What is iconicity? The view from sign languages

Abstract Iconicity has been defined in three majors ways in the sign language literature. Some authors describe iconicity as a similarity mapping between a signifier (the mental representation of the form side of a linguistic sign) and its referent, while others state that iconicity is to be understood as a similarity mapping between a signifier and its meaning. Other scholars have defined iconicity as a similarity mapping between a signifier and some other mental representation. The goal of this paper is to give an overview of the consequences entailed by defining iconicity as a mapping between a signifier and its referent, a signifier and its meaning, or a signifier and some mental concept. These consequences will be discussed from different theoretical perspectives. It will be argued that definitions viewing iconicity as a mapping between a signifier and some associated mental concept work best, while definitions based on reference and meaning run into several theoretical problems or are, at least, rather theory specific.

Keywords: iconicity; iconic; arbitrariness; meaning; reference

1   Introduction

Iconicity has played a major role in sign language research in recent years (and also in the linguistic literature in general, see, for example Meir & Tkachman 2018 for an overview). While definitions of iconicity found in the literature agree that iconicity is to be regarded as a non-arbitrary similarity mapping, the terminology used by different authors diverge. Three major definitions can be distinguished. For some researchers iconicity is a non-arbitrary (i.e., motivated) similarity mapping between a signifier and its referent, for others it is a similarity mapping between a signifier and its meaning. These two definitions are given in (1) and (2).[1]   Non-arbitrariness here is to be understood as motivation

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[1] Note that the notion of "sign" in these definitions refers to linguistic symbols in general and not only to signs of sign languages.

based on a similarity between visual characteristics of the signifier and its referent/meaning. Note that I use the term "signifier" here. Basically following Saussure (1916), the signifier is a (maybe abstract) mental representation of the surface form of a linguistic sign.

(1)   The reference definition:
      Linguistic signs are called iconic if there is a non-arbitrary similarity mapping between a signifier and its referent.

(2)   The meaning definition:
      Linguistic signs are called iconic if there is a non-arbitrary similarity mapping between a signifier and its meaning.

Besides the reference and the meaning definition there is a third class of definitions which I call the mental representation definition shown in (3). Note that differentiating between reference, meaning, and other mental representations presupposes that these notions actually refer to different things as discussed in the article—and this indeed is a view defended by many researchers.

(3)   The mental representation definition:
      Linguistic signs are called iconic if there is a non-arbitrary similarity mapping between a signifier and a mental representation (concept) associated with it.

Table 1 shows a sample of definitions of iconicity making use of the terms "reference", "meaning", and "concept"/"mental representation". The goal of the present article is to survey and to evaluate these three kinds of definitions from different theoretical perspectives. This will be done in order to track down a broadly applicable definition of iconicity. It is important to note that the theoretical perspectives discussed in this survey are not necessarily the ones shared by the authors cited in Table 1. To be more precise, the cited authors quite likely have understandings of the terms "meaning" and "reference" that diverge from the uses of these notions in at least some schools of thought. The

Table 1: Examples of the three major definitions of iconicity found in the literature.

Reference definition	Source
"We take iconicity to be any resemblance between certain properties of linguistic/communicative form (this includes sign or spoken language phonology, sign or spoken language prosody and co-speech gestures) and certain sensori-motor and/or affective properties of corresponding referents."	Perniss & Vigliocco (2014: 2)
Iconicity is taken "as the direct relationship between a linguistic form and its referent".	Ortega (2017: 1)
Iconicity is "the use of forms that resemble what they refer to".	Roberts, Lewandowski & Galantucci (2015: 52)
Iconicity exploits a "similarity mapping between form and referent".	Perniss et al. (2018: 1)
Iconic signs are "signs that incorporate features of their referents".	Ortega, Sumer & Ozyurek (2014: 1114)
Iconicity is "strictly considered as the reflection in linguistic structures of extralinguistic reality" and an iconic relationship as a relationship between the form of signs and "the reality they represent".	Pietrandrea (2002: 297/302)

Meaning definition	Source
Iconic lexical items are "signs or words that resemble their meaning".	Caselli & Pyers (2020: 127)
Iconicity is defined as "the transparent relationship between meaning and form".	Thompson, Vinson & Vigliocco (2009: 550)
"An iconic sign/word is one whose form represents its meaning in some way".	Novogrodsky & Meir (2020: 820)
Iconicity is defined as "regular correspondences between form and meaning".	Perniss, Thompson & Vigliocco (2010: 2)
Iconicity is defined through "resemblance relationships between form and meaning"	Perniss et al. (2018: 1)

Definition	Source
Iconicity is defined as "a resemblance between properties of linguistic form (both in spoken and signed languages) and meaning".	Perniss & Vigliocco (2014: 1)
Iconicity is defined as "a resemblance between linguistic form and meaning".	Baus, Carreiras & Emmorey (2013: 261)
Iconicity is "the existence of non-arbitrary links between meaning and form".	Thompson (2011: 603)
"Iconicity is generally defined as a resemblance between a linguistic form and its meaning [...] in which aspects of the form and aspects of the meaning are related by perceptual and/or motor analogies [...]".	(Sehyr & Emmorey 2019: 209)
"Iconicity is a semiotic feature [...], whereby a linguistic form resembles one or more aspects of its meaning"	(Nyst et al. 2021: 2)
Mental representation definition	**Source**
Iconicity is "relation is between construals of real-world scenes and construals of form".	Wilcox (2004: 123)
With iconicity "there is a *structural alignment* between two current mental representations" (emphasis in the original).	Emmorey (2014: 4)
"[I]conicity is a distance relation between structures in multidimensional conceptual space".	Wilcox & Martínez (2021: 502)
Iconicity is defined "as a special case in which the phonological and the semantic poles of a symbolic structure reside in the same region of conceptual space".	Wilcox (2004: 119)
Iconicity "is not an objective likeness between a referent and a linguistic form but a mentally constructed correspondence between two cognitive products".	Grote & Linz (2003: 25)

different conceptions of these terms are exactly what the present survey draws on. It will be argued that the reference and the meaning definition face some serious theoretical problems. In many cases, the solutions to these problems are rather easy. However, most of these solutions involve changing the definitions to some sort of mental representation definition. Yet this would turn the terms "meaning", "reference", and "mental representation" (or "concept") into synonyms which would be a rather unwelcome conclusion. The goal of the present article is, thus, to problematize the words used in different definitions of iconicity. The goal is not to assign theory-specific meanings to expressions like "reference" or "meaning" or to criticize the cited authors for using these words, but to raise awareness that such expressions have different meanings in different theories which could lead to confusion as to what iconicity actually is. Although the focus of the current paper lies on sign languages, I hope that it will also be interesting for researchers working on spoken languages.

The paper is structured as follows. In Section 2, some motivational examples of signs will be introduced which can or were considered to be iconic. In Section 3, the reference definition and its problems will be discussed. Section 4 is devoted to the meaning definition and its problems. Section 5 is concerned with the mental representation definition. Finally, Section 6 concludes the paper.

2 Iconic signs

On a lexical level, sign languages make heavy use of iconicity, that is, the form of a given sign is somehow motivated by visual characteristics that originally lie outside of the respective language. In this section, I will briefly discuss some motivational examples of signs which can probably be or were considered to be iconic in the literature. Note that I will start with examples which are probably considered to be iconic by most researchers and then proceed to more controversial examples. One goal of the paper will be to examine which of the existing definitions of iconicity cover these more controversial examples best.

Figure 1 shows the signs BIRD from German Sign Language (a) and British Sign Language (b).[2] These signs illustrate an often discussed property of iconicity in sign languages, namely, that it "is created from the representation of only certain salient element(s) of real-world objects" (Thompson, Vinson & Vigliocco 2009: 554). Which of these elements are chosen is subject to cross-linguistic variation (this was probably first discussed in Klima & Bellugi 1979). The salient elements in (this variant of) the sign BIRD from German Sign Language are the wings of a bird and the salient element in the same sign from British Sign Language is the beak. This illustrates that iconicity does not completely determine the form of a sign, but also that the surface form of the signs is not completely arbitrary. Instead, the form of the signs can be called motivated (Taub 2001). Note that motivation cannot be equated with iconicity, but also not with arbitrariness. The crucial ingredient of iconicity is that the motivation is based on a similarity mapping of some sensory image (with a broad use of the term "image" including other senses than vision to caption iconicity in different modalities).[3]

The fact that sign languages make use of only certain visual features leads to the observation that iconicity makes use of metonymy, which can, for example, be defined as "a cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target" (Radden &

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[3] When discussing iconicity researchers often make reference to Ferdinand de Saussure and his claim that arbitrariness is a core feature of natural languages. Saussure actually took two views about what arbitrariness means. First, he claimed that there is no natural connection between the signifier and the signified: "The bond between the signifier and the signified is arbitrary" (Saussure 1916: 100, translation from Saussure 2011: 67). Instead, this connection is unmotivated according to Saussure. This, however, is obviously not what we find with many signs from sign languages. The second view relates to the sign as a whole which only fulfills its function when used by a language user because of the fact that it is conventionalized: "In fact, every means of expression used in society is based, in principle, on collective behavior or—what amounts to the same thing—on convention" (Saussure 1916: 101, translation from Saussure 2011: 68). That is, there is an "unspoken" rule to use a certain signifier and no other. The latter point, but not the first, is clearly given in sign languages. While the role of iconicity in spoken languages was downplayed for a long time, it is now believed that it clearly plays a bigger role than previously thought also in spoken languages (see Dingemanse et al. 2015 for an overview).
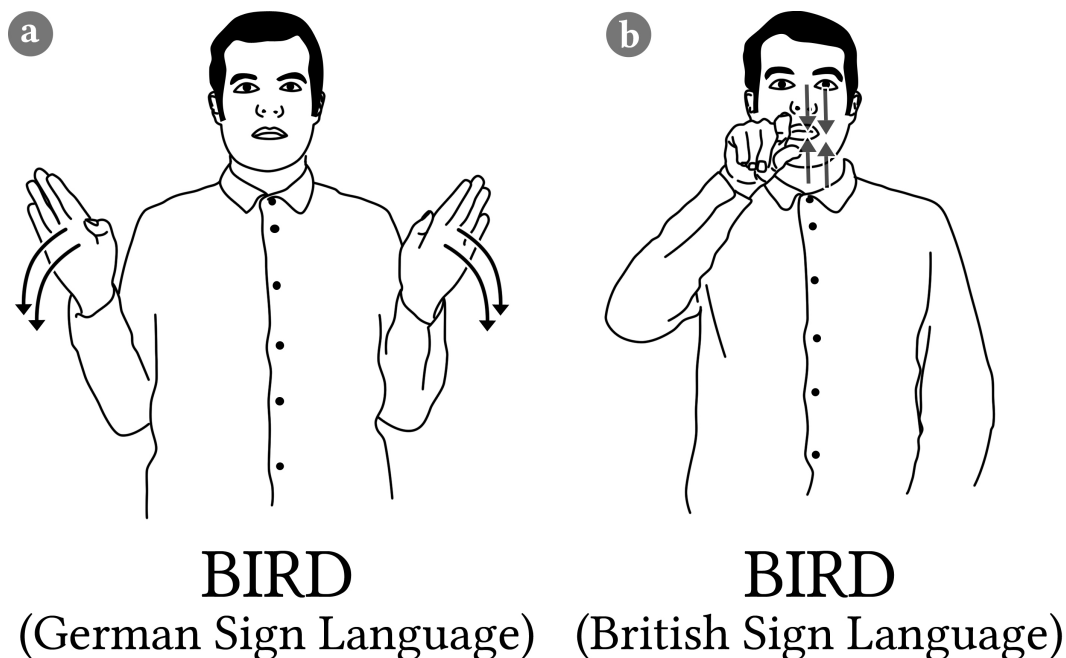
Figure 1: The iconic signs BIRD from German Sign Language and British Sign Language.

Kövecses 1999: 21). In Figure 1a the wings stand metonymically for a bird and in Figure 1b the beak stands metonymically for a bird. At the same time, iconicity is, of course, constrained by the phonotactic rules of a given sign language.

An additional point relates to the different degrees of iconicity assumed in the literature (Klima & Bellugi 1979), with the clearest cases called "transparent signs". This idea has been adopted by many researchers including, for example, Sehyr & Emmorey (2019), who define transparency "as an individual's ability to infer a sign's correct meaning based on the sign form alone" (p. 209). Completely transparent signs probably do not exist. While signs like EAT or DRINK are, for example, typically extremely transparent, it is not possible for a naïve observer to decide whether these signs mean 'eat' and 'drink' or 'food' and 'beverage' respectively (or even simply 'put something in a mouth') because "[s]ign languages in general show more flexibility regarding lexical categorical distinctions, in that words in many sign languages are often multicategorical
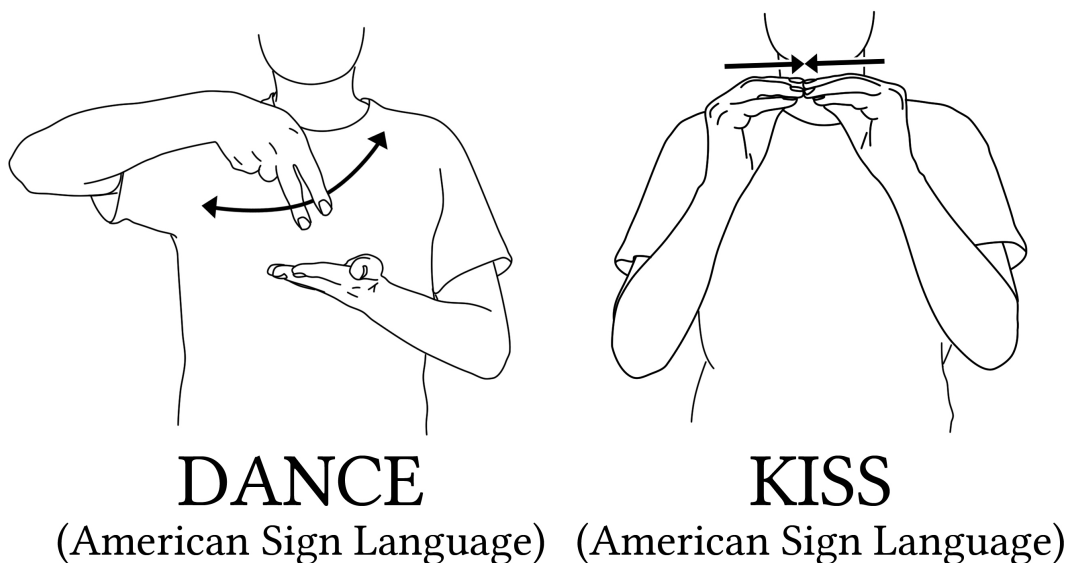
DANCE (American Sign Language) KISS (American Sign Language)

Figure 2: The ASL signs DANCE and KISS. It is not easy for a non-signer to guess their meanings, i.e., these signs are non-transparent. However, the hands with DANCE arguably iconically represent two moving legs and a floor while the hands with KISS iconically represent the lips of two persons coming in contact.

and can be interpreted as nouns, verbs, or adjectives" (Meir & Cohen 2018: 9; see also Meir 2012).

The level of transparency on the one hand and iconicity on the other are two dimensions to be kept apart because a sign can be iconic, but the sign can be non-transparent at the same time because an individual not acquainted with a given sign language cannot guess its meaning (see also the discussion in Occhino et al. 2017). This means that a sign can be iconic for some individual A and non-iconic for another individual B. Iconicity thus is in the eye of the beholder (Occhino, Anible & Morford 2020), an idea which is also supported by empirical evidence (Occhino et al. 2017; see the more detailed discussion in Section 5). I take, for example, the verb signs DANCE and KISS from American Sign Language to be iconic (see Figure 2), although they were rated as being non-transparent in a study by Baus, Carreiras & Emmorey (2013). With the sign DANCE, the index and the middle finger of the dominant hand represent moving legs while the non-dominant hand represents a floor. With the sign KISS, each hand represents the pursed lips of an individual engaging in a kissing

action. The sign is performed by moving the two "mouths" together. I will come back to the iconicity and different levels of transparency and different combinatorial possibilities at the end of the article (see Section 5).

More extreme cases of signs which have been analyzed as being iconic, but which are not very transparent are the signs GERMANY, RED, and CHERRY from German Sign Language depicted in Figure 3. The first sign in the figure depicts the sign GERMANY which is performed by an extended index finger on the forehead (the sign also exists in other sign languages like British Sign Language or Sign Language of the Netherlands). The sign is clearly an example of a sign which is not very transparent, as it "is recognizably iconic only if one knows that the Prussian military used to wear spike helmets" (Roberts, Lewandowski & Galantucci 2015: 53). Of course, this sign also makes heavy use of metonymy (see below), but metonymy, as shown above by the examples of the signs for 'bird', is a core characteristic of many (if not all) iconic signs. Other authors are more careful in their judgments of the iconicity of the sign GERMANY. Zeshan (2003), for example, claims that the sign GERMANY originally was, but now is no longer iconic. Pfau (2010) does not call the sign iconic, but motivated. However, motivation also is a core property of iconic signs (Taub 2001). The sign is simply not very transparent anymore. This, in turn, is simply because of the aforementioned fact that iconicity is always in the eye of the beholder—a conclusion already reached by Ferdinand de Saussure (see Joseph 2015 on this point in Saussure's work). The reason for the controversial status of GERMANY is that the sign's motivation—the metonymic link between spike helmets and Germany—is no longer transparent as spike helmets are not used in Germany anymore.

The signs RED and CHERRY have been called iconic, for example, by Pietrandrea (2002).[4] With RED, the lips stand metonymically for their (prototypical) color and with CHERRY, the index and middle finger iconically represent the typical bifurcated branch carrying the fruit which is often put behind the ears. In Pietrandrea's words, "body locations can iconically represent [. . .] the cultural value attributed to the body part" (Pietrandrea 2002: 302–303).

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[4] Note that the signs depicted in Figure 3 are from German Sign Language and Pietrandrea's (2002) study is concerned with Italian Sign Language. However, the signs RED and CHERRY do not differ much in these two languages.
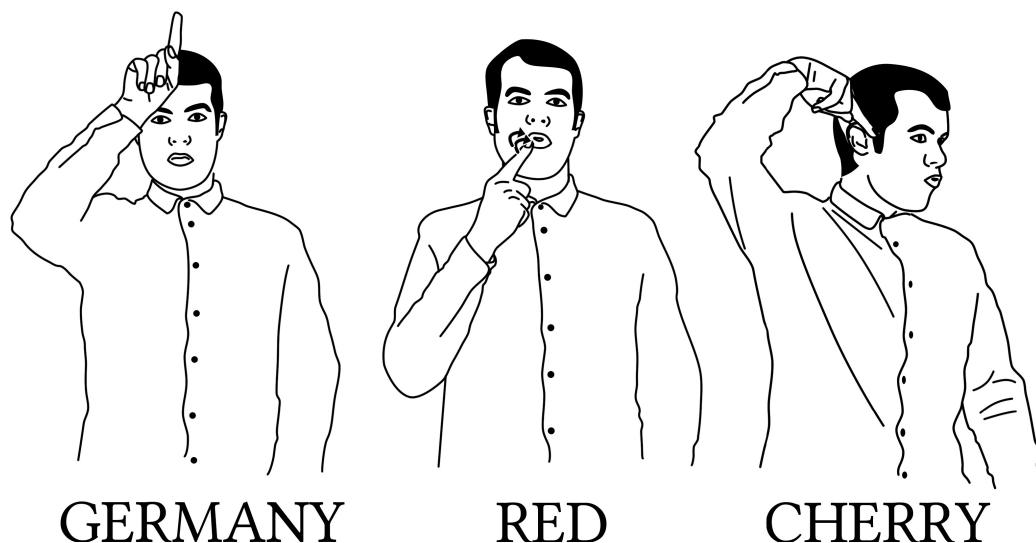
Figure 3: The signs GERMANY, RED and CHERRY from German Sign Language are signs which have been referred to as being iconic in the literature.

Again, both signs are probably not the most transparent ones. Nevertheless, they are arguably motivated and, thus, not completely arbitrary. The question is just whether this motivation stems from a mapping between the signifier and reference, a mapping between the signifier and meaning, or the signifier and some other mental representation.

Certainly, one could argue that a sign like GERMANY is not iconic or iconic to a different degree compared to, for example, BIRD because with GERMANY there are several steps of metonymy involved (and with BIRD there is only one): The hand on the forehead represents a spike on the head which is a part of a spike helmet (metonymy one). The spike helmet in turn stands for a person wearing that helmet (metonymy two), this person stands for a group of people, namely Germans (metonymy three), and this group of people stands for a country (metonymy four). Under such a view, one could argue that the sign is only to be considered to be iconic if there is, for example, one step of metonymy, i.e., if it meant 'spike helmet', but not when it meant 'Germany'. The problem with this account is that it is not clear where to draw the line. Would the sign not be considered iconic if it meant 'person wearing a spike helmet' because there are two metonymies involved? In the following, I will

consider signs involving several metonymic steps to be iconic and try to identify which of the three existing definitions of iconicity is able to capture such cases of metonymic chains best.

If iconicity is defined *ex negativo* as a non-arbitrary mapping relation or motivation it also covers what is called "relative motivation" or, in the more recent literature, "associative iconicity". Radden (2021), working on spoken languages, defines this kind of iconicity as a systematic relationship between certain phonemes or phoneme clusters, usually referred to as "phonesthemes", and a certain meaning: "One example is *gl-* (Germanic languages), where speakers can intuit the meaning 'light' via knowledge of similar words, e.g., *glisten*, *glint*, *glow*, *gleam*, *glimmer*" (Thompson & Do 2019: 1, italics added).[5] The sign language literature indeed discussed similar cases of (metaphorical extensions of) associative iconicity (for an overview of metaphors in sign languages see Meir & Cohen 2018). Taub (2001) and Emmorey (2014), for example, discuss that many signs denoting mental activities like 'think', 'forget', or 'learn' are produced on the forehead (see also Östling, Börstell & Courtaux 2018 for a quantification of this claim). The same is true for German Sign Language, as illustrated in Figure 4.[6] With this example, there is not only systematicity, but in addition there is also an iconic mapping as the head represents the locus of thought. An example without such an iconic mapping, as pointed out by an anonymous reviewer, would be that signs for female family members such as SISTER, DAUGHTER, or MOTHER are all produced

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[5] It is interesting to note that one early scholar who wrote about such cases of iconicity was Ferdinand de Saussure who noted, in a 1912 paper, that there are only a few adjectives in Indo-European languages containing diphthongs starting with /a/. However, the adjectives which exist are all linked "semantically by referring to some infirmity or deviation from the 'right' or 'straight'" (Joseph 2015: 90). Saussure also discusses associative iconicity in the posthumously published "Cours de linguistique générale" where he labels it "relative motivation" and notes that "only some signs are absolutely arbitrary" (Saussure 1916: 180–181, translation from Joseph 2004: 70). The kind of relationship Saussure was concerned with is sometimes simply called "systematicity" (see Dingemanse et al. 2015 for an overview; for sign languages see also Lepic 2015).

[6] Note that the systematicity here is uni-directional as signs denoting mental concepts are produced on the head, but there are many signs not denoting mental concepts which are also produced on the head. In fact, one may argue that there even is no uni-directionality with such verbs if one includes examples like DECIDE or EXPECT which are not signed on the head but can be considered to be mental verbs.

on the signer's chin in American Sign Language (Lepic & Occhino 2018). In the following sections, I will be more concerned with cases of more clearly perceivable visual characteristics, but I will come back to cases of metaphorical extensions in Section 5.
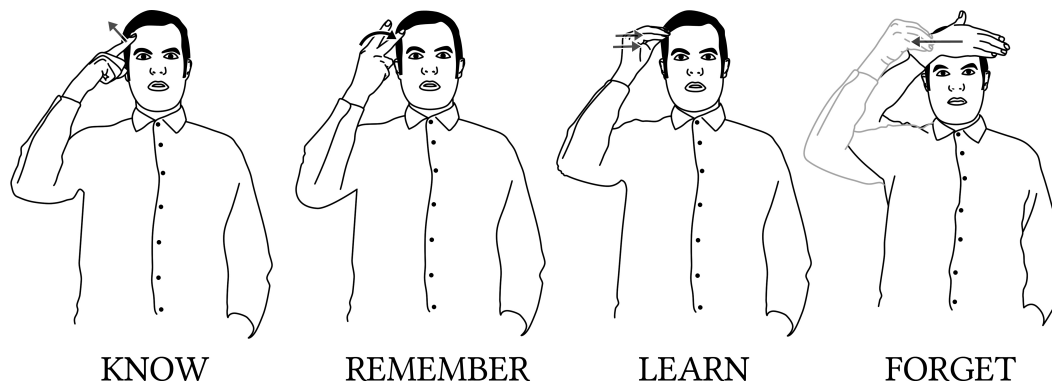

KNOW   REMEMBER   LEARN   FORGET

Figure 4: Verb signs for mental activities in German Sign Language.

In the following sections, the reference and the meaning definitions and some theoretical problems that arise from them will be discussed. Finally, I will proceed to discuss the mental representation definition. For the reference and the meaning definition, I will start taking a rather conservative view on what reference and meaning are (for example by not equating meaning and non-linguistic mental representations) and then proceed to more recent, cognitively oriented views of these concepts. That is, there are different understandings of what reference and meaning are and I will try to start by taking a more traditional, i.e., philosophical or formal, view of reference and meaning and then proceed to more functionally oriented accounts. Starting with more narrow definitions of reference and meaning should not imply that the authors of the meaning and the reference definition cited in Table 1 did have such narrows views, of course. Instead, this procedure is chosen to highlight that meaning, reference, and mental representation should be kept apart (or at least are kept apart in some theories) and that, no matter which view on meaning or reference one takes, it is theoretically favorable to use a definition based on mental concepts. Thus, this survey article is not intended to be a critique of the above-cited authors, but a plaidoyer for using concise terminology when defining iconicity.
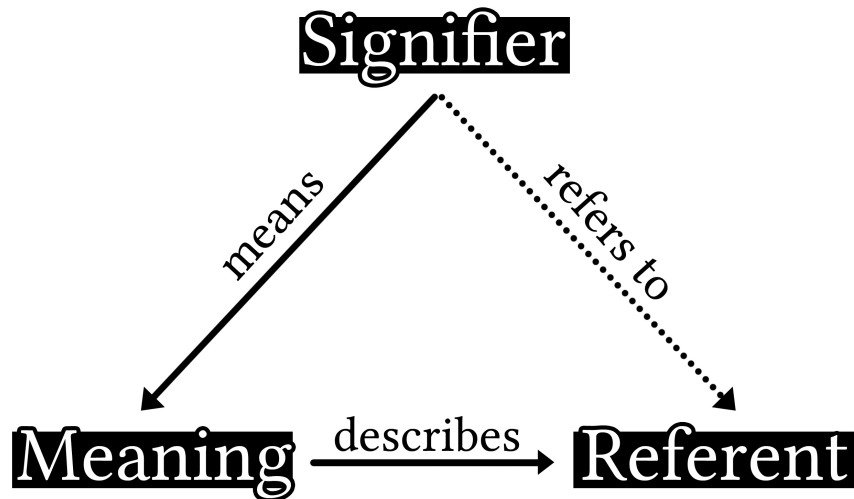
Figure 5: A version of the semiotic triangle.

3 The reference definition and its problems

Reference is often understood as a relation between a sign and an extralinguistic object, i.e., the referent of a lexical item is the object "picked out" by using the lexical item. Traditionally, it is assumed that there is no direct relation between a signifier and its referent, but that the relation that can be established between a signifier and a referent is mediated by the descriptive meaning linked to the signifier. This idea is depicted in the semiotic triangle (usually attributed to Ogden & Richards 1923) in Figure 5. The probably most famous illustration of the difference between reference and meaning comes from Frege (1892). The meaning of the expressions *morning star* and *evening star* clearly differs. The morning star is the brightest star visible just before sunrise and the evening star is the brightest star visible right after dawn. However, *morning star* and *evening star* have the same referent as they both refer to Venus. Interestingly, Frege not only distinguished between meaning and reference, but also between meaning and concepts ("Vorstellungen"):

> Si duo idem faciunt, non est idem. Wenn zwei sich dasselbe vorstellen, so hat jeder doch seine eigene Vorstellung. (Frege 1892: 30)
> [If two do the same thing, it is not the same thing. If two

> individuals are imagining the same thing each one has their own concept.]

Thus, according to Frege, a meaning is something the speakers/signers of a language share and which can be used to pick out real-world referents, while concepts can diverge because they are subjective.

3.1 Problem 1: fictional creatures

Combining the above-mentioned view on reference and the reference definition of iconicity would lead to the conclusion that iconicity is a relationship between a sign and some extralinguistic object. There are signs which do not have any referent (Kripke 1980), however, at least strictly following the traditional view that reference picks out real-world objects. Such signs are, for example, UNICORN, VAMPIRE, and WITCH depicted in Figure 6 (here, again, from German Sign Language). The sign UNICORN is performed by a Y handshape on the forehead representing a unicorn's horn. The sign WITCH depicts a crooked nose and the sign VAMPIRE depicts a vampire's blood-sucking teeth. Strictly following the traditional view of reference, these would not be considered to be iconic when used to express a meaning like 'John believes in unicorns/vampires/witches' (or even 'John doesn't believe in unicorns/vampires/witches') because there are no unicorns, no vampires, and no witches and, thus, there is no reference when using these signs (except maybe when referring to someone dressed up as a unicorn/vampire/witch). The (alleged) problem is that the use of fictional names "includes no acts such as referring" (Urmson 1976: 155).

Of course, one could simply object to Frege's strict definition of reference and say that the referents of fictional characters are, in contrast to the referents of actually existing entities, some mental representations. Thus, the referent of, for example, the sign UNICORN is some mental representation of a unicorn (see, for example, Recanati 2021). This is a legitimate argument, but then one would argue that iconicity with non-fictional names comes into being through a relation between a signifier and an actual referent, while iconicity with fictional characters is different as it is a relation between a signifier and a mental representation. That is, on some instances the reference definition
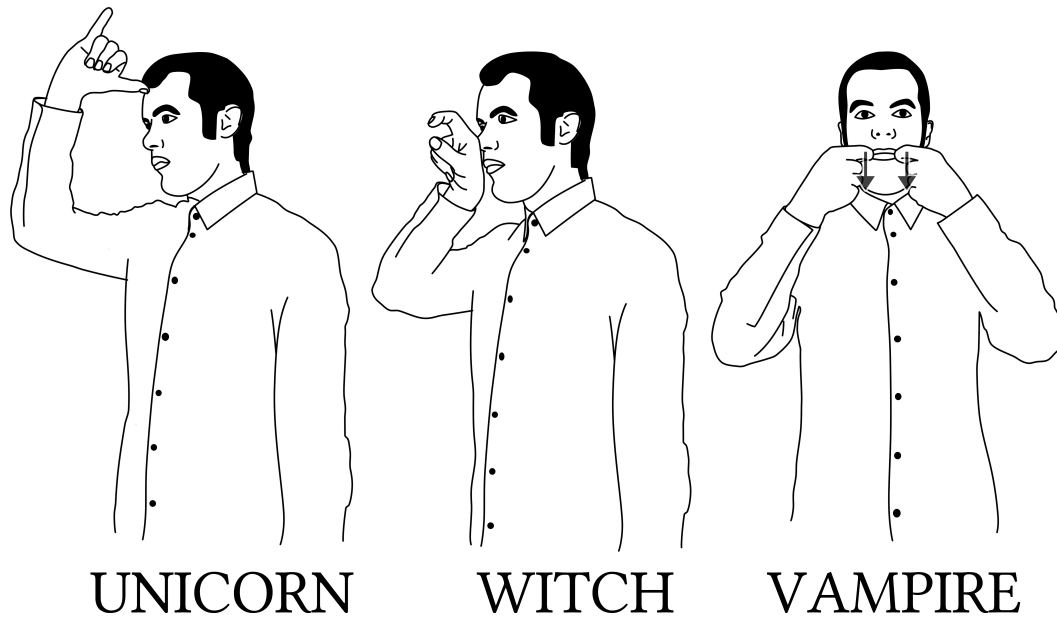
Figure 6: The signs UNICORN, WITCH, and VAMPIRE from German Sign Language. The sign UNICORN clearly resembles a unicorn's horn. The sign WITCH clearly depicts a crooked nose which witches are said to have. The sign VAMPIRE clearly aims at a vampire's teeth.

is adopted while on others, the mental representation definition is adopted. Another apparent solution would be to argue that reference in general is mediated by a mental concept.[7] Thus the reference definition only holds for a certain theoretical view on reference which equates reference with mental representations. However, this turns the reference definition into the mental representation definition. We will see in the following that most (but crucially not all) problems of the reference as well as the meaning definition can easily be solved if one adopts the view that iconicity is based on mental representations— and this, to be sure, is probably the view held by the authors cited in Table 1 above.

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[7] Clearly, in the semiotic triangle above, reference is also represented as being mediated by a mental concept, namely by meaning. However, as mentioned, I will first follow the idea that meaning and concepts are to be differentiated and then discuss alternatives below.
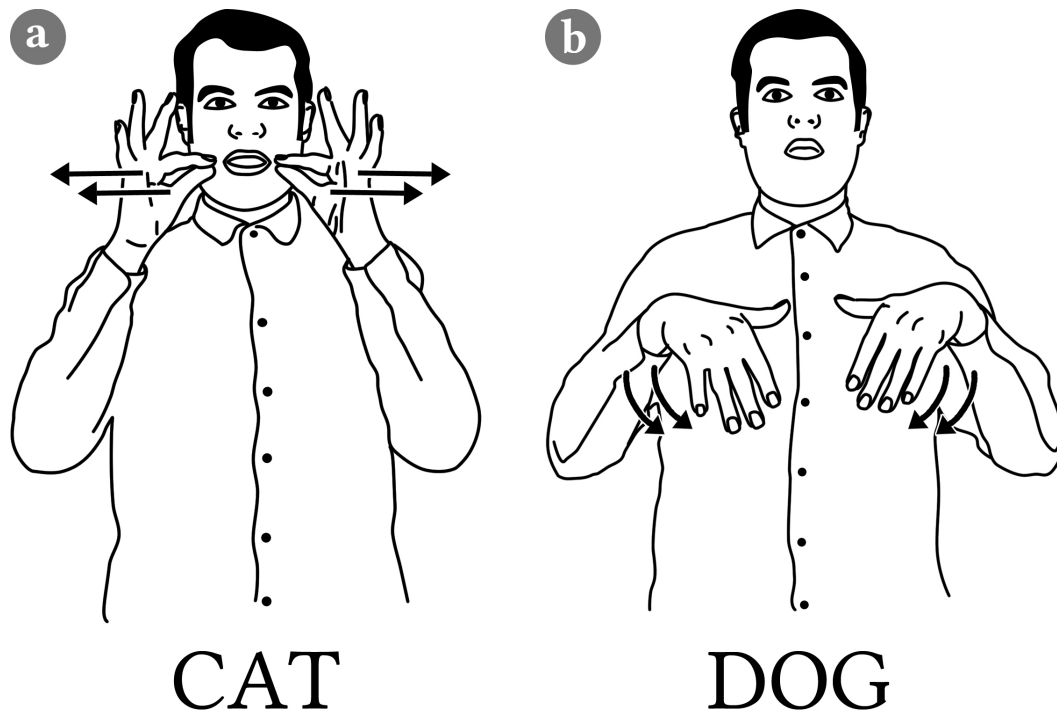
Figure 7: The signs CAT and DOG from German Sign Language. The sign CAT iconically represents the whiskers of a cat. The sign DOG iconically represents the movement of a dog's paws, e.g. while running or standing on their hind legs while bending their front paws.

3.2 Problem 2: generic sentences, negative existentials, and other non-referring constructions

There are more severe problems with the reference definition. Take the sign CAT from German Sign Language iconically depicting a cat's whiskers as an example. The sign is shown in Figure 7a. This sign can easily be used in generic sentences like 'Cats like milk' or it can be used in negated existentials like 'There is no cat in the room', i.e., in contexts in which there is no reference.[8] Strictly following the reference definition this would mean that the noun sign CAT is iconic in cases in which it is used referentially and non-iconinc in generic

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[8] A similar point can be made with adnominal adjectives which are parasitic on nouns when it comes to reference. That is, adnominal adjectives (like RED from above) have no referents. Adopting a strict version of the reference definition with reference not being mediated by mental concepts would thus predict that adjectives can never be iconic in sign languages.

sentences or negated existentials. Again, one could argue that the referents of such examples might be some kind of mental representation of a cat (ignoring the fact that the meaning above involves a plural) and this view is indeed taken by some theories, prominently, for example, by Conceptual Semantics:[9]

> Reference is standardly regarded as a relation between linguistic expressions (typically noun phrases) and things in the world. For convenience, let us call this *realist reference* (or *r-reference*). However, the goal of Conceptual Semantics is not an account of free-standing sentences, but rather an account of human understanding. Thus the relation that plays the role of reference in the theory is between the mental structure encoding the linguistic expression and the language user's conceptualization of the world – all inside the mind. Let us call this relation *mentalist reference* (or *m-reference*). (Jackendoff 2019: 88)

Here, again, reference and mental representation (or concept) are synonymous (but in fact this definition is not much different from the Fregean view where reference is mediated by meaning). While this could solve the problems described above, this view leads to other severe problems. Take the bold-faced part of a meaning like the one in (4).

(4) 'I can't remember whether **Paul's pet was a dog or a cat**.'

Surely, processing such a sentence requires the activation of the meanings 'pet', 'dog', and 'cat' and also the associated concepts (if one distinguishes between meanings and concepts) and expressing this meaning in German Sign Language would involve the iconic sign CAT and the iconic sign DOG (which resembles a typical behavior of dogs shown in Figure 7b). But how many referents are there in the bold-faced part? There is arguably only one, namely Paul's pet. The reason for this is that being a cat (or being a dog) is a permanent and not alterable property. Expressing that an entity has (or has not) such a property

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[9] Note that the quote suggests that standard accounts of reference assume that it is typically NPs which refer. On many formal accounts, however, reference is actually introduced at the D-level.

leads to individual-level predication. When combining a subject DP with an individual-level predicate through a (maybe covert) copula, "the copula has no semantic function and thus denotes just the identity map on properties of individuals" (Jäger 1999: 68). Note that this is not changed by the fact that the example contains a disjunction. In fact, a similar point can be made without disjunction: 'Paul's dog is actually a cat.' Thus, there are two iconic signs when expressing the meaning in (4) in German Sign Language, but there is only one referent.

It would be hard to argue that the mental representation of Paul's pet involves it having whiskers and it behaving like a dog. Alternatively, one would argue that the part 'whether Paul's pet is a dog or a cat' does not involve one referent (namely, Paul's pet), but four referents (Paul, Paul's pet, a cat, and a dog).[10] This, however, would make the term (word/sign) reference synonymous to (word/sign) meaning—and there clearly is a difference between the two as already pointed out by Frege. A similar point can be made with compounds as discussed next.

3.3   Problem 3: compounds

Signs like CAT can be used as parts of compounds such as CATˆFOOD 'cat food'. Note that this compound consists of two iconic signs (in German Sign Language). Following the reference definition, one would be forced to argue that the first element of the compound, i. e., the sign CAT, in such a construction is non-iconic because cat food does not have whiskers. This is because the meaning of a compound is determined by the head of the construction. CATˆFOOD is a type of food and not a type of cat. Again, it is not easy to argue that reference here is Jackendoff's (2019) mentalist reference because with compounds there is only one referent and not two (or more) of them. That is, CATˆFOOD picks out one entity when being used and not two or more neither conceptually nor in the real world.

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[10] Note that I'm abstracting away from predicative reference here.

3.4 Problem 4: metonymy

A problem which is easily solved by Jackendoff's (2019) mentalist reference is that a sign like CAT can be used to refer to a cat without whiskers. However, iconicity makes not only use of part-whole relations, but also of other types of metonymy, for example, of taxonomic relations. The sign WEAPON from German Sign Language, for instance, resembles a pistol (the sign PISTOL also resembles a pistol, but is a different sign). Would this sign be considered iconic when it is used to refer to ancient weapons or in a compound like A-B-CˆWEAPON 'ABC weapon'? Obviously, this is problematic for a definition of iconicity based on reference, no matter whether one views reference as picking out real-world objects or whether reference is based on mental concepts because neither ancient nor ABC weapons resemble a pistol.

Taken together, I conclude that the reference definition is not a suitable path to follow if one wants to call the signs discussed so far iconic because—no matter which theoretical perspective one takes—defining iconicity as a similarity mapping between a signifier and a referent leads to the above mentioned problems. This is true even if one equates reference with mental concepts—and this is surely the view held by many authors adopting this definition and, as mentioned, the goal of the present paper is not to criticize these authors, but a plea for using as concise definitions as possible. In the next section, I will discuss the meaning definition.

4   The meaning definition and its problem(s)

The second definition of iconicity discussed in this section assumes that iconicity involves a similarity mapping between a signifier and a meaning. The main problem with this view is that there is no real consensus as to what meaning actually is. One position is that there is a difference between a (linguistic) meaning and a (non-linguistic) concept. This was, as mentioned, already noted by Frege (1892: 30): "If two individuals are imagining the same thing each one has their own concept." While meanings, according to this view, are shared among the users of a language, concepts can diverge because they are more subjective. Another view is to assume that meanings are in fact rich conceptual

representations—the apparent problem with this view is that it can be equated with the mental representation definition. Both views will be discussed in this section.

The more conservative position is again one which is probably not the one which most proponents of the meaning definition had in mind (and again, this procedure is chosen to pick the most theory-neutral definition of iconicity from the three existing definitions). I will start out with a position differentiating between linguistic meanings and non-linguistic concepts. In addition, as a starting point I will assume that the relation between a linguistic sign on the one hand and a meaning on the other is an all-or-nothing connection—this, of course, is a rather strong point of view and alternatives allowing for gradience will be discussed below. As a point of departure, I will thus assume that one either knows the meaning of a linguistic sign or one does not. There is nothing in between. Either you understand what the English word *milk* means or you do not and it is, thus, not possible to partly know the meaning of a word or sign (a view which does not contradict the idea that meanings are composed of smaller units in some way). Such an all-or-nothing approach to meaning follows from some theories on meaning as discussed below. With concepts, there is no such all-or-nothing connection: It is easy to imagine that someone understands the English word *milk*, but does not know that milk comes from cows or how much a bottle of milk costs in the supermarket. Of course, meanings themselves are mentally represented as are concepts. However, there is a difference between a meaning which is part of our linguistic knowledge and concepts which are non-linguistic. Although there is an ongoing debate about the question whether or not the difference between linguistic and non-linguistic knowledge is psychologically real (with Hagoort et al. 2004 and Hagoort & Berkum 2007 finding no evidence for such a division and Warren & McConnell 2007; Pylkkänen, Oliveri & Smart 2009; Dudschig, Maienborn & Kaup 2016; Warren et al. 2015 finding evidence; see Warren & Dickey 2021 for a recent overview) there are good theoretical arguments that the two should be kept apart as discussed in Section 4.1. After discussing an all-or-nothing approach to meaning, more subjective and cognitively oriented accounts on meaning will be considered (Section 4.4).

Note that there are actually two meaning definitions when looking at the quotes in Table 1, which I will call the strict meaning definition and the weak meaning definition. According to strict definitions, iconicity is a non-arbitrary relation between a signifier and its meaning (e.g., Caselli & Pyers 2020: 127 for whom iconic signs are "signs or words which resemble their meaning"), while the weak definition views iconicity as being based on a relation between a signifier and only a part of its meaning (e.g., Nyst et al. 2021: 2 for whom iconicity is when "a linguistic form resembles one of more aspects of its meaning"). The weak view basically incorporates the fact that iconicity involves metonymy. In the following, only the weak view will be discussed as the strict view would lead to the exclusion of signs involving metonymy (the sign CAT, for example, would only be considered to be iconic according the strict view when it meant 'whiskers'). I will, again, start with a more conservative view of what meaning is and then proceed to a view equating meanings with concepts.

4.1 Meanings are not concepts

Figure 8 shows the sign MILK from German Sign Language which resembles the way cows are milked. If one wanted to adopt the meaning definition and entertain the idea that this sign is iconic one would need to argue that the way cows are milked is part of the meaning 'milk'. As mentioned, it is easy to imagine that someone knows the meaning 'milk', but does not know that milk comes from cows (or animals in general) or how they are manually milked. To figure out whether or not a property belongs to the meaning of a corresponding word or sign Löbner (2013: 295) proposes the following tests (italics in the original):

> How can we decide if a particular feature of a category is part of the meaning of the corresponding word [or sign]? There are (at least) two tests. First we can check if it is necessary to know that this is a feature of the category in order to know what the word [or sign] means. Second, we can carry out the following thought experiment: if the actual members of the category happened to lack the feature in question, could we still use the word [or sign]
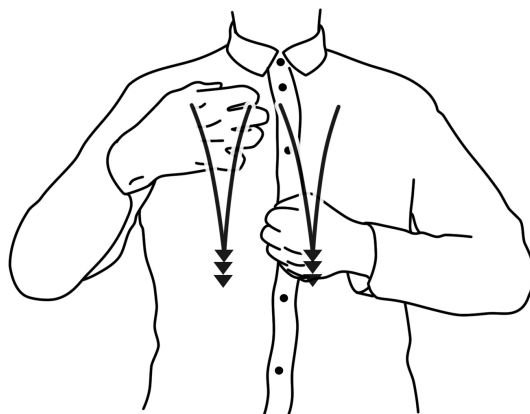
Figure 8: The sign MILK from German Sign Language resembles the action performed when milking a cow.

> for referring to them? Such thought experiments are relevant because the meaning of a word [or sign] must fit all *potential* referents.

In short, Löbner assumes that there is a difference between semantic meaning of a lexical item on the one hand and non-linguistic conceptual knowledge on the other. For the sign MILK as well as for many other iconic signs, the Löbner tests show that the iconically represented features are not part of the meaning of the respective signs. A similar point is made in Maienborn (2017) which, adapted to sign languages, looks as follows: The sign TOMATO from German Sign Language, for example, involves all fingers of the dominant hand bent as if it was holding a round object, i.e., a tomato. It is probably not controversial to call this sign iconic (but not very transparent as there are many round things in the world). Probably virtually everyone who knows the meaning 'tomato' knows that tomatoes are typically roundish. But does the semantics of this sign involve being round? According to Maienborn (2017) (and according to Löbner's tests) it doesn't as we still would call a square tomato a tomato. And in fact, square tomatoes actually do exist and are referred to by using the sign TOMATO.

This line of reasoning again underlines that iconicity is in the eye of the beholder (cf. Section 5 for a more detailed discussion of this point). For

someone who knows how cows are milked the sign MILK is iconic and for someone who does not know this practice the sign is arbitrary. But if iconicity in fact was a resemblance between form and meaning one would have to claim that the latter individual does not know the meaning of the sign. At least, one would have to claim that the individual does not know part of the meaning of the sign which seems hard to argue for as it does not seem to be reasonable to say that someone only partly understands the meaning of a sign (or word). This all-or-nothing account to meaning directly follows from Löbner's and Maienborn's arguments: We know a lot of things about milk. But only some particular features play a role in the meaning of 'milk', namely only those which cannot be absent to still call an object *milk* or MILK. If one of these features is missing in the mind of an individual, this individual should not know the meaning 'milk'. However, this line of reasoning is only true if one views meaning as some kind of indivisible whole. A different view is discussed in Section 4.4.

4.2   On metonymic relations

The problem, of course, stems from the fact that iconicity relies on metonymy. An extreme case is the sign GERMANY from above. Arguably 'wearing a spike helmet' is not part of the meaning 'Germany' and probably never was as countries do not wear helmets. It is just that in the past some people wore those (salient) helmets in the country. The same can be said of the sign RED where the lips are probably not part of the meaning of 'red' or the sign CHERRY where 'you can put cherries behind your ears/some people put cherries behind their ears' is probably not part of the meaning 'cherry'. This list could be continued infinitely. The sign DECEMBER from German Sign Language resembles a fir tree, because fir trees are usually used as Christmas trees. Does that mean that 'fir tree' is part of the meaning of 'December'? One variant of the sign SUNDAY resembles praying hands. Does that mean that praying is part of the meaning 'Sunday'? At least from a more conservative perspective on what meaning is, it is hard to argue that this is the case.

4.3   Sign language acquisition data

A final point I want to make relates to studies on the acquisition of iconic and arbitrary signs. Intuitively, one would assume that learning an iconic sign is easier compared to learning an arbitrary sign. However, this is not what sign language acquisition studies found (although studies on spoken language acquisition found exactly this, cf., Massaro & Perlman 2017). Indeed, most studies on L2 acquisition of a sign language by hearing adults using a spoken L1 found that there are sign-learning advantages of iconic signs. Iconic signs, for example, were recalled better compared to arbitrary ones (e.g., Lieberth & Gamble 1991; Campbell, Martin & White 1992 and Ortega 2017 for an overview). However, when it comes to early L1 acquisition there is evidence that iconicity presents no advantage to sign learning (e.g., Newport & Meier 1985; Orlansky & Bonvillian 1984; Meier et al. 2008 and again Ortega 2017 for an overview). This is not to say that there is no effect of iconicity in L1 acquisition at all. However, the role of iconicity only seems to become increasingly important as children grow older (Thompson et al. 2012). Researchers have repeatedly proposed that the reason for this effect is that young children, let's say at 12 months of age, are lacking the world knowledge to perceive the iconicity of many signs (Newport & Meier 1985; Tolar et al. 2008; Thompson et al. 2012). Newport & Meier (1985), for example, proposed that young children cannot interpret the iconicity of a sign like MILK as they do not know how cows are milked. Thus, for a child not knowing how milk is produced the sign is not iconic (which is fully in line with the idea that iconicity is subjective). Strictly following the meaning definition, however, one would, again, be forced to argue that these children do not know the meaning of the sign if one follows Löbner's and Maienborn's strict interpretation as meaning being composed of necessary features.

4.4   The alternative view: meanings are concepts

So far, I have defended the view that signs (and words) "stand for fixed, discrete packages of information (their 'meanings') (Taylor 2017: 255) which means that one either knows the meaning of a sign or one does not. Of course, there is an

alternative view, namely, to equate meanings with richly articulated concepts. Under this view, there is no difference between linguistic and non-linguistic knowledge. A meaning (or concept) then is a bundle of information gained by experience (see Barsalou 2008; this also includes experiences with how to use signs and words as it is assumed in usage-based accounts which I have not discussed here). Part of this information is shared within a community of language users and part of this information is not shared within the same community. Additionally, it is possible that the shared part is not stable across the users of a language. This would mean that it is possible to partly know the meaning of a sign (or word) and in fact every language user only partly knows the meaning of a sign (or word). But even if one equates meanings with non-linguistic concepts it is, in my mind, clear that there are more core parts of a meaning on which linguistic communication is based and more ornamental parts which are more likely to differ from individual to individual. It can be, for example, assumed that the meaning 'river' somehow involves the features 'consists of liquid' and 'this liquid is moving'. If one now assumes that there is an individual lacking one of these features I would argue that this individual does not know the meaning 'river' because these features are central to the meaning 'river'. A rather ornamental piece of information is that there are no rivers in Vatican city (which probably not many people know). As an anonymous reviewer noted, however, it is hard to quantify which features of a concepts exactly one needs to know to know a meaning – at least if one does not follow Löbner's and Maienborn's ideas that only those features play a role which one needs to understand a particular word or sign. This difference between core parts of a meaning and more ornamental parts can maybe be equated with the difference between lexical content and conceptual content in some models in cognitive linguistics. In such frameworks, meaning construction via language is thought to be the result of a combination of linguistic and non-linguistic processes in which

> conceptual content encodes information that parallels the multi-modal body-based (perceptual, motoric, subjective, etc.) experience that it constitutes a representation of. As such, conceptual structure is not suitable for being encoded in language. After

> all, language as a representational system consisting of symbolic
> units is simply not equipped to directly encode the rich, multi-
> modal character of sense-perceptory and subjective experience.
> While lexical concepts do not encode multimodal information
> of this sort[...] they do provide access to content of this sort.
> (Evans 2009: 105)

The quote illustrates that cognitively oriented approaches to meaning also
often draw a distinction between a core, linguistic part and a non-linguistic
conceptual part. Adopting this framework, iconicity would probably best
be defined as a non-arbitrary relation between a signifier and conceptual
content. However, also a pure meanings-are-concepts approach assuming that
"[m]eaning is equated with conceptualization" (Langacker 1991a: 2) would
generally be legitimate considering that the (empirical) question of whether
there the difference between linguistic and non-linguistic knowledge is still
under discussion (Warren & Dickey 2021). Although the authors adopting a
meaning definition of iconicity cited at the beginning of this paper probably
all would defend such a meanings-as-richly-articulated concepts view, this
approach basically equates with the mental representation definition and given
that there are diverging views on the question of whether or not linguistic
meaning and non-linguistic concepts are to be kept apart it is advisable to adopt
the mental representation definition from the beginning to avoid confusion
stemming from the different meanings of the word meaning. In other words:
There is no agreement on the question of what meaning actually is and thus, a
definition based on meaning should either be avoided to arrive at a broadly
applicable definition of iconicity or the term "meaning" should at least concisely
be defined when using it. Again, this should not imply that the authors using
the term "meaning" in their definitions used this term in some of the strict
senses discussed. Instead, the goal of the preceding discussion was to raise
awareness for the fact that this term has different meaning in different theories
and in order to arrive at a comprehensive definition of iconicity one has to keep
such different views in mind.

5   The mental representation definition

Some authors, for example Taub (2001), Wilcox (2004), or Emmorey (2014), define iconicity as a structure mapping between two mental representations: "A word or sign does not link directly to the world or to our experience of the world. Rather, the phonological form of a lexicalized concept maps to a mental representation (a schematization) that may be grounded in sensory–motor experiences" (Emmorey 2014: 8). Wilcox & Martínez (2021: 502) (based on Wilcox 2004) take a view from the perspective of mental spaces and also consider cultural practices which would include signs like CHERRY from above. For them,

> iconicity is a distance relation between structures in multidimensional conceptual space. The cognitive view of iconicity takes culture and conceptualization into account. According to this view, iconicity is not regarded as a direct relation between the form of the sign and an objective, non-interpreted reality, but as a symbolic relation that is motivated by embodied experiences common to all humans, as well as by our experiences as members of particular cultures, communities, and societies.

This definition, although confined by the assumption of metaphorical conceptual spaces, clearly captures all cases of iconicity discussed so far because it relies on the very broad concept of (non-linguistic) mental representations. Interestingly, this definition is pretty much compatible with the way Saussure viewed a linguistic sign—except for the facts that he was only concerned with spoken languages and that the evidence available to him led him conclude that arbitrariness plays a major role in natural languages. For Saussure, a linguistic sign is composed of two mental concepts, a signifier and a signified, which are inseparably connected like the front and back of a sheet of paper and "are accessible only in their conjunction" (Joseph 2004: 65) or in Saussure's words:

> The linguistic sign unites not a thing and a name, but a concept and an acoustic image. The latter is not the material sound, a purely physical thing, but the psychic imprint of this sound, the

> representation which gives us the evidence of our senses; it is
> sensorial, and if we happen to call it 'material', it is only in this
> sense and in opposition to the other term of the association, the
> concept, usually more abstract. (Saussure 1916: 98 translation
> from Thibault 2013: 211)

Note that the mental representation definition still captures the fact that
iconicity is in the eye of the beholder. We are left with three possibilities
which can be illustrated by taking the example of the sign GERMANY again.
Some individuals do not know that the Prussian military used to wear spike
helmets. For these individuals the sign is necessarily non-iconic because they
are missing the crucial mental representation. Other people might know that
the Prussian military wore spike helmets, but are unable to see the metonymic
links involved in the sign. For these individuals the sign GERMANY is also
non-iconic, but for a different reason, namely because of a lack in transparency.
The third group of people are individuals who know that the Prussian military
wore spike helmets and can make this link. For these individuals the sign is,
thus, iconic. This line of reasoning, of course, is not new, but in line with
previous research: Occhino et al. (2017) found that native signers (in their
study, ASL and DGS signers) perceive signs of their own sign language as
more iconic compared to signs from a foreign sign language—even if the signs
had extremely similar forms. This finding not only underlines the fact that
iconicity is in the eye of the beholder, but can also be taken as an argument in
favor of the mental representation definition: Occhino et al. (2017) compared
signs from two different sign languages which were translational equivalents.
While the sign pairs used might slightly differ in meanings and in the potential
referents which can be picked out by using them, the participants in this study
were not aware of this as they were only fluent in one sign language. In other
words, the meanings and potential referents of the signs pairs used in this
study were the same for the participants. That they nevertheless rated signs
from their own sign language as being more iconic, thus, must have a different
reason. Occhino et al. (2017) and Occhino, Anible & Morford (2020) interpret
these results in terms of "construal" (see Langacker 1991b; 20080), that is, the
"process by which humans select one way to portray and object/event, from the

many different possible ways in which they can conceptualize the object/event" (Occhino, Anible & Morford 2020: 115). Under this view, iconicity is subjective and relies on a signers ability to conceptualize the available articulators and relate this conceptualization to mental representations: "As signers are able to construe visual objects and signed language articulators as consisting of shapes and having spatial orientations, they are able to capitalize on these abilities to align these construals" (Occhino et al. 2017: 118).[11]

In the end, a definition based on mental representations not only circumvents the theoretical problems described in this survey but is also theory-neutral as researchers differ in their theoretical views on meaning and reference. As an anonymous reviewer correctly noted, "meaning", "reference", and "concepts" (or "mental representations") are not necessarily seen as denoting completely different things, but can also be viewed as overlapping notions. However, there are also many linguistic theories in which these terms have very specific meanings. To avoid confusion, it is probably the best route to follow to adopt a mental representation definition from the beginning. Surely, there are also different views as to what mental representations exactly are, but nothing hinges on this for the purpose of the definition of iconicity. A definition based on mental representations can also account for the fact that iconicity is subjective. To highlight this subjectivity it was, as discussed, suggested to define iconicity in terms of construals. On such views, iconicity is a perceived mapping between between an individual's construal of a signifier and a construal of a related mental representation (Occhino et al. 2017; Occhino, Anible & Morford 2020). A mental representation definition, especially one which is based on construal, is also able to capture cases of systematicity and metaphorical extensions such as the fact that mental verbs are mainly produced on the forehead as the locus of thought as discussed in Section 2. It would be, again, hard to argue that the forehead plays a role in the meaning of such signs or their reference.

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[11] That iconicity is subjective creates a problem for empirical studies because subjectivity is hard to operationalize. One possibility would be to create experiments which take by-participant measures of iconicity into account by quantifying and finding patterns across many participants.

6   Conclusions

Three main definitions of iconicity are found in the sign language literature. These definitions have in common that iconicity is thought to be based on motivation of the signifier. They differ, however, in how this motivation looks like. According to the reference definition iconicity is based on a motivated similarity mapping between a signifier and its referent. According to the meaning definition iconicity is based on a motivated similarity mapping between a sign and its meaning. Finally, according to the mental representation definition iconicity is based on a motivated similarity mapping between a signifier and some (not necessarily linguistic) mental representation associated with it.

In this survey article, I have reviewed these definitions from different theoretical viewpoints and argued that the reference and the meaning definition face some severe theoretical problems. Relying on reference, for example, leads to the problem that there often is only one referent which is described by using several iconic signs—no matter whether reference is viewed as relating to the real world or relating to mental concepts (or being mediated by mental concepts). The compound sign CATˆFOOD, for example, consists of the iconic signs CAT and FOOD in German Sign Language. However, when used referentially, CATˆFOOD only picks out one referent and not two and, thus, only one of the signs would be viewed to be iconic, namely FOOD, but not CAT because 'cat food' is a kind of food and not a kind of cat. That is, the reference definition predicts that signs are sometimes iconic, namely when they refer, and are not iconic when they do not refer. The major problem of the meaning definition is that it only applies when meaning is defined as non-linguistic mental concepts. For many signs which are viewed as being iconic, however, it is hard to argue that what they represent is part of their meaning as they rely on metonymy. The sign MILK, for example, resembles the way cows are milked (which metonymically stands for the product of this process). The meaning of this sign, however, is not 'milking a cow', but 'milk'. Additionally, it is questionable (or at least unclear) whether the way cows are milked is really to be considered part of the meaning of 'milk'. For these and other reasons it was proposed to adopt a definition of iconicity which involves a motivated similarity mapping between a signifier and some associated mental representation (or concept). In sum,

following earlier proposals, iconicity is a subjective perceived similarity between the mental representation of the form side of a sign and a mental representation associated with the sign. Still, it can be useful to use expressions like "meaning" or "reference" when talking about iconicity, but it seems advisable to be as explicit as possible about the exact meanings assigned to these terms.

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