense, RED refers to a property that we can directly see (we can directly see things as red) and instances of red are homogeneous and diagnostic of the category of red not because of the intrinsic properties of those things, but because certain things simply look red to us (see Fodor 1998 for the discussion on the semantics of color concepts).¹¹

I argue that the proposed characterization of abstract and concrete concept captures well what we want the notion of abstract concept to capture in psychology and cognitive science. In other words, it is extensionally superior to the current characterization. Again, I assume that the aim is to investigate the impact of direct sensorimotor interaction with a referent on concept and language acquisition and processing. The proposed characterization of concrete concept picks out concepts for which it is at least reasonable that their acquisition, representation and application (e.g., in categorization) can be fully explained by sensorimotor representations. Most importantly, the characterization does not conflate concreteness with imageability, complexity, difficulty and generality, even though many abstract concepts are also highly general, complex, difficult and score low on imageability ratings.

Finally, it should be noted, that the here proposed characterization is both more restrictive and relaxed than the notion of abstract concept that has been used in psycholinguistic experiments where psychologists rely on a less theoretically motivated distinction and the above discussed concreteness ratings. It is more restrictive because it acknowledges the important relation between superficial and diagnostic properties that excludes superordinate categories from being concrete. It is more relaxed in the sense that I do not restrict the notion to physical objects. Most importantly, compared to the way concreteness is currently estimated – mostly by looking at expressions and not concepts – the here proposed way to distinguish abstract from concrete concepts is far more fine-grained.

¹¹ Note that even though it may be more difficult to learn which concept fits to the use of the lexical form ‘red’ than it is to learn the meaning of ‘ball’ (Werning 2010; Gärdenfors 2019), this does not necessarily mean that for a baby to possess the concept of red or to adequately distinguish red from non-red things, we need language or amodal representations (although it might still be possible that this is the case, it is rather unlikely). The so-called “complex first problem” applies to language and not to concepts.

To illustrate the advantage of the here proposed characterization, take Sadoski et al.'s (1997) investigation of the concreteness effect, i.e., the question of whether there is a processing difference between concrete and abstract words. The authors followed Reynolds and Paivio (1968) and classified the expressions 'library', 'prisoner', 'picture', 'hotel', and 'mother' as concrete words and 'crime', 'science', 'mind', 'fun' and 'death' as abstract words. It is not a clear-cut matter whether these expressions are concrete or abstract especially if all we have available is a characterization that does not acknowledge lexical ambiguity. For example, the word 'death' is commonly thought of as abstract referring to a supposedly abstract "idea", but the same expression also refers to the impersonation of death, which is highly iconic and concrete. A characterization based on the idea that concrete concepts refer to physical concrete objects fails to acknowledge that the concept of death is usually easily applied to physical objects and accompanied by properties that are highly diagnostic of the category. It is not implausible that a non-linguistic child and even a non-linguistic animal could be able to distinguish dead from living animals by means of vision and smell alone. *Prima facie*, DEATH is a highly abstract concept but on a closer look it seems less clear whether it may not be rather concrete in the sense relevant for research in cognitive science, especially psycholinguistics.

The here proposed characterization provides a more useful, sensible and principled assessment of the expressions selected by Sadoski and colleagues. First, unlike the old characterization, the here proposed characterization emphasizes that the properties *concreteness* and *abstractness* apply to concepts as opposed to lexical forms. This means that it may be that a word like 'mother' may be both abstract and concrete depending on which concept or meaning the subject retrieves first. Second, it emphasizes diagnosticity as crucial determiner of concreteness. For this reason, 'library', 'prisoner', 'picture' and 'mother' may all be concrete based on my characterization if, for example, in the respective culture those categories may have clear perceptually accessible diagnostic properties. It is not unreasonable that a person who is new to a linguistic community and has never seen a library before may acquire the meaning of the word 'library' just by visiting a distinctive looking place with books.¹²

To give another example, consider two concepts of mother, one being PRIMARY FEMALE CAREGIVER, the other being THE WOMAN WHO IS THE SOURCE OF ONE'S MITOCHONDRIAL DNA. Intuitively, the former concept seems significantly more concrete than the latter. It is not unreasonable that this impression can be captured by the notion that the former may sufficiently be acquired, represented and applied by sensorimotor representations alone (representing *always being around, nurturing*). The sensorimotor experience made with the primary female caregiver is so diagnostic of the category that it is plausible, at least from a theoretical perspective, that it suffices to possess this concept of mother (cp. Margolis 1998; Löhr 2021b). More is needed to possess the more demanding scientific concept involving scientific concepts like DNA.

¹² Note that 'library', too, is highly polysemous. It may refer to the building as well as the institution. It may also apply to a set of data or information used by computer programs. Thus, a child who learns to use the word as applied to the institution and building associated with books may not possess the concept relevant for computer scientists.

Note that I do not claim that the here proposed characterization is a definition in the sense of necessary and jointly sufficient conditions. This also means that the characterization does not entail that the distinction between abstract and concrete concepts is binary or clear-cut. There may be many concepts that do not clearly fit either classification. I also do not claim that it is already suitable for concreteness rating studies. In fact, it might still be difficult for laypeople and researchers to determine which words or concepts meet the conditions. The question of what part of society will be best suited to judge which concepts meet the conditions cannot be answered here as it requires further empirical and methodological research. Again, the hope is that the here proposed characterization and the previous remarks will at least help to improve future instruction texts and concreteness studies. Moreover, the main focus here is on providing a better description of what kind of concepts we are in fact interested in.

Crucially, I do not claim that a concreteness study based on the here proposed characterization necessarily generates different stimuli assuming that future studies take concreteness ambiguity into consideration. It would of course be a relief if a set of paradigm examples that would be selected based on the here proposed characterization strongly overlaps with the set of examples generated by currently available studies. A strong overlap would support previous findings of a concreteness effect especially if such findings are based on stimuli generated by stimuli with extreme ratings and low standard deviation as proposed e.g., by Pollock (2018) and Verheyen et al. (2020). In fact, at least many of the words in the MRC database rated as clearly concrete (600–700) and the words rated as highly abstract (100–300) also meet the conditions of concreteness and abstractness proposed here. The difficult words are the ones that received ratings between 300 and 600, such as ‘essay’ (527) or ‘evangelist’ (500) both of which possess a high degree of concreteness ambiguity (essays and evangelists are, in a sense, physical objects but cannot merely be acquired ostensibly).

The aim of the characterization proposed here was to provide psycholinguists with a characterization or description of what especially these paradigm examples may have in common that make them scientifically interesting. My hope is that if stimuli are presented within sentence context and with an instruction text based on the characterization provided here, subjects of rating studies will make at least more specific and accurate classifications than the current characterization allows them to. Moreover, I hope that it will allow psychologists to identify paradigmatic instances of abstract concepts on more principled grounds beyond mere intuition.

5 Conclusion

There has been a growing interest in concreteness ratings in recent years. This growing interest motivated this critical discussion of what exactly concreteness ratings are and what they measure. I pointed out two problems. First, most current concreteness ratings do not measure the concreteness of words or concepts but of lexical forms. Second, the current characterization that the instruction texts of most concreteness studies are usually based on does not capture the relevant notion of abstract concept. I argued that in order to alleviate the first problem, stimuli should be presented in a sentence or even discourse contexts that can draw out the relevant senses of the word. In order to alleviate the second problem, I proposed a characterization of a notion of concreteness

that avoids the problems of the current understanding. This characterization may be used to design more fruitful concreteness rating studies that avoid the problem of concreteness ambiguity.

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