The Variability of Semantic Categories: An Experiment in

Matthew Whelpton

The nature and variability of lexical semantic categories remains an enduring topic of controversy and debate. The Evolution of Semantic Systems (EoSS) project sought to address such issues by collecting naming data from 50 Indo-European languages, using a fixed stimulus array covering four domains: colours, body parts, containers, and spatial relations. This inspired subsequent work in Iceland on heritage language (North American Icelandic) and sign language (Icelandic Sign Language). This paper reports key findings relating to Icelandic. The least variability is found with body parts and colours, both of which are supported by specialised neuro-psychological architecture for visual and proprio-perception.

1. Introduction

To the naive observer, few aspects of language are more accessible than the meaning of words referring to concrete objects and their observable characteristics. A cup and bowl on a table or the red of berries against green leaves seem to present themselves naturally for classification and labelling. However, it is well known in the fields that have concerned themselves with word meaning—linguistics and lexicography, philosophy, psychology, and anthropology amongst them—that this transparent link between word meaning and the observable world is illusory. The term *red* in English is hemmed in by *orange* and *yellow* and *purple* and *pink*, whereas the Ejagham language of Nigeria and Cameroon has a three-term system: énjàgà 'black/green/blue', ébáré 'white', ébí 'red/yellow' (Kay et al. 2009:227); a *house* in English is not the same as a *hús* in Icelandic, the former being restricted to domestic dwellings and the latter not.

Such questions concerning the variability of semantic categories and how they

[1] This work stems from the Evolution of Semantic Systems project which received financial support from the Max Planck Gesellschaft. The EoSS data for Icelandic was collected by the author. I would like to thank Linnaea Stockall for the use of the British English data. Data for North American English and North American Icelandic was collected as part of the *Heritage Language, Linguistic Change and Cultural Identity* project (PIs: Höskuldur Þráinsson and Birna Arnbjörnsdóttir) funded by the Icelandic Research Fund. Data for Icelandic Sign Language was collected as part of the *Colour in Context* project (PI: Matthew Whelpton) funded by the University of Iceland Research Fund. All views, errors and omissions are mine solely.

change is the focus of the Evolution of Semantic Systems (EoSS)[2] project (Majid, Jordan & Dunn 2011). How variable are semantic categories across languages? Do different kinds of categories differ in the degree to which they vary between languages? For instance, are categories for spatial relations between objects more variable crosslinguistically than categories for the concrete objects themselves? Are categories for attributes of objects more variable than categories for parts of those objects? How do such patterns of variation relate to the processes of historical change?

Unusually for a typological study, EoSS chooses to look at a single family of related languages (Indo-European) rather than a selection of typologically diverse languages. This allows for the use of statistical methods (similar to those used in biology for phylogenetic research) to quantify the degree of variation in the family group. Naming data was collected for four semantic categories—body parts, colours, containers, and spatial relations—in 50 Indo-European languages. Use of fixed stimulus arrays allows for comparisons across a uniform extensional space.

This paper reports results relating to Icelandic, including EoSS-inspired work on heritage Icelandic and Icelandic Sign Language. Section 2 sets the experimental work in the context of debates concerning the nature and variability of semantic categories. Section 3 sets out the methodology of the EoSS project. Section 4 reports the main EoSS findings for Germanic as well as related work on Icelandic. The findings support the view that semantic categories do indeed differ in the degree of variation that they exhibit. Colour and body-part naming are more constrained by neuro-psychological factors than containers, which are more suspectible to cultural influences. Spatial relations vary at least as much as containers but are arguably susceptible to different cognitive constraints.

2. Semantic Categories

The classical theory of (lexical) concepts holds that to identify the meaning of a word, you identify the set of things to which it can truly be applied (the extension); you identify the extension by asking questions concerning its defining characteristics (the intension), as in the parlour game *Animal? Vegetable? Mineral?* Each concept will have a set of necessary and sufficient conditions which define its range. This view goes back to Plato´s *Euthyphro* and Aristotle´s *Categories* and runs through Western philosophy (cf. Locke, Descartes, Hume, Frege and Russell).

This view has been famously challenged in philosophy, psychology and linguistics. The philosopher Wittgenstein (1953) challenges the feasibility of isolating a set of necessary and sufficient conditions for every lexical concept using an argument from family resemblances. The psychologist Rosch (1973) challenges the sharp categorial nature of lexical concepts with her work on prototypes. In a

2 <http://www.mpi.nl/departments/other-research/research-consortia/eoss/aims>.

similar spirit, the linguist Labov (1973) illustrates the fuzzy boundaries between the common container categories, *bowl, cup* and *vase*, a study reproduced for Icelandic by Höskuldur Þráinsson (1979).

Underlying such controversies are assumptions concerning the sources of stability or variability in semantic categories. Universalists argue for strong shared constraints on semantic categories. The constraints might be imposed by the environment, for instance the claim that certain aspects of our experience "cry out to be named" (Berlin 1992:290); or they may reside in the cognitive system itself in the form of innately given primitive concepts (cf. Fodor 1975). Relativists on the other hand argue for the free construction of semantic categories, most famously by the linguistic system itself (Sapir 1912, 1929, Whorf 1956), a view going back to Saussurean notions of semiotic value (Saussure 1922).

Majid et al. (2015) point in particular to an ongoing controversy concerning the relative importance of external stimuli and internal cognitive constraints. The psychologist Gentner argues that directly perceptible individuated entities vary less than abstract relational entities (Gentner 1981, Gentner & Boroditsky 2001): external stimuli trump internal cognitive constraints. The linguist Talmy argues that closed class functional terms vary less than open class substantive terms (Talmy 1983, cf. Landau & Jackendoff 1993, Haspelmath 2003): internal factors strongly constrain abstract functional categories which are not readily subject to conditioning by external experience. To address such questions, an experimental extensional approach is taken, in which the lexical categorisation in different languages of a fixed stimulus array is compared statistically.

3. Methodology

3.1. Languages and participants

Icelandic was one of the 50 European languages for which data was elicited as part of the EoSS project. Section 4 reviews some studies relating to Icelandic, resulting from this original research, including comparisons with Dutch, Frisian, Swiss German, Standard High German and Norwegian Bokmål. This work inspired further research in two projects in Iceland.

The *Heritage Language, Linguistic Change and Cultural Identity* project (2013–2015; PIs: Höskuldur Þráinsson and Birna Arnbjörnsdóttir), funded by the Icelandic Research Fund, was concerned with the current status of the heritage language, North American Icelandic (NAI), spoken by descendants of emigrants from Iceland, primarily in 19th century, who settled in Canada and the United States (Arnbjörnsdóttir 2006). As part of a wide ranging set of research assessing the status of NAI, from grammatical properties to cultural context, the project collected naming data for both NAI and the English spoken in the same communities (North American English, NAE). Colour naming data for NAI and NAE was collected in 2014 in Manitoba, Saskatchewan and North Dakota. Naming data in the other three EoSS categories was collected in 2013 in Manitoba. This data was supplemented with the EoSS data for British English, kindly supplied by Linnaea Stockall.

The *Colour in Context* project (2014-2016; PI: Matthew Whelpton), funded by the University of Iceland Research Fund, collected colour naming data from the Icelandic Sign Language community. The aim was to allow researchers to compare Icelandic colour naming practices with those of a community in Iceland speaking a typologically unrelated language, as well as with a typologically related variant of Icelandic which had developed in a foreign country (North American Icelandic).

Table 1 shows information on the participants for each language reported here.

Language (Project)	Participants (Female)	Mean Age	Researchers
Icelandic (EoSS)	21 (10)	29	Matthew Whelpton; Þórhalla Guðmundsdóttir Beck
Frisian (EoSS)	23 (13)	20	Pieter Duijff; Arjen Versloot
Swiss German (EoSS)	20 (10)	26	Raphael Berthele; Martina Zimmerman
Standard High German (EoSS)	20 (10)	21	Cornelia van Scherpenberg; Michael Dunn; Fiona Jordan
Norwegian (Bokmål) (EoSS)	20 (10)	28	Åshild Næss
Dutch (NL) (EoSS)	21 (16)	22	Wendy van Ginkel; Fiona Jordan; Michael Dunn
British English (EoSS)	20 (9)	22	Linnaea Stockall; Euphemia Snell
North American English (Heritage)	51 (36)	67	Matthew Whelpton; Þórhalla Guðmundsdóttir Beck
North American Icelandic (Heritage)	30 (19)	78	Kristín Jóhannsdóttir; Íris Edda Nowenstein; Matthew Whelpton; Þórhalla Guðmundsdóttir Beck
Icelandic Sign Language (Colour in Context)	21 (14)	48	Kristín Lena Þorvaldsdóttir; Matthew Whelpton; Þórhalla Guðmundsdóttir Beck

Tabel 1: Overview

Two points require immediate comment. Participants in the EoSS project were primarily undergraduates and the mean age of participants was in the 20s. NAI on the other hand is a heritage language which is dying. The participants were therefore considerably older (mean age 78). The English particpants were selected from the same communities as the NAI speakers and were often their carers, who brought them to the experimental site. Though younger than the NAI speakers, the NAE speakers are therefore also considerably older than the EoSS participants: mean age 67. Icelandic Sign Language (ISL) is spoken by a very small community in Iceland and it was not possible to find 20 volunteers if participation was restricted by age; the mean age of participants was 48.

This means that age is a potentially confounding factor in interpreting differences between the languages. However, this only serves to underline the striking similarities in colour naming reported in section 4.4.

3.2. Experimental stimuli

Data was collected in each of the four semantic categories, following a standardised elicitation task, as specified by the EoSS project protocol (Majid et al. 2011). Each participant was presented with a series of stimuli and asked to name them. The stimuli were presented in a fixed random order. It was emphasised that they should use the first word that came to mind and that we were interested in simple everyday language. In addition, participants completed a focal colour task and a colour blindness task. Responses were audio-recorded (video-recorded in the case of sign language) and transcribed and coded by the researcher afterwards.

3.2.1. Body parts

Stimuli in the body part task comprised 90 line drawings: 70 of the human body viewed front and back; 20 of the head and face viewed from the front. A red dot on each line drawing identified the area to be named. The stimuli were developed for the EoSS project by the principal investigators (Jordan, Dunn & Majid 2009). Participants are asked "The man has a dot on his...?".

3.2.2. Containers

Stimuli in the containers task comprised 67 colour photographs of household containers, primarily kitchen containers, which were developed by and used in Ameel et al. (2005). Items were photographed from a fixed distance against a neutral background with a ruler in the foreground. Participants are asked "What is this called?"

3.2.3. Spatial relations

Stimuli in the spatial relation task comprised 71 line drawings from the Topological Relations Picture Series (Bowerman & Pederson 1992). Each drawing shows a Figure in orange set against a Ground in black. Participants are asked "Where is the X?".

3.2.4. Colour naming

Stimuli in the colour naming task comprised 84 Munsell colour chips. Four colours were achromatic (black-grey-white). The remaining 80 vary in hue, brightness and saturation. There are 20 equally spaced hues at four degrees of brightness. Saturation varies so that colours are generally at the maximal possible chroma for that point in the colour space. Only Munsell certified colour sheets were used. As light conditions critically affect perception, colours were presented under a daylight bulb simulating the full spectral range of daylight.

3.2.5 Focal colours

After colour names had been elicited, the participant was presented with all 84 colours in a 4x21 array, ordered by hue and brightness. Participants were then asked to point to the best example of a series of basic colour terms (e.g. "Please point to the best example of red"). A standard list of basic colour terms was used for both varieties of English; the list for Icelandic Sign Language was taken from Rannveig Sverrisdóttir and Kristín Lena Thorvaldsdóttir´s (2016) detailed study. No standard list was available for Icelandic so a rapid listing test was run to determine a salient set of colour terms (Corbett & Davies 1997, cf. Berlin & Kay 1999). Given constraints on data collection with the heritage community of North American Icelandic speakers, it was not possible to run such an elicitation test; the list for Icelandic was used. The consequences of this decision are discussed in detail in Guðmundsdóttir Beck & Whelpton (To appear). All five languages had the eleven basic colour terms standardly listed for English (Berlin & Kay 1999, Kay et al. 2009).

3.2.6. Colour blindness test

Finally, all participants took a colour blindness test. The British English and Icelandic participants took the Waggoner (2002) colour blindness test. The North American and Sign Language participants took the 10-plate Ishihara Test for Colour Blindness (The Isshinkai Foundation 2005). Results from participants who were found to be colour blind were then excluded from the final analysis.

3.3 Coding

The complete response given by each participant to each stimulus was transcribed into a standardised spreadsheet as the full response. Sign language responses were transcribed using the standard transcription for ISL, including information on mouthing and facial expression, as well as the fingered spelling of items. That full response was then coded as a main response, which was the transparent morphological and semantic head of the word used to name the stimulus. For instance, if a participant responded "it's a black coffee cup" (full response), then *cup* was coded as the main response because *cup* is the morphological head of the compound *coffee cup* and the semantic relation between the compound and the morphological head is transparent: a coffee cup is a kind of cup (hyponym relation). If the participant did not respond, gave an unintelligible response, or responded in a way unrelated to the stimulus, an error was coded. From the main responses, a dominant term was also identified for each stimulus: a dominant term is a term that is used more often than any other term to name a stimulus.

In some cases, the choice of a coded main response was problematic, usually because the relationship between the target phrase in the full response and the morphological head was not (entirely) semantically transparent. For instance, the compound noun *ashtray* is made up morphologically of two nouns *ash+tray*. However, most speakers do not accept that an ashtray is a kind of tray and ashtrays can take a form which is quite different from the form of trays. In this case, the whole nominal term *ashtray* was coded as the main response.

A number of coding decisions deserve special comment here. The standard Icelandic translation for *orange* is *appelsínugulur*, literally *orange+yellow*. The standard Icelandic translation for *purple* is *fjólublár*, literally *violet+blue*. These terms were coded as independent lexemes. This decision was taken for two reasons. First, most Icelandic speakers are not comfortable saying that *appelsínugulur* is a kind of *gulur* or that *fjólublár* is a kind of *blár*. Second, both *appelsínugulur* and *fjólublár* appeared prominently in the rapid listing task discussed in section 3.2.5 and therefore appear to be salient to speakers as independent lexical items.

Another significant coding decision relates to the EoSS protocol as a whole. In the responses to the spatial relation stimuli, it was decided to code only prepositions as main responses. In some cases, this has a potentially significant distorting effect on the analysis. So for instance one stimulus shows a fence as the Figure surrounding a house as the Ground. The participant is asked "Where is the fence?". A common Icelandic response exemplifies the problem that arises.

1) girðingin umkringir húsið
fence=the around+circles house=the
"the fence surrounds the house"

The Icelandic verb for *surround* includes an incorporated prepositional particle *um* 'around'. However, there is no prepositional phrase *um húsið* 'around the house'. This was therefore coded as an error. The study reported in section 4.2 seeks to address this deficit in the standard protocol.

The coding of heritage language responses posed a special challenge. Given the fragile state of heritage NAI, there was enormous variation in the phonological form of responses and often also in the morphological class attributed to nouns. For instance, NAE *eyebrow* and Icelandic *augabrún* might appear in NAI responses as *augabrún, augnbrún, eygabrúr, augabrýr,* or *eygabrár*. It was decided to code such continua of variation by a single standard form as the main response. Similarly, NAE *arm* and Icelandic *handleggur* (masc) might appear as *armur* (masc), *armið* (neut) or *armini* (fem). These were coded by a single standardised main response. It was however possible to set the processing script to recognise all such variants as separate main responses.

Conversely, there were cases where the variant forms potentially signified diverging semantic categories, especially the use of English versus Icelandic terms (e.g. both *bowl* and *skál*). It was decided to code these as separate main responses but with an option in the processing script of treating these as a single main response.

4. Icelandic and the EoSS results

4.1. Statistical analysis for the EoSS Germanic languages

A special volume of *Language Sciences* appeared in 2015 dedicated to results from the Germanic group of languages in the EoSS project. Majid et al. (2015) offer an overview of the results, including a statistical analysis of naming patterns in the Germanic languages, which address the issue of relative variability of semantic categories.

Following Malt et al. (1999), the authors conducted simple Pearson correlations on all possible pairwise similarity matrices in each of the semantic categories. To take body parts as an example: there are 90 line drawing stimuli in the body part task. For each individual participant, the response for a pair of stimuli was compared, e.g. the response to stimuli 5 and the response to stimuli 62. If the same main response was given to name both stimuli the value of 1 was assigned; otherwise a value of 0 was assigned. For each individual participant, there was therefore a 90x90 matrix representing which stimuli were grouped under the same name and which were not. The matrix for participants in a language were then averaged to give a value between 0 and 1 representing the proportion of participants in that language who assigned each pair of stimuli the same name. Simple Pearson correlations were then run on each pair of languages within a particular semantic category to see how similarly two languages divided up the extensional space lexically. All languages were significantly positively correlated in all categories (at $p = .01$, one-tailed); however, there was an interesting difference in the degree of variability of categories. Colour and body parts correlated on average over 0.9, containers over 0.8, and spatial relations over 0.7 (Majid et al. 2015:7).

The same data was then subjected to a Principal Component Analysis (again following Malt et al. 1999). This technique identifies a small number of components and quantifies how much of the variation in the data can be attributed to each component. For all four domains, a single factor accounted for most of the variance: body parts (94.5%), colour (93.8%), containers (83.9%), spatial relations (75.8%). For all but the spatial relations the eigenvalue scores were higher than 1 only for the first component, suggesting that a single component was enough to account for variation in the data; 2 were sufficient for spatial relations (Majid et al. 2015:8).

The authors observe that this is consistent with the Gentner perspective rather than the Talmy perspective, in so far as abstract spatial relations are more variable than containers, though the high correlation for colours and body parts is surprising from that perspective (Majid et al. 2015:9). However, a number of factors undermine support for the Gentner perspective. If the crucial factor is individuation of concrete objects as opposed to abstract relations, then one would expect containers to show the least variation, perhaps followed by body parts, which are less easily individuated than cups and bowls but still have clear potential boundaries for segmentation at the joints (Majid 2010:60). Colours are an abstract quality representing a continuum of physical properties; spatial relations are also abstract, representing a continuum of relative positions in physical space.

The grouping of body parts and colours is not however surprising from another perspective: both involve categories for which we have specialised neuropsychological architecture (visual and proprio-perception). Containers on the other hand are a cultural artefact, the general constraints on which are largely functional (convenient ways of eating, drinking, storing, cooking and distributing consumables). The similarities reflect both the broad functional constraints on the artefacts and the shared cultural history of many of the Indo-European languages. But there is still ample room for cultural variation, even for instance within a sub-group such as a Western Europe. Dutch for instance set itself apart from the other Germanic languages by having a container, *kom*, which is a container for consuming soup. It cuts across the typical division into cups and bowls that emerged strongly in the Germanic data (see Whelpton, Guðmundsdóttir Beck & Jordan 2015 for more detailed discussion). This suggests support for the Talmy perspective, in which external physical objects are more susceptible to cultural and functional influences on categorisation. If factors such as proprioperception and visual perception play a strong role in constraining categories in the body parts and colour categories then this can be viewed as supporting a certain kind of internal constraint on categorisation.

The main problem for the Talmy approach is of course the high variability of the spatial relations relative to the other categories. However, the second component in the Principal Component Analysis (Majid et al. 2015:8, Figure 1) appears to split the Germanic languages into two tight clusters: on the one hand, Netherlands Dutch, Belgium Dutch, Frisian, German, Swiss German; on the other hand, Danish, English, Faroese, Icelandic, Luxembourgish, Norwegian, Swedish. This looks like a typological split of the kind that one might expect in a model such as Talmy´s where languages differ in the way that information is coded but only in constrained ways; for instance, the difference between post-Latin Romance languages which favour Path-conflation in motion events as opposed to other Indo-European langauges which favour Coevent-conflation (e.g. Manner-conflation) (Talmy 2000:27). In section 4.2, we see in more detail how a subgroup of the EoSS Germanic languages differ precisely in the way that they code spatial information in the verb and preposition.

4.2. Spatial relations in five Germanic languages

As mentioned in section 3.3, the standard coding protocol in EoSS was problematic for cases where spatial information was coded in a prepositional particle incorporated into the verb rather than in an independent prepositional head. This was particularly marked for languages like German which make extensive use of prepositional particles. The focus on independent prepositional heads also potentially obscures other ways of encoding spatial information within the predicate.

Berthele et al. (2015) therefore decided to recode the EoSS data in five Germanic languages to recognise four kinds of spatial coding: complex prepositional forms (e.g. *up against*), three primary posture verbs (*sit, stand, lie*), other coevent verbs (e.g. *hang*), and perfective resultatives (e.g. *be wound around*). The data was recoded for Frisian, Icelandic, Norwegian (Bokmål), Swiss German and Standard German. For our purposes, the results concerning complex prepositions and posture verbs will illustrate the important point.

All five languages made available the option of using complex prepositional constructions. A line drawing depicting a ladder leaning against a wall elicited complex prepositional constructions in all five languages (Berthele et al. 2015:86–87). However, Icelandic differed sharply from all four other languages, including Norwegian, in how frequently it used such complex prepositional combinations (Berthele et al. 2015:87, Figure 1). Even in simple static locational descriptions, complex prepositional elements are often used (Berthele et al. 2015:88, ex. 13).

2) Kanína=n er inni í búri=nu
rabbit=the is inside in hutch=the
"The rabbit is in the hutch."

With respect to the primary posture verbs (*sit, stand, lie*), Icelandic was at the opposite end of the scale and it was Frisian which differed sharply from the other four languages, being the only language in which use of a posture verb was more common overall than lack of a posture verb (Berthele et al. 2015:91, Figure 3). The high proportion of posture coding in Frisian was driven largely by use of the verb *sitte* 'sit', whereas in the other four languages the three posture verbs were used in roughly equal proportions. For Icelandic, Standard German and Swiss German, the use of *sit* cognates was largely limited to animate figures in a prototypical posture (forming a low block profile) with firm contact along the bottom to the ground (e.g. cat on a mat). In both Frisian and Norwegian, the specifically postural elements have been bleached, leaving the sense that the Figure is closely contained by or in close contact with (often adhered to) the Ground (e.g. the gum sits under the table). In Frisian, this bleaching has gone far enough to allow use of the verb with cases of containment-plus-suspension (e.g. the fish sits in the fish bowl). In Frisian (but not Norwegian), this has led to a strong preference to use *sitte* rather than the copular in appropriate contexts (Berthele et al. 2015:92–93).

Close analysis of the coding of spatial information therefore suggests that variation in this domain can be sharp but is not completely free. The variation is structured along an number of dominent lines: a preference for coding information in the prepositional versus the verbal domain; a preference for coding vector orientation or posture/attachment. A statistical analysis of the variation will show marked differences between languages but this will potentially obscure the fact that the variation is generated by a small number of coding choice points. This is exactly the kind of contrast that Talmy predicts. This kind of structured variation is very different from the kind of variation we find in the domain of container naming.

4.3. Containers in Dutch and Icelandic

The EoSS work on containers is built on previous research by Malt and Ameel (Malt et al. 1999, 2003, Ameel et al. 2005). Malt et al. (1999) have shown that speakers of English, Spanish and Chinese who name a set of containers in rather different ways, nevertheless sort them into groups in very similar ways: lexical categories are not the same as, and do not condition, conceptual categories. Malt et al. (2003) suggest that container naming shows complex interactions of linguistic naming conventions and cultural history with more general factors. They find neither the free cross-cutting of categories that one would expect from a structuralist-relativist perspective nor the kind of general uniformity with nesting for more specific descriptions, that one would expect from a universalist perspective. Rather, the complexity of the data requires what they call a mix-and-match approach.

Ameel et al. (2005) consider the naming patterns of Belgian French-Dutch bilinguals in comparison to their monolingual peers. They find that the naming patterns of bilinguals are distinct from those of their monolingual peers and tend towards convergence, though bilinguals have not developed a single uniform naming system. This kind of variation is very different from the structured variation we found with spatial information coding.

One claim in Malt et al. (2003:35) caught the particular attention of the EoSS group. Not only did they find significantly different container naming categories for the three languages but also a significant difference in the number of terms: for 60 stimuli, 5 Chinese terms, 7 English terms, and 15 Spanish terms. They suggested that this was influenced by productive morphology in Spanish which lead to elaboration of container names. Spanish has productive instrumental suffixes (*-ero/-era/-or*) for describing objects used for performing a particular action, e.g. *mamadera* naming an object for sucking on. In the EoSS data, the least related languages for container naming were Icelandic and Dutch. We noticed that Dutch made productive use of diminutive morphology in this naming domain but Icelandic did not. We therefore decided to test Malt et al.´s hypothesis with respect to Icelandic and Dutch (Whelpton et al. 2015).

Dutch has been noted for its "fondness for the diminutive" (Brachin 1985:63). The diminutive *-(t)je* serves a range of functions, including smallness (*kopje* 'espresso cup'), individuation (*broodje* 'bread roll'), portioning (*een biertje* 'a glass of beer'), and the expression of speaker attitudes such as endearment, modesty, or contempt. Our Dutch data includes 12 diminutives. Icelandic has diminutives but they are not especially productive. The diminutive *-lingur* expresses smallness or youth (*gríslingur* 'piglet'); the dimunitive *-s(l)a* expresses endearment and is common in child-directed speech (*tásla/tása* 'toesie'). There were no diminutives in our Icelandic container naming data. The question is then whether the division of the extensional space reflects this difference.

Icelandic has a few broad inclusive terms in the domain (e.g. *skál* 'bowl' and *bolli* 'cup') including at least small and medium sized items. There are then a number of more specialized terms, particularly at the larger end (e.g. *fat* 'platter' and *kanna* 'mug/tankard'). Dutch tends to separate off the smaller items with the diminutive. In some cases, the diminutive separates off the small items (*schaaltje* '(small) bowl') and the non-diminutive covers the medium-to-large items (*schaal* 'bowl/dish'); in some cases there is simply a more even spread across the space: *kopje* 'espresso cup', *mok* 'mug', *pul* 'tankard'.

This might lead one to expect strong prototypical centres for the diminutive terms, especially terms like *kopje* 'espresso cup' whose root *kop* 'cup' does not occur at all as a dominant term. However, Icelandic and Dutch differ strikingly in the items that receive the highest inter-speaker agreement in naming. The Icelandic items that receive highest inter-speaker agreement would typically be named with a diminutive in Dutch (*kopje*, *schaaltje*). However, it is the non-diminutive terms describing larger items that have the highest inter-speaker agreement in Dutch (e.g. *schaal* 'bowl/dish' and *bord* 'plate').

Productive diminutive morphology can influence boundary placement in the extensional space but does not produce a proliferation of terms and/or fine-grained nesting within the domain. Despite its salience, the diminutive is not associated with its own clear prototypical exemplar.

4.4. Colours in Icelandic, English and Icelandic Sign Language

Guðmundsdóttir Beck & Whelpton (To appear) report on colour-naming data from five languages: Icelandic (ICE), North American Icelandic (NAI), North American English (NAE), British English (BRE), and Icelandic Sign Language (ISL).

Following Majid et al. (2015) and Malt et al. (1999), they conduct simple Pearson correlations[3] of the similarity matrices. All the languages are extremely highly correlated (mean 0.92, at $p = .01$). This is particularly striking given the wide variation in age of participants for the five languages and in the typological diversity introduced by the inclusion of Icelandic Sign Language. To the extent that the small variation between language pairs suggests anything, it is interesting to note that the top end of the ranking includes languages sharing a cultural context: Icelandic and Icelandic Sign Language (0.942), typologically diverse but sharing a common cultural environment; and North American Icelandic and North American English (0.939), different languages spoken by members of the same communities; British and North American English also rank highly (0.94). Similarly, the Principal Component Analysis showed that 93.6% of the variance was accounted for by a single component and only the first component received an eigenvalue score greater than 1.

It should be noted that the authors discuss the kinds of variability that emerge beyond this broad statistical analysis. Even in domainant naming patterns some interesting differences emerge. All five languages share 10 dominant terms that may be treated as rough equivalents: green, blue, purple, pink, brown, yellow, red, orange, grey, white. However, even in dominant naming we begin to see diversity. Speakers of both North American and British English used the term *peach* twice as a dominant term (for the same stimuli). For one of these, Icelandic speakers used *húðlitur* 'skin-color' (a term that occurred recurrently in the EoSS data; see Zimmermann et al. (2015) for discussion). In addition, the two Englishes each introduced one additional term of its own but in a different area of the colour palette. North American English introduced *turquoise* as the dominant term for one color in the blue-green area, while British English introduced *maroon* for one color in the dark brown-red area. In their in-depth discussion, Guðmundsdóttir Beck & Whelpton (To appear) explore these kinds of diversity further.

[3] A preliminary statistical analysis was conducted on a snapshot of the data from May 2016 by the Social Sciences Institute of the University of Iceland (Tryggvadóttir & Jónsdóttir 2016); I would like to thank the authors for their invaluable analytical work and discussions. The analysis presented here is based on a snapshot of the data from August 2017. The analysis is conducted in R version 3.3.2 (2016-10-31). I would like to thank Michael Dunn, Joe Jalbert and Helgi Guðmundsson for their help with the R analysis. All errors and misunderstandings remain mine solely.

5. Conclusion

The picture that emerges is a complex one. However, it is clear that different semantic categories vary to different extents, even in closely related languages. The least variable categories are colours and body parts. These are domains for which humans have specialised neuropsychological architecture (visual perception and proprioperception). The same does not go for cultural artefacts such as containers or particular configurations of spatial relations. Although culture is an important factor in all these domains, it cannot be the sole reason for the high similarity of colour naming and body part naming, as containers at least should be just as suspectible to cultural factors in a West European context. Further, the variability in the domain of containers and spatial relations is of a potentially different type. While container naming is affected by a complex interaction of cultural, linguistic and formal factors, the variability in the domain of spatial relations may well be structured by a smaller number of coding choices which may reflect other kinds of internal constraint.

Although more detailed investigations and a broader range of techniques are necessary to establish a fuller picture, it is clear that experimental extensional semantics provides a useful tool in probing some of the deeper questions of lexical semantics.

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Dr. Matthew Whelpton
Professor of English Linguistics
University of Iceland
Brynjólfsgata 1
107 Reykjavík
whelpton@hi.is