Iconicity is in the eye of the beholder
How language experience affects perceived iconicity

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A renewed interest in understanding the role of iconicity in the structure and processing of signed languages is hampered by the conflation of iconicity and transparency in the definition and operationalization of iconicity as a variable. We hypothesize that iconicity is fundamentally different than transparency since it arises from individuals’ experience with the world and their language, and is subjectively mediated by the signers’ construal of form and meaning. We test this hypothesis by asking American Sign Language (ASL) signers and German Sign Language (DGS) signers to rate iconicity of ASL and DGS signs. Native signers consistently rate signs in their own language as more iconic than foreign language signs. The results demonstrate that the perception of iconicity is intimately related to language-specific experience. Discovering the full ramifications of iconicity for the structure and processing of signed languages requires operationalizing this construct in a manner that is sensitive to language experience.

Keywords: iconicity, construal, ASL, DGS, signed language

Introduction

Iconicity is a buzz-word generating much debate in linguistic circles. Harkening back to ancient Greece, philosophers such as Plato questioned the pros and cons of iconic linguistic representations. In the dialogue Cratylus, Hermogenes invites Socrates to weigh in on his debate with Cratylus over whether the names of things are “conventional” or “natural” (Plato, 1926). In other words, are languages primarily constructed of arbitrary signs or are form-meaning pairings motivated by some intrinsic relation? Fast-forward to the 19th century; Saussure’s treatise Course in
general linguistics (Saussure, 1986) discusses the centrality of the arbitrariness of signs to the structure of human language. This claim was later interpreted by Structuralists as a necessary precondition for human language.\(^1\) Accepting the notion that arbitrariness is the privileged form-meaning pairing, linguists of the 20th century felt it appropriate, and non-problematic, to begin to study linguistic form in its own right. Semantics found itself left by the wayside in the search for universal underlying properties of language structure and this viewpoint overwhelmingly dominated the field of linguistics for most of the last century.

During this period, signed languages came to be recognized as real, natural languages and their worth as objects of linguistic study set signed language linguistics on its path. But the prevalence of iconicity was problematic within a framework that privileged arbitrary relationships of form and meaning. Adhering to the dominant paradigm, signed language researchers emphasized why iconicity was not important to the structure, acquisition, or execution of the language. Frishberg (1972, 1975) contributed a compelling argument that reduced the role of iconicity to one of historical transparency. “Signs change away from their pantomimic or imitative origins to more arbitrary shapes” (1975, p. 700). Linguistic processes exert their forces on these originally iconic forms, suppressing or excising their iconic roots in favor of morphological or phonological systematicity. Along similar lines, Battison (1978) stated that iconicity is inversely related to phonological or sublexical structure, also suggesting that phonological processes systematically eradicate iconic motivations. Other early signed language linguists, while echoing the same historical change argument, reconciled the discrepancy between signed language iconicity and necessary linguistic arbitrariness by emphasizing that, cross-linguistically, signed languages do not use the same underlying motivations. Klima and Bellugi (1979) give examples of the sign TREE in Danish Sign Language (Dansk Tegnsprog, DTS), Chinese Sign Language (Zhōngguó Shǒu yǔ, ZGS) and American Sign Language (ASL), showing that although all three languages take advantage of the visual affordance of iconic form-meaning mapping, iconicity is not deterministic. The three languages exhibit maximally different expressions of that iconicity – none of the signs resembles the others in form, though each one profiles an iconic mapping of ‘tree’ (cf. Wilbur, 1979).

Thus, for several decades it was common to conclude that iconicity, while prevalent in the visual modality, did not exert any linguistic pressure or structure on fully conventionalized signed languages (Frishberg, 1975; Morford, Singleton, & Goldin-Meadow, 1993). Pioneering studies exploring the influence of iconicity on the acquisition of ASL found that iconic signs are learned no earlier than

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1. See Engberg-Pedersen (1996) and Grote & Linz (2003) for discussions of how Saussure’s premise about *l’arbitraire du signe* has been misinterpreted.
non-iconic (Orlansky & Bonvillian, 1984), that children seemed oblivious to the iconic nature of verb agreement (Meier, 1987), and that the iconic underpinnings of the pronominal system were not taken advantage of by young children (Petitto, 1987). Still others during this time looked at whether iconicity affected cognitive processing such as memory retrieval of learned word lists (Poizner, Bellugi, & Tweney, 1981) and naturally occurring articulation errors (Meier, 1987), and found that these areas of linguistic performance were also minimally impacted by the iconicity of the sign.

With the advent of the 21st century, the role of iconicity in both spoken and signed languages has received renewed interest. Researchers have begun to find effects of iconicity in processing, production, and acquisition of signed languages (Meir, 2010; Ormel, Knoors, Hermans, & Verhoeven, 2009; Perniss, Thompson, & Vigliocco, 2010; Thompson, Vinson, & Vigliocco, 2009; Thompson, Vinson, & Vigliocco, 2010). But in the rush to bring iconicity back into the discussion, the construct of iconicity has frequently been conflated with transparency, either in definition or in operationalization. In this paper, we outline several reasons why iconicity must be distinguished from transparency in empirical studies of signed languages. We demonstrate that iconicity is not an unmediated relationship of the form of a sign to its meaning, and that signs cannot be objectively categorized as “iconic” or “arbitrary”. We argue instead that iconicity becomes evident in the construal of the form-meaning relationship that signers engage in when they produce and comprehend signs (Grote & Linz, 2003; Adam, Iversen, Wilkinson, & Morford, 2007). Construal is a central tenet in cognitive linguistics, which refers to the ability of the language user to conceive of, interpret, or understand a situation or object from a variety of perspectives. As such, the manifestation of iconicity relies on signers’ own sensory-motor, perceptual, cultural, and linguistic experiences, which are shaped by the specific language system that the signer has acquired. Therefore, the perception of iconicity of any given sign or construction varies from one individual to the next even within a single language, or as we demonstrate in the current paper, from signers of one language to the next.

In the following sections, we first review prior experimental work investigating the influence of iconicity on language processing. Subsequently, we outline several recent developments in defining iconicity. Finally, we present our own empirical study of perceived iconicity of native and foreign signs.

**Recent investigations of iconicity**

In one of the first studies to investigate whether iconicity influences the organization of the semantic network of deaf and hearing signers (i.e., hearing bimodal bilinguals), Grote and Linz (2003) asked participants to judge the presence or
absence of a semantic relation between a German Sign Language (DGS) sign and a picture (deaf and hearing signers) or a German word and a picture (hearing signers and non-signers) in a picture-sign/word verification task. The pictures varied in whether or not they highlighted the iconic base of the signs (the perceptual feature of the referent profiled by the sign form). For example, the DGS sign for “eagle” is made by tracing the shape of an eagle’s beak with a bent index finger in front of the face. A picture of an eagle’s beak highlights the iconic base of this sign, whereas a picture of an eagle’s outspread wing or an eagle’s claws does not. Nevertheless, all three pictures are related semantically to the concept of “eagle” and thus should receive the same response on this task. Deaf and hearing signers responded faster to pictures that highlighted the iconic base of the sign compared to the neutral pictures. In contrast, a hearing control group with no knowledge of DGS showed no differences in mean reaction time across these conditions. Assuming that reaction time is an indicator of the strength of a semantic relation, the authors conclude that signers do not merely recognize the iconic relationship between sign form and meaning, but that the semantic frame (Fillmore, 1982) of a sign is shaped by the construal of the sign’s form and meaning. Grote & Linz’s results have since been replicated with adult signers of ASL (Thompson et al., 2009) and child signers of NGT (Nederlandse Gebarentaal, Dutch Sign Language; Ormel et al., 2009).

In a follow up to their 2009 study, Thompson and colleagues (2010) addressed critiques that these iconicity effects were the result of task-specific confounds, such that instructing participants to focus on semantics may have highlighted the iconic form-meaning pairings. In their 2010 study, Thompson and colleagues asked native signers of British Sign Language (BSL) to complete a phoneme monitoring task and decide whether a handshape was curved or straight. This task, in contrast to the picture-sign verification task, could be completed without accessing meaning at all. Their results showed that participants were significantly slower at detecting the sub-phonemic structure of a handshape in highly iconic signs than in less iconic signs.

Similar results were found in a study of ASL signers (Anible, Occhino-Kehoe, & Jaquez, 2014; Anible, Occhino-Kehoe, & Kammann, 2013); however, rather than using sub-phonemic features of handshapes (e.g., straight vs. curved), participants were asked to monitor for a particular handshape within a signed sentence. Participants detected handshapes from sparser phonological neighborhoods (highly marked) more quickly than handshapes from denser phonological neighborhoods, and this effect was amplified in signs judged to be iconic by native signers. These results suggest that phonological processing is not carried out independently of semantic levels of linguistic representation.
That phoneme monitoring tasks still produce iconicity effects is a compelling piece of evidence for the active role iconicity plays in the lexicon. Rather than being a characteristic of signs restricted to sign creation or metalinguistic reflection, investigations demonstrate that iconicity influences both online semantic and phonological processing. The fact that this converging evidence comes from multiple research groups, working on various unrelated signed languages, using different methodologies, suggests that the influence of iconicity on language production and perception is robust and deserving of more intensive inquiry. Clearly, this is more than an artifact of the visual modality, relegated primarily to creative language use. It is not peripheral, but central to users’ interaction with their language.

Defining iconicity: Iconicity as a property of language

While iconicity is often considered inferior to arbitrariness in symbolic relationships, the privileging of arbitrariness is itself arbitrary. Iconicity exists across modalities, across languages, and across cultures. Within cognitive and functional linguistics, the topic of iconicity in spoken languages has become a compelling focus of investigation with growing evidence that iconicity exists at multiple levels across languages. Spoken language linguists have documented iconicity at the discourse level (Haiman, 1980, 2003; Kaiser, 1999), at the morphosyntactic level (Bybee, 1985; Givón, 1985), and at the morpho-phonemic level (Fischer, 1999; Reilly & Kean, 2007). Iconicity does not in any way restrict languages from exhibiting Saussurian arbitrariness. Thus the “problem” of iconicity that prevented signed language linguists from exploring the phenomenon fifty years ago has all but disappeared as a barrier in cognitive-functional approaches to linguistic analysis. Iconicity should be viewed as an accepted affordance used by all languages to varying degrees in varying linguistic contexts. In fact, Perniss and Vigliocco (2014) argue that iconicity is a core mechanism of human language which “provides a key to how humans share sensory, motor and affective experiences with each other via communication” (p. 10). At the very least it is reasonable to treat iconicity in signed languages not as a special feature incidental to the modality, but as a particularly clear manifestation of a global human tendency.

Iconicity defined in signed language literature

Definitions of iconicity currently in circulation often imply, whether intentionally or not, that the relationship between form and meaning is a static one-to-one mapping that is externally verifiable. Moreover, some definitions conflate transparency with iconicity. For example, Thompson et al. (2009) refer to iconicity as “the transparent relationship between meaning and form” (p. 550). Methods for
selecting signed stimuli for psycholinguistic experiments also imply that iconicity is a characteristic of individual signs, independent of the signs’ participation in a language. For example, in a study investigating whether iconicity enhanced priming effects in ASL, Bosworth and Emmorey (2010) operationalized iconicity by asking hearing non-signers to rate the iconicity of their materials on a 5-point scale. The raters were instructed that iconic signs have “very transparent meanings” (p. 1575). Similarly, Vinson, Cormier, Denmark, Schembri, & Vigliocco (2008) instructed participants participating in a BSL norming study that for iconic signs, “you would be able to guess this sign’s meaning even if you did not know BSL” (p. 1087). These instructions direct participants’ attention to the transparency of signs more than to their iconicity.

Three tacit assumptions implicit in such operationalizations of iconicity as a variable are: (1) that iconicity equals transparency, in that the more iconic something is the more transparent it is; (2) that iconicity is either present or absent in any given sign, and (3) that we can all look at the same sign and objectively agree whether the sign is or is not iconic. While each of these problems stems from different basic assumptions about iconicity, they are nevertheless intimately intertwined. That non-signers should be able to judge iconicity at all stems from the idea that more iconic equals more transparent, so the most iconic signs are by definition the most transparent. Not unrelated to this issue is that there is objective iconicity that non-signers will agree on, which itself is related to the issue that there either is or is not measurable iconicity of a sign. Even when using scalar measurements, the scale is often then divided at some arbitrary halfway-point, 3.5 or above is iconic, below 3.5 is not iconic. However, if we are to come to a better understanding of the role iconicity plays in signed language organization and processing, we must revise our methods and our analyses to reflect what many researchers have been describing in theoretical work for several years (Cuxac & Sallandre, 2007; Pietrandrea, 2002; Pizzuto, Pietrandrea, & Simone, 2007; Russo, 2004; P. Wilcox, 2000; S. Wilcox, 2004).

Cognitive definitions of iconicity

Cognitive linguists have argued that iconicity is best understood as the mapping of a mental representation of an articulatory form to a mental representation of a concept tempered by an individual’s language experience (Taub, 2001; P. Wilcox, 2000; S. Wilcox, 2004). This “construal” in Cognitive Grammar terms (Langacker, 2008), is central to the symbolic pairing of form and meaning, in that rather than positing a representation of an actual thing in the real world and a form as a physical entity, it is an individual’s construal of the referent which is mapped onto that individual’s construal of the form. Adopting this perspective opens the door to
Iconicity is in the eye of the beholder. Cognitive iconicity, as coined by Wilcox (S. Wilcox, 2004), is defined as “a distance relation between the phonological and semantic poles of symbolic structures” (p. 122). Here we briefly address theoretical implications of a cognitive iconicity approach for four dimensions of iconicity: the inherent objectivity of any iconic form, the issue of ‘transparency’ as iconicity, construal of semantic content including metaphorical and metonymic extensions, and construal of the articulatory form in the construction of meaning.

First and foremost, considering iconicity as a process of construal eliminates the notion that iconicity is objective. Iconicity is specific to the individual user’s construal of form and meaning of any given sign. While it is true that certain culturally relevant/prevalent mappings can arise across a number of speakers which leads to an appearance of objectivity, these mappings do not extend beyond the scope of culturally constructed norms. For example, the sign PIANO is generally considered a highly iconic sign. However, in a community in which the concept ‘piano’ has not been experienced, the sign that profiles the act of playing a piano would not be iconic. So, while there may be seemingly stable interpretations of iconic forms within and across language users, which are often mistaken for objective iconicity, it is only through shared cultural experiences that these patterns of shared construal allow for a conventionalized cultural interpretation of a form-meaning mapping.

A second realization when considering iconicity as a construal process is that iconicity cannot be reduced to transparency. Transparency or opacity of a sign is often conflated with iconicity. The assumption underlying the conflation is that a form-meaning mapping that is self-evident is necessarily more iconic than a form-meaning mapping that is not self-evident. This understanding of iconicity privileges iconic mappings based on sensori-motor experience over other types of iconic relations. As Wilkinson (2009) has noted, “The iconic form for baby in many signed languages metonymically maps to the image schema of holding a baby in arms, and in some cases, also depicts the small physical size of the baby. Cradling a baby in arms is very likely a universal human behavior” (p. 185). Global patterns of human experience often underlie seemingly transparent signs, in that many culturally and socially salient concepts map similar form features in the world’s signed languages.

However, not all motivated form-meaning mappings necessarily map to transparent motor-routines which have global salience. Iconicity can have its roots in different kinds of externally motivated mappings, gaining saliency within a given language when regular form-meaning mappings reoccur with such frequency as to strengthen the external associations. For example, in ASL the sign DANCE is often considered “not iconic” by researchers, because it does not resemble its referent
(Baus, Carreiras, & Emmorey, 2013), but unlike signs that recruit general motor-routines, signs such as DANCE recruit stable phonological mappings across related meanings (e.g., the signs STAND, DANCE, JUMP, and FALL-DOWN, among others, all use an iconic mapping wherein the V-handshape profiles the legs of a participant; Anible, 2016). Thus, while the sign DANCE is likely externally motivated in that two-fingers extended map easily to two-legs extended, it is the language internal patterning of this form-meaning mapping which reinforces the perceived iconicity in the minds of language-users. This type of motivation is often excluded from studies on iconicity, due to the conflation of transparency with iconicity, and most noticeably overlooked in non-signer’s inability to access these types of iconic mappings.

Further, this issue of transparency as iconicity assumes that knowledge of the language does not influence the construal of form and meaning. When we include the premise of conceptual construal of both pieces of the linguistic symbol, semantic concept and phonetic material, it becomes apparent that the form-meaning mapping of an individual sign is not independent of other forms and meanings represented by a specific language. There are no one-to-one correspondences between form and meaning for fluent signers. For example, a given handshape can be construed as iconic in many ways. The V-handshape can represent the letter V in fingerspelled words and initializations; it can represent the number two; it can represent pairs of things such as eyes or legs or even tines; and thus it is open to participate in a multitude of constructions depending on the construal. The more often it participates in a specific construal, the more likely a signer is to construe the form in that way in another signing context. Likewise, concepts or semantic properties of concepts can be construed in many ways as well. Any given scene can have a multitude of selected elements that can be profiled depending on what is highlighted or backgrounded. For example, the concept of “dog” exists in a semantic frame which connects all aspects of doghood and dog-like-ness in a complex web of interconnected concepts. As a result, signers are capable of selecting any of these semantic characteristics to profile in the form of a sign, and thus can metonymically represent the concept of “dog”. If we look cross-linguistically at signs for “dog” in the world’s signed languages, we find that though they all have iconic forms, the variability of what is profiled in that form is vast. The concept of “dog” can be construed through how we interact with a dog, as in the Australian Sign Language (AUSLAN) sign DOG in which the form is articulated by slapping the leg. The concept of “dog” can also be represented by profiling the physical characteristics of a dog, as is the case in Brazilian Sign Language (Libras) in which the articulation profiles the snout of a dog, and in British Sign Language (BSL) where the sign profiles the begging posture of a dog. As several studies have now documented, a signer’s knowledge of signs that profile specific semantic features
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in a conceptual domain actually shapes the signer’s sensitivity to precisely those semantic features (Grote & Linz, 2003; Thompson et al., 2009; Ormel et al., 2009).

Mental representations of such mappings are not static, but dynamic – continuously evolving at varying degrees and thus constantly creating, discarding, and updating connections between semantic and phonetic material as new signs are acquired or as signs are used in new contexts and so acquire new connotations. In this sense, the linguistic symbol itself is a dynamic coupling of a semantic and a phonological pole situated in a constantly changing conceptual space (Langacker, 1987, 2008).

Third, iconic mappings often arise from metaphorical construals of objects or processes; thus the semantic pole of any given symbolic unit may in fact be a metaphorical extension of the apparent reference. These types of motivations are not only not transparent, but because they are often based on language internal patterning of form and meaning, are not generally available to non-signers and are not always available to signers from other signed languages. This in turn excludes them from accessing comparable sources on which to base their perceptions of iconicity. While some metaphors are cross-culturally common, such as more is up, others such as intensity is a pressurized container are not.

S. Wilcox (2004) reworks an analysis of SLOW versus VERY-SLOW originally intended to support the view that sign language grammar erodes iconicity (Klima & Bellugi, 1979). The morphology in question is the grammatical marker denoting “intensity,” sometimes called “spritz movement”, which is characterized by an initial articulatory hold followed by a rapid release of the hold. When appended to the adjective SLOW the resulting sign is interpreted as “very slow”. Klima and Bellugi argue that since the rapid movement of VERY-SLOW is incongruous with the meaning of the lexical root SLOW, the iconic aspects of the sign have been subsumed in favor of grammatical processes. Wilcox, by contrast, argues that “VERY-SLOW” is iconic, but that the iconicity is apparent not in the manner of movement of the root but in the movement of the ‘spritz’ morpheme, which maps an initial hold and a quick release onto the metaphorical extension of intensity as the build-up of pressure being suddenly released. Thus the ‘spritz’ morpheme is really a marker of intensity of ‘x’ property, which is semantically schematic though phonologically fully specified.

Fourth, this framework provides the capability of construing phonetic as well as semantic material, be it articulatory scores, kinesthetic feedback of articulation, or acoustic/visual properties of the articulation. Similarly, conceptualization of phonetic content is no less a conceptualization in semantic space than a semantic concept in that our ability to conceptualize these properties of articulations makes them available for construal within motivated form-meaning pairings. Additionally, phonetic material should not and cannot be restricted to a one-to-one mapping of
form and meaning. Occhino (2016) provided evidence of the complexity of iconic mappings through an analysis of the many construals of individual handshapes that emerge within a single signed language. She discussed in depth the Claw-5 handshape, which is formed by spreading the fingers and the thumb in a 5 handshape and then slightly bending each joint of the fingers and thumb to form the shape of a claw. As shown below in Figure 1, the Claw-5 handshape can take on many externally motivated construals. The palm of the hand can be construed as a concave surface, manifested in ASL signs like BALL and RADIO, or the fingers themselves can be profiled as individuated parts of a whole, seen in ASL signs such as TIGER and RAIN. Alternately, the Claw-5 handshape can map the domain of non-compact matter (NCM), represented by the gaps between the bent fingers in signs such as CLOUD. This construal profiles the concept of a mass or collective which is not solid, but nonetheless is considered to be a unit. Perhaps most obviously, the hand can be construed as a hand, the most straightforward mapping for this particular handshape, which we see in signs like PIANO and TYPE. While these aforementioned mapping possibilities are examples of metonymic, domain internal mappings, any mapping can then be metaphorically extended across domains. This can be seen in the ASL sign BREAKDOWN in which the two claw-5 handshapes which begin with fingers interlocked (showing cohesion), ends with the hands disengaging from one another, metaphorically representing the concept of BREAKDOWN as the disconnection of the functioning unit. This is not an exhaustive list, but a sampling of the ways in which a single handshape can be construed as representing multiple iconic mappings between form and meaning.

![Figure 1. Semantic profiles of the claw-5 handshape in ASL (Occhino, 2016.)](image)

Finally, a cognitive definition of iconicity provides a unifying account of the role of iconicity in the structure of any language, regardless of modality. Under this cognitively motivated definition, iconicity is neither predictable nor transparent. Construal is central to understanding how form and meaning are related, and in many cases, multiple construals of a single parameter are not only possible but
are to be expected. Likewise, multiple construals of the semantic frame of a given referent also create multitudes of possible form-meaning mappings. It is for these reasons, as Klima and Bellugi (1979) pointed out in their example of iconic form-meaning mappings of TREE across three different signed languages, that signs from different signed languages often do not map the same semantic features to the same form features. It is in this multi-faceted process of construal of form and meaning that we find the arbitrariness of the form-meaning mapping. That iconicity does not reside in the sign, nor exist as an objective reality that is measurable or predictable, are major entailments of this theoretical perspective. This definition of iconicity necessitates a subjective approach to the analysis of iconic properties of language.

**Research question**

The research findings to date, while providing evidence that iconicity influences processing, would be predicted whether iconicity is understood as an “objective” perceptual similarity relationship between a sign and its referent, or a construal of form-meaning relationships within a lexical network specific to individual signers. Since the participants of these studies all used the same signed language, their performance as a group was, not surprisingly, quite similar. In order to distinguish these positions, we must compare the performance of signers accustomed to differing construals of phonetic form and semantic concepts.

Do signers of different signed languages show preferential sensitivity to the iconic construals consistent with their own language? We hypothesize that they will, and test this hypothesis by comparing the performance of signers of DGS and ASL on an iconicity judgment task. We selected this task because it allowed us to compare performance on native and foreign signs. Further, when signs are categorized as iconic or non-iconic for psycholinguistic studies, investigators rely on their own off-line judgments, or they have signers or non-signers rate signed stimuli on their iconicity using off-line judgments. Our study attempts to evaluate whether such judgments can be considered objective, or whether they are influenced by the language-specific experience of the raters. If we find no differences across ASL and DGS signers, we can conclude that iconicity is an objective perceptual similarity relation – accessible to all signers. If we, however, find that signers rate their native signs to be more iconic than the foreign signs, we will have evidence that iconicity is not independent of linguistic experience.

It is challenging to test our theoretical claim empirically. If, as we argue, there is no objective measure of iconicity, how then can we claim to manipulate iconicity in a predictable way in our study? Our approach, out of necessity, is to demonstrate that each conceivably objective measure of iconicity does not result in comparable changes in iconicity ratings in signers of different signed languages.
**Method**

**Participants**

20 deaf signers of DGS from Germany and 24 deaf signers of ASL from the United States were recruited to participate in the study. One participant was eliminated from the DGS group due to equipment failure. All the German participants described DGS as their primary language and had no knowledge of ASL other than superficial exposure through acquaintances. All of the participants from the United States described ASL as their primary language and had no knowledge of DGS other than superficial exposure through acquaintances. All participants were paid for their participation.

**Materials**

Forty-three DGS signs and their translation equivalents in ASL were used in the current study (see Appendix 1 – Stimulus List). The stimulus material was based on a previous study (Grote & Linz, 2003) in which deaf signers of DGS rated the frequency, familiarity and iconicity of 150 DGS signs. Those 150 signs were translated into ASL. A subset of 43 signs with citation forms in both DGS and ASL was selected. The selected signs did not include any classifier constructions, deictic signs, or lexicalized fingerspelling. A fluent, deaf DGS signer was filmed producing the citation form of the DGS signs. A fluent, deaf ASL signer was filmed producing the citation form of the ASL signs. QuickTime video files were created for each sign, and displayed in an experimental interface that allowed participants to control the presentation and repetition of each target sign.

**Procedure**

Participants were informed of the nature of the experiment in their native language. Those who consented to participate were asked to perform five rating tasks. The experimental task was based on the VEIP (Verfahren zur Einschätzung von Item Parametern [Procedure to evaluate item parameters], Grote & Willmes, 2003). For all tasks, participants viewed a video clip of a sign, and then rated the sign on a scale from 0 to 100. The ratings were entered by moving a cursor on a horizontal scrollbar. The leftmost location on the scrollbar was marked with the value “0”, and the rightmost location was marked with the value “100”. The center of the scrollbar was marked with the value “50”. Participants could view the sign as frequently as they wanted prior to entering their rating. Tasks 1 and 2 were control measures.
Task 3–5 were experimental measures. The duration of the entire procedure was approximately one hour.

**Task 1**: Usage. Participants viewed 43 signs from their native language and were asked “Do you use this sign?” The ends of the rating continuum were labeled “never” (0) and “very frequently” (100).

**Task 2**: Familiarity. Participants viewed the same 43 signs from their native language and were asked “How familiar is this sign to you?” The ends of the rating continuum were labeled “not at all” (0) and “very familiar” (100).

**Task 3**: Native language iconicity. Participants viewed the same 43 signs from their native language and were asked “How similar is the form of this sign to its meaning?” The ends of the rating continuum were labeled “not at all” (0) and “very similar” (100).

**Task 4**: Foreign language iconicity. Participants viewed the 43 foreign language signs followed by their translation equivalents in their native language, and were asked “How similar is the form of this sign to its meaning?” The ends of the rating continuum were labeled “not at all” (0) and “very similar” (100).

**Task 5**: Cross-language form similarity. Participants viewed the 43 foreign language signs followed by their translation equivalents in their native language and were asked “How similar is the form of the DGS (ASL) sign and the corresponding ASL (DGS) sign?” The ends of the rating continuum were labeled “not at all” (0) and “very similar” (100).

**Results**

**Controls**

All participants rated the signs highly in terms of usage and familiarity (Table 1). All item ratings fell within 2.5 standard deviations of their respective means for both DGS-signers and ASL-signers. DGS-signers rated DGS signs lower than ASL-signers rated ASL signs for usage \[ t(42) = 7.74, p < .001, d = 1.18 \], for familiarity \[ t(42) = 6.29, p < .001, d = .96 \], and for similarity \[ t(42) = 4.46, p < .001, d = .68 \]. This is indicative of a global difference between our groups; DGS signers were less likely to use the high end of the rating scale when compared to ASL signers across all measures. Iconicity results are addressed in the next section.

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<tr>
<th>Table 1. Mean ratings by DGS and ASL signers (standard deviation)</th>
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<td>DGS Signers</td>
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<td>ASL Signers</td>
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We also analyzed judgments of form similarity in DGS and ASL (Task 5) to determine whether some of the signs were perceived by the participants to have similar forms in the two languages. The average form similarity rating across the 43 signs by the DGS-signers was 26 (range 0–100), and for the ASL-signers 33 (range 0–100). Eight signs received an average form similarity rating above 50 by both groups, and were classified as Similar signs. The remaining 35 signs, which were not judged to have a similar form by the participants, were classified as Dissimilar signs. An analysis of the usage and familiarity ratings of the Similar and Dissimilar signs revealed that neither was rated higher in familiarity or usage than the other (Table 2).

Table 2. Mean usage and familiarity ratings of similar and dissimilar signs by DGS and ASL signers (standard deviation)

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<tr>
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<th>Similar Signs</th>
<th>Dissimilar Signs</th>
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<tbody>
<tr>
<td><strong>DGS Signers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usage</td>
<td>73.2 (9.73)</td>
<td>72.9 (13.80)</td>
</tr>
<tr>
<td>Familiarity</td>
<td>85.5 (5.64)</td>
<td>88.2 (8.68)</td>
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<tr>
<td><strong>ASL Signers</strong></td>
<td></td>
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<td>95.8 (2.08)</td>
<td>96.6 (4.21)</td>
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Native vs. foreign iconicity judgments

The first analysis assessed whether the two groups of signers considered their native signs to be more iconic than the signs of the other language. If experience informs the availability of form to concept mappings, signers should rate items in their native language as more iconic than those of a language to which they have limited to no exposure. We tested these predictions with a 2 × 2 repeated measures mixed ANOVA with language (DGS, ASL) as a within-subjects variable and group (DGS-signers, ASL-signers) as a between-subjects variable across subjects (F1) and items (F2). Results revealed no main effect of Language [F1(1,41) = 2.16, ns; F2(1,42) = 2.35, ns]. A main effect of Group [F1(1,41) = 5.57, p < .05, ηp² = .12; F2(1,42) = 38.93, p < .001, ηp² = .48] was modulated by a Language × Group interaction [F1(1,41) = 43.52, p < .001, ηp² = .52; F2(1,42) = 87.08, p < .001, ηp² = .66], (Figure 2). ASL-signers rated ASL signs higher than DGS signs [(62.6, 45.2), t(46) = 3.20, p < .005, d = .92], and DGS-signers rated DGS signs higher than ASL signs [(58.4, 31.2), t(36) = 6.22, p < .001, d = 2.0]. Both groups exhibit an effect of language experience on their perception of iconicity.
High vs. low iconicity subset

The stimulus items were selected on the basis of comparable meanings in the two languages. To explore the robustness of the experience effect found in the first analysis, we selected a subset of items that were not matched by meaning, but were matched by degree of iconicity, as perceived by native signers. Specifically, we selected a set of five signs from the high and low ends of the iconicity rating scale for each language, attempting to match the native language ratings across the two groups as closely as possible without taking the sign’s meaning into account (Figure 2).

A 2 × 2 repeated measures mixed ANOVA with language (DGS, ASL) as a within-subjects variable and group (DGS-signers, ASL-signers) as a between-subjects variable across subjects (F1) and items (F2) revealed a main effect of Group with ASL signers providing higher iconicity ratings overall compared to DGS signers [F1(1, 41) = 14.15, p < .001, ηp² = .26, F2(1,16) = 7.78, p < .05, ηp² = .33]. The effect of Group was modulated by a Language x Group Interaction [F1(1,41) = 16.83, p < .001, ηp² = .29, F2(1,16) = 13.78, p < .01, ηp² = .46]. Each group rated their own language as more iconic than the foreign language (Figure 4). For the high
Corrine Occhino, Benjamin Anible, Erin Wilkinson, and Jill P. Morford

iconicity items ASL signers rated ASL signs higher than DGS signs [(91.4, 78.7), \( t(46) = 3.17, p < .005, d = .91 \)] and DGS signers rated DGS signs higher than ASL signs [(77.0, 62.7), \( t(36) = 2.30, p < .05, d = .75 \)]. For the low iconicity items ASL signers’ ratings of ASL vs. DGS signs was not significantly different [(35.9, 24.1), \( t(46) = 1.56, p = \text{n.s.} \)], but DGS signers did rate DGS signs significantly higher than ASL signs [(27.5, 9.5), \( t(36) = 3.01, p < .001, d = .98 \)]. The results again demonstrate that linguistic experience influences the perception of iconicity.

Cross-language visual similarity subset

For 8 of the 43 items, translation equivalents in DGS and ASL had very similar forms, such as the pair BANANE/BANANA. Signs that have similar forms in the two languages may allow signers to construe form and meaning in a similar manner, resulting in comparable iconicity ratings. Alternatively, even minor phonetic differences in the forms could be sufficiently entrenched as to influence ratings of these highly similar forms. In the case of BANANE/BANANA, the sign in DGS is produced with the non-dominant hand in an A-handshape, profiling how a banana is held, while the non-dominant hand of the ASL sign is a 1-handshape, profiling the shape of the banana. The dominant hand in both signs “peels the banana” which is held or depicted by the non-dominant hand.

Figure 3. Examples of signs from the high iconicity and low iconicity conditions: (A) ASL and DGS signs with highest iconicity ratings BANANA and APFEL “apple” (B) ASL and DGS signs with lowest iconicity ratings FURNITURE and BEDEUTUNG “meaning” Photos courtesy of spreadthesign.com
Iconicity is in the eye of the beholder

A 2 × 2 repeated measures mixed ANOVA with language (DGS, ASL) as a within-subjects variable and group (DGS-signers, ASL-signers) as a between-subjects variable across subjects (F1) and items (F2) revealed a Language x Group interaction in the subject analysis [F1(1,41) = 10.55, p < .01, \( \eta^2_p = .21 \), F2(1,7) = 2.34, p = n.s., \( \eta^2_p = .25 \)]. The item analysis lacked power due to the small number of items that were similar in the two languages. While ASL signers rated ASL not significantly higher than DGS [86.0 vs. 79.4, p = .08], Germans did rate DGS significantly higher than ASL [78.7 vs. 67.3, p < .01], (Figure 5). These results suggest that even when signs look very similar across languages, signers have a tendency to judge native signs to be more iconic than non-native signs.

**Initialization subset**

Signed languages exist in close contact with the spoken languages of their surrounding communities. One effect of this contact is the introduction of handshapes in the phonological formation of a sign to represent the first letter of the written form of the sign’s translation equivalent in the surrounding spoken language (Battison, 1978). For example, one sign in our sample was the ASL sign for OFFICE. This sign is historically a modification of the ASL sign ROOM, in which
the B-handshape profiles the relationship of the flat surface of the handshape onto the semantic feature of flatness of walls. When this flat palm is replaced with a handshape that forms the letter “O”, the sign is translated into English as “office”. Obviously, the intent of initialized OFFICE no longer involves the mapping of the handshape involved in the articulation to the shape of the walls, as the walls are not suddenly construed as cylindrical or concave; in fact we suspect that no signer would be confused by this change in mapping. In these instances, it seems that the profile of the iconicity of the handshape is transferred to the relationship of that handshape to fingerspelled “O” or even the orthographic convention in English spelling. Thus we can conceive of this as a shift in iconic motivation from language external sources to language internal sources in that by profiling “O” the sign is not only simultaneously connected to the sign ROOM which shares its movement and location, but also to other ASL signs which contain the mapping of the handshape O to other O-based fingerspellings or initialized signs. As Lepic (2015) suggests, initialized signs may in fact be a type of derivational morphology which is very similar to blending, in which partial form-meaning properties from one word or construction are blended together with form-meaning properties of another word or construction. In this sense, much in the way that “bromance” evokes both “bro” and “romance” both phonologically and semantically, OFFICE may evoke both

Figure 5. Ratings for similar signs by group and language
Iconicity is in the eye of the beholder. There were 7 initialized signs in the ASL items and no initialized signs in the DGS items. We thus compared ASL signers’ and DGS signers’ iconicity judgements of these 7 ASL signs.

In a paired two sample t-test across items, we found a significant effect of group, $t(6) = 8.13$, $p < .001$, $d = 6.64$, on the iconicity ratings of these 7 ASL signs. The ASL signers judged these signs to have a moderate level of iconicity ($M = 42$, range $= [29, 68]$) whereas the German signers did not perceive them to be iconic in the least ($M = 8$, range $= [2, 23]$). The fact that initialized signs could be considered iconic supports our contention that the iconicity of these signs is shifted to language internal sources rather than being eradicated by this process.

Discussion

The results of this experiment provide strong evidence for the critical role of language experience in the perception of iconicity. ASL-signers give higher iconicity ratings to ASL signs than they give to DGS signs and DGS-signers give higher iconicity ratings to DGS signs than to ASL signs. Moreover, we attempted to isolate this effect in a subset of the data to determine whether iconicity ratings were triggered by specific characteristics of signs. When the data is separated into highly iconic items, marginally iconic items, signs that share form and meaning similarities across ASL and DGS, or initialized signs which overlap with orthographic representations of the surrounding spoken language, we still find significant effects of language experience on participants’ judgments of iconicity. This suggests that when signers are asked to assess how closely the form of a sign is related to its meaning, they are drawing on resources that are ancillary to the directly observable connections between form and meaning, and so are accessing a robust network of associations available to proficient native users (McClelland & Elman, 1986; Lund & Burgess, 1996; Kohonen, 2001; Shook & Marian, 2013). Even non-signers, who lack the extensive experience of native signers, may nevertheless draw on their experience, albeit with co-speech gesture, when evaluating signs (Ortega & Morgan, 2014). In cases where signers are asked to rate non-native signs, users are able to access the general surface level form associations, and perhaps bring to bear information about form which looks similar in their native sign language, but lack the influence of frequency, cultural connectivity and personal experience through which they are able to process native signs. The result is that native iconicity associations are always judged higher than non-native associations.

These findings can be accounted for with usage-based approaches to phonology that directly incorporate language experience into language representation. Namely, it is only when form and meaning are considered together, and not in isolation, that we can begin to solve the questions regarding the effects of iconicity in
processing, storage, and production in signed languages. Usage-based approaches to spoken language have helped us to understand the effects of frequency and variation on the organization and grammaticalization of language, as well as offering insight into the role that general cognitive processes, such as schematization and analogy, play in language structure and language use (Bybee, 2001, 2010; Langacker, 2008). These approaches hold promise for explaining phenomena that have formerly been marginalized in the field of signed language linguistics.

The implications for studies that deal with iconicity in both spoken and signed languages are profound. The position that iconicity is a mapping between a linguistic signal and an actual real-world referent (and methods of assessing iconicity grounded in this position) are revealed as untenable under these circumstances. Instead these results support the proposal that iconicity is a construal of a linguistic signal relative to its referent. Iconicity is completely subjective in that it relies on an individual’s interpretation. It cannot be measured via truth-conditions or “reality.” Rather, it is our ability to conceptualize our articulators, and to conceptualize semantic fields that allows signed languages to take advantage of countless opportunities for iconic mappings. 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 construed. That individual language users can come to similar conclusions and thus create a sense of communal reality arises from the fact that users in a given language community often experience similar cultural and environmental conditions. Iconicity may seem to be objective because many individuals “see” the iconicity, but it is based on shared perceptual abilities and similar cognitive forces at work.

Due to granularity of association, it is not necessary that all aspects of a sign are mapped iconically. Likewise, specific aspects of a sign may map a particular phonological feature to a particular semantic feature, but that iconic mapping may be inaccessible to a perceiver for whom those specific mappings do not exist. For instance, the ASL sign TROPHY is produced by extending the thumb and little finger on both hands (Y-handshape) and placing the knuckles of the remaining fingers in close proximity. The resulting configuration easily represents the shape of one type of prototypical trophy (along the lines of the Wimbledon or Wanamaker trophies). However, this handshape is also the same as the letter “y” from the ASL fingerspelling alphabet. When ASL signers are asked why TROPHY is iconic, they may alternately respond that it is because the sign looks like the shape of the cup of the trophy or because the two “Y” handshapes represent the handles of the trophy, or even that “trophy” ends in the letter “y” (S. Wilcox, personal communication, January, 2015). While all three explanations express iconic relationships, they are unique in the construal of form and meaning, and hence also in the alignment of form and meaning within the conceptualization. In this way iconicity is not only
Iconicity is in the eye of the beholder

based on language experience, but also individual idiolectal experiences – individuals construe form-meaning pairings based on their own experience, cultural connotations, and linguistic associations.

We draw from this evidence that experience with linguistic forms in contexts of meaningful communication is what allows for iconic mappings, not objective properties of the signs themselves. When viewed in these terms, the notion that non-signers – who have no exposure to a signed language and by extension a shared associative network of language internal mappings, have little to no individual experience with the form (other than perhaps via co-speech gesture), and little if any in-group cultural associations² – the notion that non-signers with such a paucity of experience with signs are able to assess the “iconicity” of signs more objectively than signers is faulty and must be dismissed.

Conclusion

In this study we began by comparing iconicity ratings across groups of signers for a selection of signs that are matched for meaning in DGS and ASL. Second, we selected a subset of signs that each group estimates to be either highly or marginally iconic, in their own language. Third, we analyzed just the signs that the participants in the study judged to have similar forms across the two languages. Finally, we selected a group of signs that have been influenced by language contact with a majority spoken language, and hence could be assumed to have a lesser degree of motivation due to the borrowing influence on features of their form. Across all of these analyses, we found a recurrent pattern in the iconicity ratings of our participants: they consistently rated the signs of their own language as more iconic than the signs of the other language.

If we return to the argument initiated by Hermogenes and Cratylus some 2500 years ago about whether names are conventional or natural, like Socrates we feel compelled to point out weaknesses in both positions. Socrates pointed out that even the most conventional names (i.e., numbers) must have an element of naturalness to them, and the most natural names such as the Greek word meaning hardness, sklêrotês, can be understood despite the soft sound of the l due to the

². There may be some evidence that shared cultural knowledge can facilitate access to iconic mappings. Pizzuto and Volterra (2000) found that hearing Italian non-signers who shared cultural experience with Deaf Italian Sign Language (LIS) users were better at guessing the meaning of a set of LIS signs than Deaf signers from other countries. Thus, broader socio-cultural context factors into the ability of non-signers to have access to the semantic features profiled by the phonetic form of the sign. Further study needs to be conducted to better understand the role of culture and group-status as related to iconicity.
convention of using this word to refer to this meaning. While the ancients tried to argue that all words were conventional or natural, the modern focus of this debate with respect to signed languages centers on the idea that there is an objective basis on which to assess whether or not signs are iconic.

For signed languages, the supposition that iconicity is a transparent feature of signs is undermined by the fact that language users engage in construal processes that bind form and meaning such that forms appear natural for their users – more natural than the forms of other languages; likewise, the contention that a sign’s iconicity is a transparent relationship between form and meaning, fails to account for the variation in the perception of iconicity that we demonstrate in our study across signers of different languages. In sum, iconicity is in the eye of the beholder, and cannot be evaluated independently of an individual’s language experience.

Acknowledgements

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References


### Appendix – Stimulus List

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