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# Temperaments, tempers, and temporality

## Constructions reveal how speakers of French and English conceptualize human properties

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This study focuses on French and English abstract nouns denoting properties that can be ascribed to humans, such as *beauty*, *carefulness* and *anger*. Previous research showed that some but not all of these nouns are licensed in both locative existentials (e.g., *There's an intense anger in Isabella*) and possessive existentials (e.g., *Isabella has an intense anger*). What remains unclear is how these and other patterns correlate among themselves depending on how easily they host such nouns. We here use speaker ratings of these nouns in different constructional environments. A principal component analysis suggests that the main dimension underlying native speakers' ratings of these abstract nouns in six different patterns is temporal limitability. This gradable distinction, strongly correlated with the locative existential, holds for both the French and English data and outweighs any French-English contrastive differences in how acceptable human property nouns are considered to be in the patterns studied.

**Keywords:** human property noun, conceptual autonomy, temporal limitability, existential construction, English/French

### 1. Introduction

When we talk about people, we can describe them as exhibiting any number of properties: they can be of a passionate nature, on the skinny side, measured in their actions, fond of children, and so on. Such examples of properties ascribed to humans are rather permanent, but others are of a more fleeting nature, as when someone is said to be angry, ashamed, frightened or in a sour mood. In this study, we focus on abstract nouns such as *temperament*, *carefulness* and *anger*, which are (semantically and/or morphologically) related to adjectives denoting enduring

or more transient human properties (e.g., *temperamental, careful, angry*). We will call such abstract nouns ‘human property nouns’, henceforth abbreviated as HPNs. The aim of this paper is to explore speakers’ conceptualization of HPNs, as reflected in the constructional environments in which such nouns can be used, and to find out how stable these nouns’ (dis)preference for certain constructional environments is across different languages, which in the present study are French and English.

As we hinted at above, HPNs range from involving relatively stable properties (e.g., *weight*: people tend to be either skinny or heavily built for very long periods in their lives) to involving much more short-lived properties (e.g., *sadness*: people can move from being sad to being no longer sad much more quickly). HPNs also range on another dimension, one that may turn out to be strongly correlated with this temporal dimension: the degree to which the property can be thought of as inherently dependent on the bearer of the property, and vice versa (Cappelle *et al.*, 2019). This dimension, which can be called ‘conceptual autonomy’, is best illustrated with nouns in general rather than just HPNs. Nouns that refer to an object’s (or, for that matter, person’s) size, shape, color, age, etc. cannot easily be thought of independently of that object (or person), nor can we easily picture physical objects or people without making mental reference to any of these inherent features. A noun such as *size* and the ‘bearer’ or ‘support’ of this concept are therefore mutually dependent on each other (the one can’t be thought of without the other). By contrast, we can much more effortlessly think of, for example, a *car* independently of where we may find one or of who may have one, and we can usually think of a place or a person without also having to think of a car. In that respect, *car* is conceptually autonomous from its support (location or possessor), and vice versa.

All HPNs are to some extent conceptually dependent on their support (the person exhibiting the property in question) and, vice versa, the support of an HPN is to some extent always conceptually dependent on the HPN. Yet, for some HPNs, this mutual conceptual dependence is stronger than for others. For instance, an HPN such as *weight* has no existence independently of its support; moreover, every person happens to have a particular weight and they therefore cannot be thought of as having an existence *without* any weight at all (even if one does not know, or care about, the exact weight of the person in question). By contrast, while a noun such as *sadness* also requires the conceptualization of someone to have that feeling, we can easily think of people as not experiencing any such feeling, since we do not all ‘have a sadness’ at any given time. Thus, the mutual co-dependence of *sadness* and its support is weaker than is the case for *weight* and its support.

In this paper, we report on how speakers of French and speakers of English rate HPNs in a set of six different constructions (cf. *infra*). We thereby answer three questions:

- For each of these two languages, do the different constructions that we consider pattern alike in terms of how acceptable different HPNs are in them?
- Can a semantic and distribution-based classification of HPNs in French (*tempérament* ‘temperament’, *maigreur* ‘skinniness’, *prudence* ‘carefulness’, etc.) be upheld by speakers’ judgements?
- Do speakers of French and speakers of English carve up the broad gamut of human properties along similar conceptual dividing lines?

Our paper is theoretically motivated by the view that grammatical constructions can be fruitfully employed in cross-linguistic research (cf., e.g., Boas, 2010).

This paper is organized as follows. In Section 2, we first provide some background on the compatibility of conceptually more autonomous and more dependent nouns in two types of existential constructions: locative existentials (*there is X in Y*) and possessive existentials (*Y has X*) (Section 2.1). We then present a classification of (French) HPNs that has been proposed in the literature and briefly discuss such nouns’ variable acceptability in each of these two constructions (Section 2.2). Next, we introduce four more constructional environments in which HPNs can be found, to varying degree of acceptability (Section 2.3). Finally, we relate the above-mentioned questions to some predictions that can be tested empirically (Section 2.4). In Section 3, we present the methodology used in our study, providing details about the nouns selected and the constructions in which they were presented in two acceptability judgement tasks (one for French and one for English). In Section 4, we present the results of our questionnaire experiments, using a principal component analysis (PCA) to summarize and visualize our observations. The main findings are discussed in Section 5 and some conclusions are given in Section 6.

## 2. Existentials and other constructions, a cline of HPNs, and predictions

### 2.1 Two existential constructions

Languages provide speakers with several constructions to claim that something exists. One of these is the locative existential construction, illustrated for English in (1a) and for French in the equivalent sentence (1b). As Freeze (1992) has pointed out, however, languages may also offer the possibility to predicate existence by

means of a possessive construction, as illustrated for English in (2a) and its French equivalent in (2b):<sup>1</sup>

- (1) a. *There are* at least two existential constructions in French and English.  
b. *Il y a* [lit. It there has] au moins deux constructions existentielles en français et en anglais.<sup>2</sup>
- (2) a. French and English *have* at least two existential constructions.  
b. Le français et l'anglais *ont* [from the verb *avoir* 'have'] au moins deux constructions existentielles.

These two existential constructions cannot always be used interchangeably. It has been suggested in previous research (*inter alia*, Van de Velde, 2003; Cappelle and Tayalati, 2015; Paykin and Van de Velde, 2015) that one of the factors governing the choice of existential construction is the conceptual autonomy of the existential entity. With conceptual entities that are conceptually fully autonomous with respect to their support (i.e., the location/possessor), the locative existential is acceptable while the possessive existential is not. The reverse pattern holds with existential entities that are conceptually fully dependent on their support. Compare first (3a–b) and (4a–b), where in both English and French the locative existential but not the possessive existential is allowed:

- (3) a. *There's* a strange man in the garden.  
b. *Il y a* un homme étrange dans le jardin.
- (4) a. \*The garden *has* a strange man.  
b. \*Le jardin *a* un homme étrange.

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1. A distinction is sometimes made between possessive *have* (e.g. *Mike has a wife*) and existential *have* (e.g. *Mike has a hole in his shoe*), depending on the absence or presence of a locative phrase; cf. Takeuchi (2015) for an overview of the literature and discussion. The view taken here is that *have* can be used for existential predication even if there is no locative phrase.

2. As the French sentences closely follow the English sentences in syntax, we do not provide glosses. We do wish to point out, however, that French uses a possessive verb not only in the possessive existential (cf. (2b)) but also as part of its locative-existential formula (cf. (1b)), while English uses a copular verb in the locative-existential formula (cf. (1a)). In using a possessive verb in the locative existential, French follows a pattern that is widespread among Romance languages. In having a preverbal element, though, French is unlike the other Romance languages (where the post-verbal NP, referring to the existential entity, accordingly has more subject properties), and is more like the Germanic languages (where the preverbal element takes on subject properties, e.g. by inverting with the verb in interrogatives: *Are there... ? / Y a-t-il... ?*). For discussion of subject properties of pre- and post-verbal elements in locative existentials in Germanic and Romance languages, see Gast and Haas (2011).

In this case, we can think of *a strange man* independently of a garden (and vice versa), so *a strange man* is conceptually fully autonomous with respect to its location (and vice versa). Conversely, (5a–b) and (6a–b) illustrate that it is also possible for an NP to be licensed by the possessive existential but not by the locative existential:

- (5) a. \**There's* a round shape in/to the coffee table.  
 b. \**Il y a* une forme ronde dans/en/à la table basse.
- (6) a. The coffee table *has* a round form.  
 b. La table basse *a* une forme ronde.

Here, it is hard to think of a particular shape independently of the object in which it is instantiated – except in mathematical textbooks or works of modern art, shapes do not have an existence detached from physical entities. Moreover, it is quite impossible to mentally picture a concrete object without also making mental reference to any shape that it may have.

## 2.2 HPNs in locative and possessive existentials

HPNs denote properties that we pay attention to when we talk about ourselves or other people. (Animals, or perhaps robots, may also partake of some of the properties at stake.) For all their prominence in discussions of people's mental or physical condition, HPNs have not been the focus of intense study in linguistics. Among the exceptions is Van de Velde (1995), who provides a semantic classification of such nouns for French (cf. Table 1). This classification goes back to an ontological distinction made by Husserl (1913) between dependent and autonomous entities and has been further developed by Flaux and Van de Velde (2000) and Mostrov (2010).

**Table 1.** Classification of human-property-denoting abstract nouns (HPNs) with some French examples and their translations, based on Van de Velde (1995)

Dimension/Nature	Physical characteristic	Behavioral trait	Directed feeling	Psychological state
– <i>poids</i> 'weight'	– <i>beauté</i> 'beauty'	– <i>bêtise</i> 'stupidity'	– <i>amour</i>	– <i>colère</i>
– <i>tempérament</i>	– <i>maigreur</i>	– <i>courage</i>	'love'	'anger'
'temperament'	'skinniness'	'courage'	– <i>haine</i>	– <i>tristesse</i>
		– <i>gentillesse</i>	'hate'	'sadness'
		'kindness'		
		– <i>prudence</i>		
		'carefulness'		

In Table 1, the properties denoted by the nouns are assumed to be ordered from conceptually less autonomous (towards the left) to more autonomous (towards the right). This ordering is largely based on introspection of how we are likely to conceive of the properties in question. For example, it may be intuitively clear that one can hardly talk about people's dimensional properties, such as height, weight or age, or their inherent nature, such as irascibility or easygoingness, as entities detached from individuals having them – an age is always the age of something or someone. One could perhaps object that psychological states such as happiness or sadness, which we find at the other end of the spectrum, are not different in that respect: moods do not just float around in mid-air, so to speak, unconnected to individuals characterized as having one or another of them. Yet, we do conceptualize psychological states as very different from dimensions: note that one can *stumble upon* happiness or be *flooded by* sadness, as if these states have an independent existence outside individuals. True enough, one can also *reach* a certain weight or age, as if an age is an outside location as well. Yet, as pointed out above, one is never *without* a particular weight or age, while one may at any given time be altogether deprived of happiness or sadness. In between these extreme types of HPNs, we find further subclasses which, based on a number of diagnostics (see Section 2.3) and (more crucially) on the basis of their ontological properties, are assumed to form fairly discrete loci along a cline of autonomy of the property with respect to its human support.

HPNs are often allowed in both types of existentials (e.g., *There was in that man a deep love for his children; That man had a deep love for his children*). In view of the contrasts shown earlier in (3)–(6), Cappelle and Tayalati (2015) and Cappelle *et al.* (2019) hypothesized that high-autonomy HPNs show a preference for the locative existential, while low-autonomy HPNs have a preference for the possessive existential (where 'high autonomy' and 'low autonomy' here relate to the ease vs. difficulty with which we can think of the property independently of a person having it, and vice versa).

Despite clear and significant differences in acceptability between the two existential constructions for some HPNs (e.g., for *temperament*: cp. *Sarah has a fiery temperament; \*There is a fiery temperament in Sarah*), Cappelle *et al.* (2019) were unable to find full support for their conceptual autonomy hypothesis. Some HPNs in the middle of the scale, too, exhibited unexpectedly marked constructional preferences; and English and French translation equivalents did not always pattern alike. This suggests either that the existing classification of HPNs is not adequate for English or that conceptual autonomy cannot be considered the main dimension along which such nouns can be ordered.

### 2.3 Four other constructions

Apart from the locative existential and the possessive existential, other classifying criteria have been proposed for HPNs in French (cf. Anscombe, 1992, 1995, 1996; Balibar-Mrabti, 1995; Beauseroy, 2009; Flaux and Van de Velde, 2000; Krzyżanowska, 2006, 2011; Leeman, 1987, 1991, 1995; Mathieu, 1995, 1999; Tutin and Grossmann, 2002; Tutin *et al.*, 2006; Van de Velde, 1995, 1998a, 1998b, 1999a, 1999b). From this literature, it appears that the degree of conceptual dependence vs. autonomy of the property with respect to its human bearer may also be reflected by a number of other constructions. The following overview is based mainly on Flaux and Van de Velde (2000). These authors argue, for French abstract nouns, that the two extreme cases of dimensions/natures and psychological states can be neatly distinguished with respect to such constructions, while abstract nouns that fall in between these extremes pass some but not all of these construction-based criteria.

#### 2.3.1 *Genitive of quality*

The so-called ‘genitive of quality’, otherwise known as the ‘genitive of description’ (which is actually not really a genitive but a construction with the preposition *de* in French or *of* in English), is said to be more acceptable with HPNs hypothesized to be conceptually non-autonomous, in the sense defined above:

- (7) a. Sarah is of a fiery temperament.  
 b. \*Samantha is of a deep sadness.

In the case of an HPN like *temperament*, the human (*Sarah* in (7a)) and the HPN are intrinsically strongly bound to each other, as is clear from the fact that one can apply an adjective such as *fiery* equally well to the human support as to the HPN. In the case of an HPN like *sadness*, this dependence on the human support (and vice versa) is much weaker. The genitive of quality appears to link the human with the property in a sort of binding relationship (X is of Y). This binding of the human to its property may be what makes the construction acceptable with HPNs whose support is conceptually dependent on the property.

#### 2.3.2 *Go into a state of...*

Emotional states are often conceptualized as bounded regions or ‘containers.’ The following are some typical examples from the literature based on Lakoff and Johnson’s (1980) conceptual metaphor theory (Barcelona, 2001; Kövecses, 2002):

- (8) a. She’s in love.  
 b. Her behavior sent me into a fury.  
 c. I fell into a depression.



It stands to reason that a person can only enter a state if that state is external to, hence conceptually independent of, that person. Therefore, expressions that make use of the EMOTIONAL STATES ARE CONTAINERS metaphor can be used as a test for relative autonomy vs. dependence. For example, the expression *go into a state of...* taps into this conceptual metaphor. As expected, HPNs that denote a conceptually autonomous property are more acceptable in this expression than HPNs that denote a conceptually dependent property:

- (9) a. \*Sarah has gone into a state of fiery temperament.
- b. Samantha has gone into a state of deep sadness.

### 2.3.3 *Pluralization*

If an HPN can be conceptualized as a bounded location (cf. 2.3.2), then its boundedness may also allow it to be used in the plural. However, this test for conceptual autonomy may work better for French HPNs (cf. (10a–b)) than for English ones (cf. (11a–b)):

- (10) a. \*Léa et tous ses tempéraments
- b. Anna et toutes ses tristesses
- (11) a. \*Sarah and all her temperaments
- b. ?Samantha and all her sadnesses<sup>3</sup>

### 2.3.4 ... *didn't last long*

An environment that forces the property to be seen as limited in duration also differentiates HPNs (cf. the contrast presented by the French examples in (12a–b) and the contrast in the English sentences in (13a–b)):

- (12) a. \*Le tempérament de Léa n'a pas duré longtemps.
- b. La tristesse d'Anna n'a pas duré longtemps.
- (13) a. \*Sarah's temperament didn't last long.
- b. ?Samantha's sadness didn't last long.

The motivation for seeing this kind of constructional environment as related to the HPN's conceptual autonomy/dependence is that a human property that is dependent on the support tends to coincide in duration with the lifespan of the

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3. The ease with which a mass noun allows a count reading depends on a variety of factors. Context may play a role. For instance, in the web-attested example *I shared all her joys and sadnesses*, pluralization of the mass noun *sadness* seems to be more acceptable than if it is not coordinated with *joys*.

support. If the property is autonomous, then that means that it does not (as it were) ‘cling’ to the support and hence can be limited in its duration.

#### 2.4 Constructional convergence, classificatory validity and cross-linguistic convergence: Predictions

In Section 1, we formulated three research questions, which we can now restate in more concrete terms and link to testable predictions. One question that needs to be addressed is whether and to what extent different constructional patterns, including the two existential constructions, correlate among themselves (positively or negatively) with respect to how well they license HPNs. A second question is whether the existing classification of HPNs (cf. Section 2.2) can be maintained at all. Given the less than full support for the conceptual autonomy hypothesis reported above for the two existential constructions (cf. also Section 2.2), one might be led to doubt the accuracy of the fine distinctions made between subclasses. On the other hand, to the extent that the subclasses correspond to clearly distinct cognitive concepts – for instance, physical characteristics and directed feelings are ontologically different things – the classification may remain valid as a taxonomy of human properties. Speakers’ judgements of the acceptability of these nouns in six different constructions can be used as a test for the validity of the classification. A third, and related, question is whether speakers of French and speakers of English adopt roughly the same classification of HPNs. In essence, speakers of French and speakers of English can be assumed to think similarly about human properties and, accordingly, to use nouns denoting them in (largely) similar ways. Thus, assuming that the nouns’ translational equivalents employed here express the same human properties across the two languages, that speakers of French and English conceptualize these similarly, and that the cross-linguistic constructional equivalents that we employ here are indeed also semantically closely related, we should find that the nouns’ translational equivalents behave similarly across French and English with respect to these equivalent constructions.

We realize that we make quite a few assumptions here and that these premises themselves are in need of empirical testing. Yet, if we assume that constructional diagnostics do provide converging data, that the classification of HPNs in French is valid, and that it can be extended to English, we can formulate three testable predictions related to our research questions:

- Prediction 1 (Constructional convergence):  
A construction that gives to the referent of the HPN a high degree of conceptual autonomy, for instance by representing it as a location existing external

to the human possessor (e.g., *X went into a state of deep sadness*), is positively correlated with the locative existential (e.g., *there is a deep sadness in X*). A construction that gives to the referent of the HPN a low degree of autonomy, for instance by conceptualizing the property as something that ‘binds’ the human having that property (e.g., *X was of a fiery temperament*) is positively correlated with the possessive existential (e.g., *X has a fiery temperament*).

- Prediction 2 (Classificatory validity):

The semantic classification available for French HPNs is reflected by the distribution of these nouns in a larger range of patterns than just existential constructions.

- Prediction 3 (Cross-linguistic convergence):

French speakers’ ratings for different HPNs with respect to a set of constructional patterns is mirrored by English speakers’ ratings for translation equivalents of HPNs, deviations for specific HPNs in specific constructions notwithstanding.

To test these predictions, we draw on speaker assessments of some HPNs in all six constructions. In Section 3, we describe in some detail the set of sentences used in the questionnaires. We also briefly explain how we collected the data and which statistical method we used to analyze them.

### 3. Materials and methods

#### 3.1 Test items

For French, we selected 12 HPNs, which are the ones given in Table 1 (cf. Section 2.2). For English, we selected what we considered to be their closest translation equivalents (also given in Table 1). Each class (referred to as ‘group’ later on) is represented by two nouns, except for the class of behavioral trait nouns, for which four nouns were selected. The reason for this is that in the literature (e.g., Paykin *et al.*, 2015), a further subdivision is made in this class between action-oriented behavioral traits (‘noms de qualité pratique’, e.g. *maladresse* ‘clumsiness’, *prudence* ‘carefulness’) and morality-oriented behavioral traits (‘noms de qualité morale’, e.g. *bonté* ‘goodness’, *gentillesse* ‘kindness’). As the subclass of action-oriented behavioral traits seems to us to be richer in lexical items, three items were selected for that category (*bêtise* ‘stupidity’, *courage* ‘courage’, *prudence* ‘carefulness’), as opposed to just one in the subclass of morality-oriented behavioral traits (*gentillesse*). In our study, we group these two subclasses together.

We constructed short sentences in which each of the nouns was used in six different constructional contexts. These patterns were chosen on the grounds that they had been proposed in the literature as licensing different kinds of HPNs (cf. Sections 2.2 and 2.3).<sup>4</sup> Integration of these twelve nouns in six patterns yielded 72 sentences per questionnaire.<sup>5</sup> The order of sentences was randomized (cf. Table 2 for a fragment) but was kept identical across respondents and across questionnaires (French and English versions). For sentence types which we suspected could lead to an unwanted reading, we made explicit the intended interpretation. This was done, for the sake of systematicity, for all sentences involving a locative or a possessive existential (see Table 2, sentences 27 and 30), even in cases in which the interpretation seemed obvious (as for sentence 27 in Table 2). For some sentences with a plural HPN, such a cue was also provided (cf. Footnote 5). All sentences required an obligatory judgement response.

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4. These patterns also feature in Cappelle *et al.* (2019), a preliminary study where we used the same test items and method of collecting data. In the present study, all six constructions are treated as equal candidates to attract or repulse HPNs and no a priori assumptions are made as to these constructions' encoding of conceptual autonomy vs. dependence of the human property.

5. In fact, the French and the English questionnaires consisted not of 72 but of 74 sentences each, as two different sentences were presented for the pluralized form of *beauté/beauty* and *maigreur/skinniness*, with two different intended interpretations (whose mention preceded the presentation of each of these sentences): plural quantification across time and across space (i.e., the human body), respectively. The sentences, with their interpretations, are given below for the English words concerned.

- i. (intended interpretation by the speaker: 'Emily's beauty has been characterized as sensual, then intimidating and finally serene.') Emily has had several beauties in her life.
- ii. (intended interpretation by the speaker: 'Emily has beautiful eyes, a beautiful mouth, beautiful hair and beautiful legs.') Emily has several beauties.
- iii. (intended interpretation by the speaker: 'Madison's skinniness has been characterized as normal for her age, then as fashionable and finally as frightening.') Madison has had several skinninesses in her life.
- iv. (intended interpretation by the speaker: 'Madison has a thin neck, skinny arms, a small waist and thin legs.') Madison has several skinninesses.

The explicitation of the intended interpretation was also meant to exclude the unwanted reading for (i) and (ii) whereby the subject referent has (had) relationships with several beautiful people in her life. We were interested in the interpretation with multiple instantiations of the property across time, as in (i) and (iii), so ignored the ratings for (ii) and (iv).

**Table 2.** Part of the questionnaire submitted to speakers of English. For the first sentence in this extract, we provide an example of the rating scale presented underneath each sentence

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26. Olivia has gone into a state of remarkable carefulness.						
	1	2	3	4	5	
very bad sentence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	completely normal sentence
27. (intended interpretation by the speaker: ‘Hannah’s kindness can be characterized as being extraordinary.’) Hannah has an extraordinary kindness.						
28. Madison’s skinniness didn’t last long.						
29. Abigail’s stupidity didn’t last long.						
30. (intended interpretation by the speaker: ‘Sophia’s weight can be characterized as being normal.’) There is a normal weight in Sophia.						
31. Emma has shown several courages in her life.						
32. Sophia’s weight didn’t last long.						
33. Elizabeth is of a great love for her children.						

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### 3.2 Data gathering

The questionnaires were constructed with the freely available online tool Google Forms and were spread on social media. For the French version of the questionnaire, we obtained 72 native speakers, of whom 21 identified themselves as male, 50 as female and 1 with neither of these gender categories, and whose mean age was 31. The English version was filled out by 36 native speakers of English, 5 male and 31 female, and with a mean age of 45. Respondents were asked to rate each sentence on an acceptability scale from 1 (“phrase très mauvaise” / “very bad sentence”) to 5 (“phrase absolument normale” / “completely normal sentence”).

The 72 sentences rated by the 72 French-speaking respondents and the 36 English-speaking respondents yielded 5184 and 2592 data points, respectively, or a total of 7776 data points, where each data point is a judgement from 1 to 5 for an HPN in a particular sentence pattern.

### 3.3 Statistical processing

For the French and the English results separately, we calculated correlations between several variables (i.e., the six constructions mentioned in Sections 2.1 and 2.2). For each dataset, we ran a principal component analyses (PCA; cf. Pearson, 1901), a method that reduces the high dimensionality of a multivariate dataset to a more manageable number of new variables known as principal com-

ponents, which are dimensions along which the data show maximal variation. These components thus express the total variation in the data with as little loss of information as possible. PCA is also used to yield a visual summary of the correlations in the data matrix and can therefore be used to identify hidden structure in the data. For the analysis we used the FactoMineR plugin in R (Lê *et al.*, 2008) and for the visualization we used the factoextra R package (Kassambara and Mundt, 2017). We also conducted a PCA for the combined French and English dataset.

## 4. Results

### 4.1 Results for French

#### 4.1.1 Correlations among constructions

Table 3 presents a correlation matrix, which specifies for each construction how well or poorly it correlates with each other construction. The matrix is based on the ratings of each of the twelve HPNs in each of the six constructions (see the Appendix for average acceptability scores of each noun in each construction). Correlation strength between constructions is indicated by means of a correlation coefficient ranging from 1 (perfect positive correlation) to -1 (perfect negative correlation). Obviously, each construction correlates perfectly with itself. A grayscale helps us identify both strong positive correlations (values in cells tending to black) and strong negative ones (values in cells tending to white).<sup>6</sup>

**Table 3.** Correlation matrix for six French constructions, based on acceptability ratings for a set of HPNs in each construction

	<i>il y a</i>	<i>avoir</i>	<i>être de</i>	<i>entrer dans</i>	<i>plusieurs</i>	<i>n'a pas duré</i>
<i>il y a</i>	1.00	-0.01	-0.19	0.42	-0.08	0.78
<i>avoir</i>		1.00	-0.04	-0.22	-0.55	-0.48
<i>être de</i>			1.00	-0.29	-0.28	-0.38
<i>entrer dans</i>				1.00	-0.01	0.50
<i>plusieurs</i>					1.00	0.16
<i>n'a pas duré</i>						1.00

6. Grayscale formatting was added by means of the conditional formatting function in Excel. A continuous black-to-white color gradient was used. The gray shade of each cell indicates how its value compares to the values of other cells.

The correlation matrix shows that the locative (*il y a*) existential and the possessive (*avoir*) existential do not correlate with each other, neither positively nor negatively (note that the coefficient is close to zero).

As regards the locative existential, we notice that there are positive correlations with the construction conceptualizing the HPN as an external location (*entrer dans un état de N*) and especially the construction implying limitation of the property in time (*N n'a pas duré longtemps*). As for the possessive existential, we can see that this construction *negatively* correlates with pluralisation of the HPN and with the construction implying limited duration. Another fairly strong negative correlation holds between the genitive of quality and the limited duration pattern.

This multiplicity of correlations can be represented graphically in a correlation circle (Figure 1), produced as output of a principal component analysis.

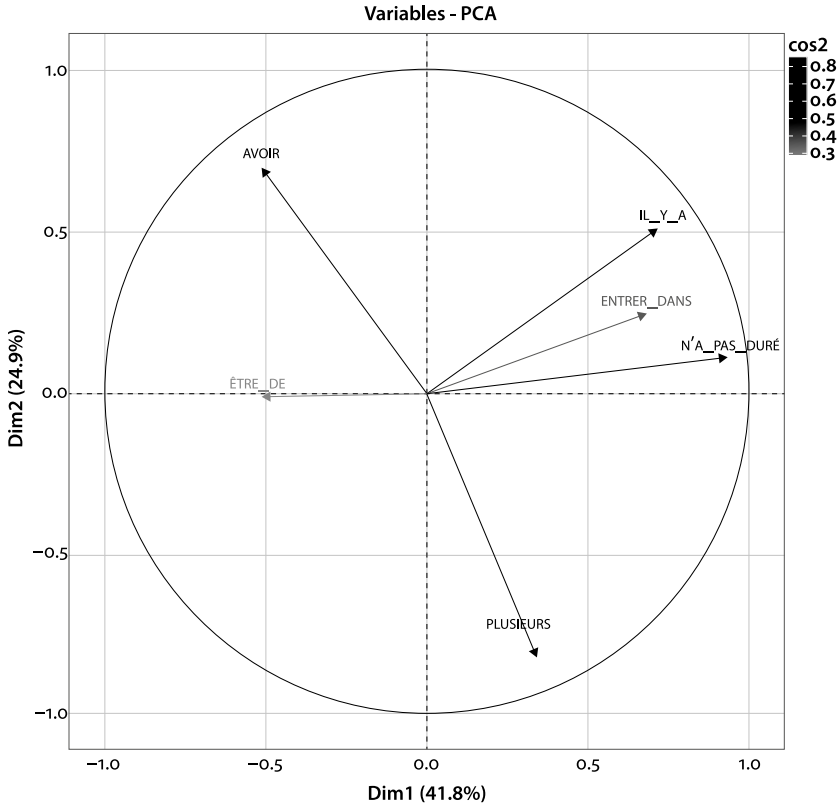


Figure 1. Variable correlation plot for the six French constructions, based on a principal component analysis

Inside this circle, the six constructions are shown as arrows pointing in a particular direction. Arrows that point in roughly the same direction are positively correlated, arrows that are orthogonal (i.e., forming a 90-degree angle) are unrelated, and arrows that point in opposite directions are negatively correlated.

The PCA reveals that about two thirds of the variance (66.64%) can be represented in a two-dimensional space. These two dimensions are new variables that explain most of the variance described by the six constructions (the original variables). The correlation plot in Figure 1 shows which of the original variables are ‘well represented’ on the factor map: the longer the arrow – or the closer a variable is located to the circumference of the correlation circle – the higher the quality of representation of this variable by the principal components. (This is also indicated by the grayscale, which corresponds to the squared cosine ( $\cos^2$ ), a measure for quality of representation.)

The variable that is best represented by the two principal components is the pattern that implies limited duration (*Le/la X de Y n’a pas duré longtemps* ‘Y’s X didn’t last long’). Moreover, the direction of the arrow corresponding to this variable is closely aligned with the first (and most important) component, which helps us to interpret the nature of this component. Specifically, we can consider this first component to be one that somehow involves time. Nouns that are located close to the right on this horizontal dimension lend themselves well to being used in a pattern that presents the relevant property as of limited duration. As for the second-most important dimension, the original variable that is most closely aligned with it is the possibility to pluralize the noun. This dimension could therefore potentially be seen as one that distinguishes nouns that are conceptualized as unbounded substances (towards the top) and others that denote individualizable ‘portions’ or manifestations of a property, thus allowing pluralization (towards the bottom).

#### 4.1.2 *Classes of HPNs*

The principal component analysis can also be used to represent the HPNs (the ‘individuals’ for which we have numerical values for each of the six constructional variables) on a two-dimensional map; see Figure 2 for such a representation. The two axes of the map correspond in their orientation (though not in their calibration) to the two axes in Figure 1: they represent the same two principal components describing the variation in the data.

For this graph, the five groups defined above (cf. Table 1) were first reduced to three, in order to have four HPNs per group. This enabled us to calculate confidence ellipses locating the mean value in each group. As can be observed, the groups of HPNs form distinct, non-overlapping (or hardly overlapping) clusters, positioned from left to right along the first dimension, which was earlier



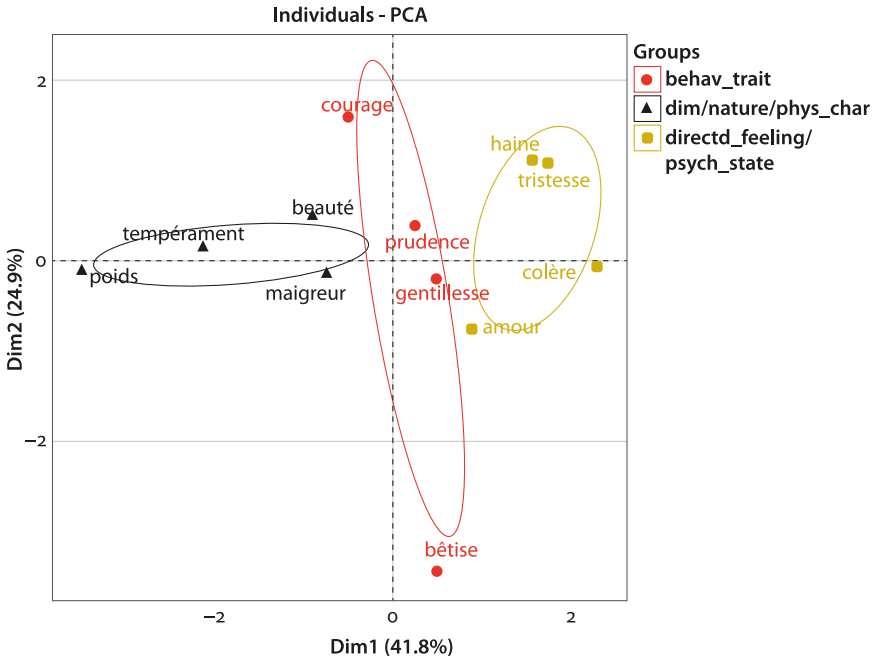


Figure 2. Graph of 12 French HPNs, based on a principal component analysis, with 95% confidence ellipses for mean values of groups

interpreted as involving temporality. This suggests that the previously established classes of HPNs in French find support from the data and that these HPNs can be distinguished mainly with respect to how well they can be conceptualized as being of limited duration. HPNs denoting a kind of dimension, an inherent nature or a physical characteristic are naturally more permanent than HPNs denoting a directed feeling or a psychological state. HPNs denoting a behavioral trait take up a middle position.

The other dimension, interpreted tentatively as pertaining to a mass/count distinction, does not enable us to support the validity of the existing classification of HPNs and can merely be used to distinguish particular HPNs within classes (most strikingly, *courage* ‘courage’ and *bêtise* ‘stupidity’). Different mass nouns differ in their flexibility of shifting to count uses: some easily accept a count reading, others are lexicalized as mass-only nouns (cf. Lauwers and Vermote, 2014; Vermote, 2014a, b; Vermote *et al.*, 2017). Accordingly, a construction such as pluralization might coerce or select a count reading much more easily with some mass nouns (e.g., *plusieurs bêtises*) than with others (e.g., *\*plusieurs courages*).

## 4.2 Results for English

### 4.2.1 Correlations among constructions

As shown in Table 4, the English constructions used as counterparts to the ones used for the French questionnaire exhibit somewhat different correlation patterns. First, the locative (*there*) existential does correlate, and positively at that, with the possessive (*have*) existential in English, whilst no (negative or positive) correlation between these patterns was found for French. Second, the English possessive existential does not show any pronounced negative correlations with other constructions, again in contrast to the French possessive existential. The construction with the highest number of negative correlations is the genitive of quality (*be of*), which is negatively correlated most strongly with the locative existential construction, the pattern that conceptualizes the HPN as an external location (*go into a state of N*) and, especially, the pattern implying that the HPN has limited duration (*N didn't last long*). These latter three constructions also correlate positively with one another, as was also the case for the French equivalent constructions.

**Table 4.** Correlation matrix for six English constructions, based on acceptability ratings for a set of HPNs in each construction

	<i>there</i>	<i>have</i>	<i>be of</i>	<i>go into</i>	<i>several</i>	<i>didn't last</i>
<i>there</i>	1.00	0.61	-0.52	0.43	0.27	0.81
<i>have</i>		1.00	-0.12	0.12	0.34	0.25
<i>be of</i>			1.00	-0.52	-0.11	-0.81
<i>go into</i>				1.00	0.07	0.41
<i>several</i>					1.00	0.13
<i>didn't last</i>						1.00

As before, we can use a PCA to provide an efficient visualization and summary of these multiply inter-correlated variables (cf. Figure 3). The two most important components extracted by the analysis explain over 70% of the total variation in the data, and the first component even explains half of the variation. What this reveals is that there is considerable redundancy in the data table (cf. Appendix), due to the fact that many of the original variables are highly correlated. Indeed, we can see in the graph that five of the six variables point towards the positive side of the first axis. Most closely aligned with this dimension are the locative existential and, again, the pattern implying limited duration of the property. The genitive of quality is also quite well represented by this first component, but then in the other direction. This first dimension, therefore, can also

be interpreted as relating to temporality, as was the case for the first principal component obtained for the French data.

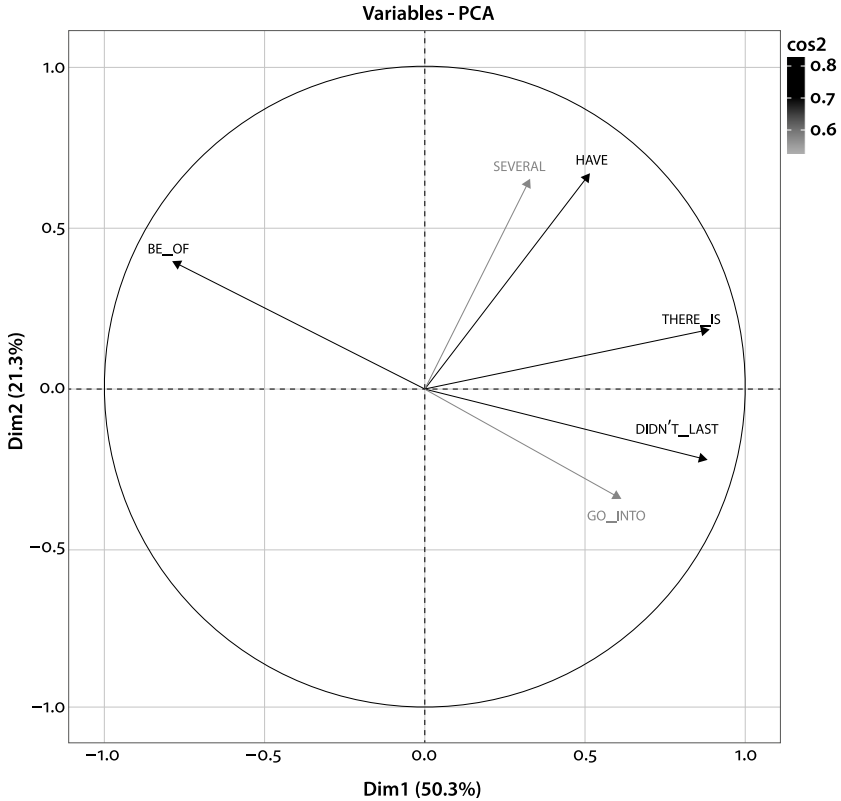


Figure 3. Variable correlation plot for the 6 English constructions, based on a principal component analysis

The second principal component is harder to interpret. This dimension does not represent the original variables very well, apart from the possessive existential and plurality. However, note that, in contrast to what we found for French, these two variables are not negatively correlated. Given that plurality is represented by this second component (albeit to a low degree of quality), we may again consider this dimension to be (weakly) linked to the count/mass distinction. At the same time, the possessive existential is better represented by this dimension, so it is safer to consider the second principal component to be mainly linked to how well an HPN is rated in the pattern with *have*.

#### 4.2.2 Classes of HPNs

Do HPNs in English fall into classes, as we were able to observe for HPNs in French? Here, too, we find that the confidence ellipses for the means of (reduced) groups of HPNs show no or little overlap, which suggests that these classes are quite distinct. Moreover, these groups are distributed from left to right along the axis representing the first principal component, suggesting that in English, too, HPNs are distinguished in terms of how well they give rise to a conceptualization in which the property is limited in duration. In addition, these HPNs in English also differ in their ease of being used with the locative existential.

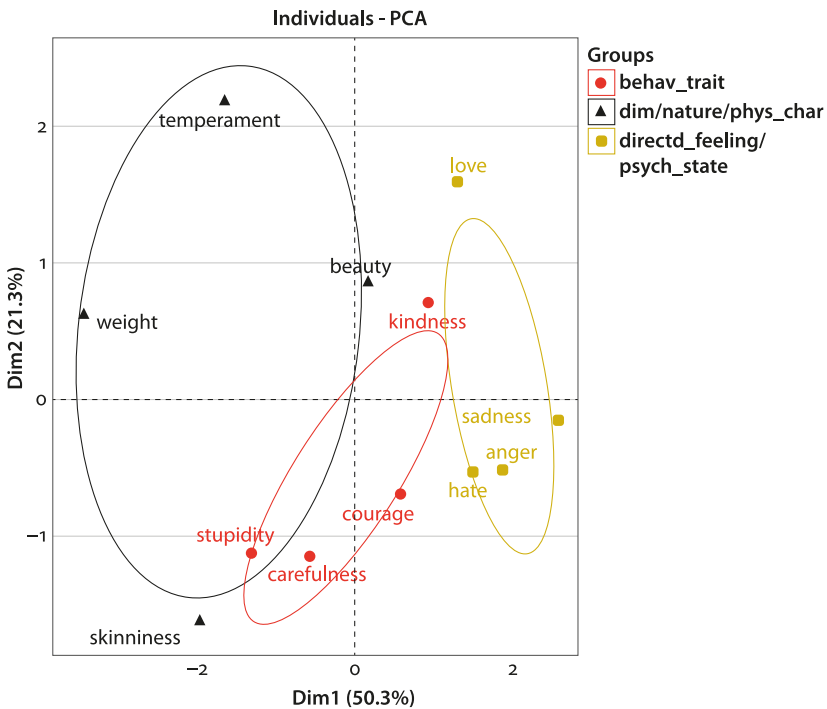


Figure 4. Graph of 12 English HPNs, based on a principal component analysis, with 95% confidence ellipses for mean values of groups

Within classes, we can notice great variation along the second axis. This is most noticeably so for the nouns *temperament* and *skinniness* (which belong to two different subclasses). This reflects the fact that the former noun is fully acceptable with the possessive (*have*) existential and, to some extent, with pluralization, while the latter noun is not.

### 4.3 French and English results taken together

To compare more closely the French and the English data, we can run a PCA on the dataset that combines all observations obtained via the French and English questionnaires. This analysis is then performed on 24 individuals (12 French and 12 English HPNs), described by six variables. Each of the six constructional environments of course has a French and an English version, but they can nonetheless be considered to be similar enough to be treated as unitary constructions. For instance, the *il y a* construction and the *there* construction are here both treated as manifestations of the locative existential. A graph of variables (Figure 5) shows that the first principal component reliably represents the locative existential and the construction that conceptualizes the HPNs as being temporally limited. These two constructions are closely correlated. The possessive existential is not negatively correlated with the locative existential, but it is not clearly positively correlated with it either. We will discuss the significance of this finding in Section 5.

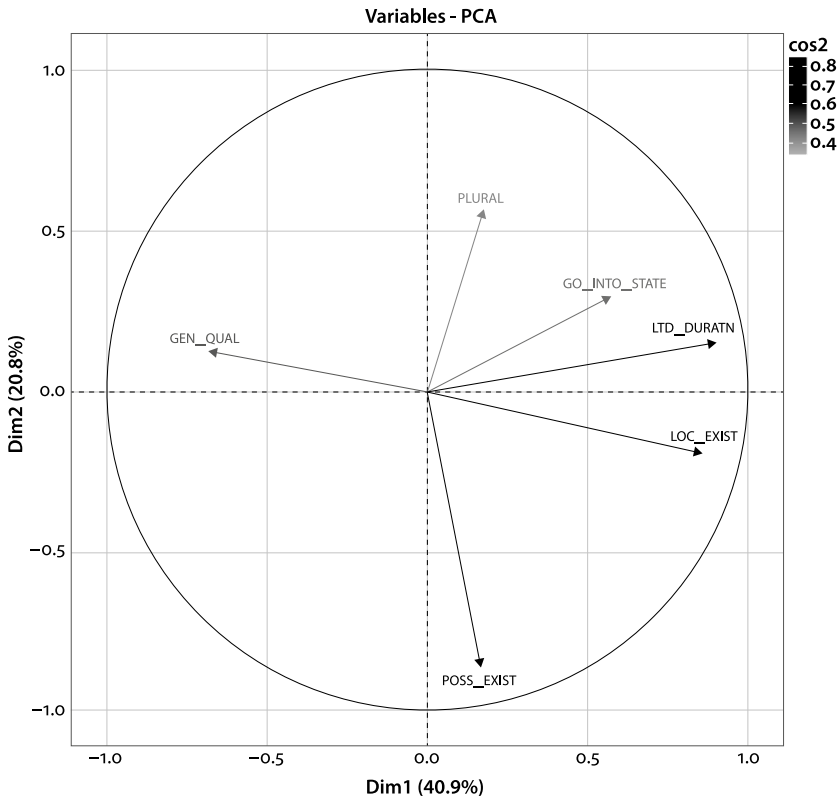
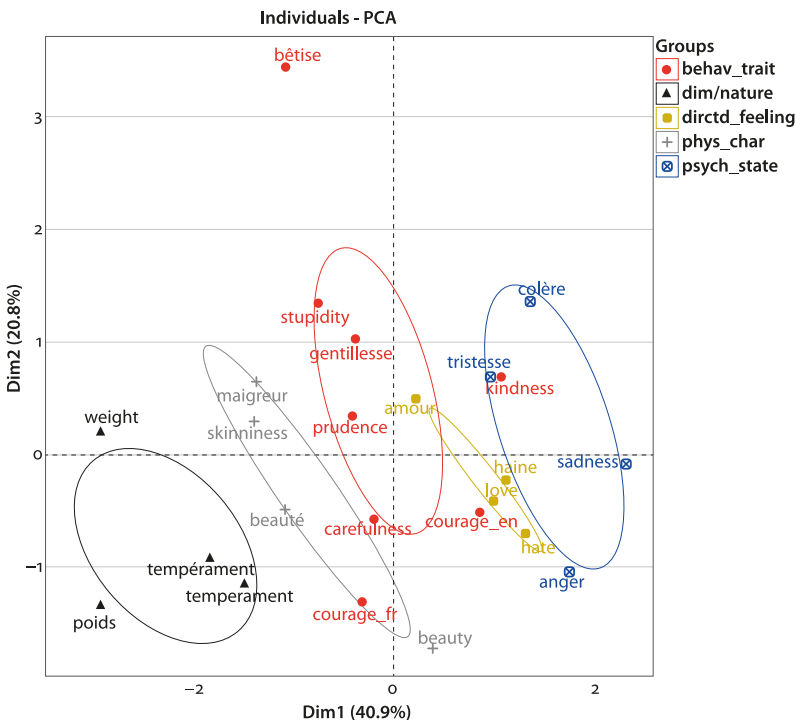


Figure 5. Variable correlation plot for the six constructions, based on a principal component analysis involving 12 French and 12 English HPNs

Finally, let us take a look at the twelve French and the twelve English nouns, described by the six constructional variables. Figure 6 presents a two-dimensional map of these twenty-four individuals.

As each group consists of at least four elements, it does not need to be merged with any other group to enable calculation of a confidence ellipse for its mean value. What we see in this map is that the five groups are nicely distinguished from one another, with quite negligible overlap of two ellipses only. The distribution of groups is mainly along the horizontal axis. This allows us to conclude that HPNs, irrespective of whether they are French or English ones, are mainly distinguished with respect to how well they can be used in the locative existential and how easily they can be conceptualized as a property that doesn't last long.

The map also shows that for some pairs of translation equivalents, the two nouns making up these pairs are located in very close proximity. This is the case for, among others, *tempérament* and *temperament*, for *maigreur* and *skinniness*, and for *haine* and *hate*. Apparently, even though the constructional variables cluster somewhat differently across the two languages studied here, these differences are not so severe as to cause the French HPNs and their English equivalents to end up in very different locations on the map, quite on the contrary.



**Figure 6.** Graph of 12 French and 12 English HPNs, based on a principal component analysis, with 95% confidence ellipses for mean values of groups

## 5. Discussion

We can now attempt to give answers to the questions we raised. First, the HPNs display consistent behavior with respect to some of the six constructional environments which were used in our sentence rating experiment. The three constructional environments that pattern alike most clearly are the locative existential, the construction implying limited duration of the property and the construction portraying the property as an external location that one can enter. This is true for both English and French. Prediction 1 (Constructional convergence; cf. Section 2.4) is thus borne out. However, it is not the case that the possessive existential and the genitive of quality, both of which were hypothesized to be linked to low conceptual autonomy of the HPN, are also positively correlated to each other; no correlation was found between these two constructions.

Second, the classification of French HPNs that has been offered in the previous literature makes sense not just semantically and does not just follow from introspective application of constructional diagnostics, but is supported by actual speakers' ratings of different HPNs in six different environments. This result is all the more satisfying if we consider that many of the diagnostics are hard to apply by the individual linguist, in that they sometimes yield unclear results between 'fully acceptable' and 'clearly unacceptable.' (Speakers' ratings were not different in that regard, but the subtle quantitative data proved to be good enough for a clear picture to emerge.) Prediction 2 (Classificatory validity) is thereby also confirmed. Based on speakers' ratings of HPNs in six constructions, the classes previously posited appear to have some distributional reality. An important discovery is that the two types of existential construction do not appear to 'pull' in opposite directions. That is, we did *not* find that the more acceptable an HPN is in the locative existential, the less acceptable it is in the possessive existential, and vice versa. Rather, an HPN's acceptability in the locative existential and its acceptability in the possessive existential appear to constitute two different, unrelated aspects of such a noun's constructional affordance. Consequently, if it is true that, in general, the locative and possessive existential are jointly related to a noun's conceptual autonomy (Van de Velde, 2003; Cappelle and Tayalati, 2015; Paykin and Van de Velde, 2015), then what we find here is that these two constructions' tight connection is loosened in the domain of HPNs.

Third, speakers of French and speakers of English may rate some equivalent HPNs differently for constructional equivalents, but overall the French HPNs and their English translation equivalents do not differ all that much in terms of their constructional distributions (or at least speakers' ratings of these). This confirms our third prediction, which stated that the classification proposed for French is valid for English as well. Both languages have quite clearly delineated subclasses

of HPNs, and these subclasses form a gradient primarily in terms of the temporal limitability of the property.

Our findings raise a theoretical dilemma, however. If, as Cappelle *et al.* (2019) propose, HPNs can be ranked on a cline of conceptual dependence/autonomy, then it cannot be considered to be entirely correct that the position of a noun on this cline correlates with its acceptability in the possessive existential, as Van de Velde (2003); Cappelle and Tayalati (2015), and Paykin and Van de Velde (2015) suggest. On the other hand, if conceptual dependence/autonomy does correlate with a noun's acceptability in the possessive existential (cf. again *The table has a strange form* vs. \**The garden has a strange man*), then we should reject Cappelle *et al.*'s (2019) proposal that the existing classification of HPNs reflects their degree of conceptual autonomy. In that case, it is the temporal limitability of a property that can be stated to be the most decisive criterion for a classification of HPNs, and not their conceptual autonomy. In view of our data, this seems to be a sensible conclusion. Temporal limitability is positively correlated with the locative existential but not negatively correlated with the possessive existential. In any case, one cannot have one's cake and eat it: it is not possible to maintain simultaneously that conceptual dependence/autonomy is correlated with the acceptability of the possessive vs. locative existential *and* that HPNs are primarily ordered with respect to their degree of conceptual autonomy.

That temporal limitability is a crucial dimension for HPNs has implications for deciding their semantic proximity. For instance, *temperament* and *temper* are sometimes seen as semantically closely related. Not surprisingly, then, these two nouns are not different in their ability to combine with *have* (*to have a fiery temperament*; *to have a bad temper*) and we also see that their combinability with *there* is either reduced or excluded (?*There is a fiery temperament in him*; \**There is a bad temper in him*). However, *temperament* is something near-permanent while *temper* is not (or not necessarily) and it is this time-related feature that sets these two nouns most clearly apart. Thus, someone's fiery temperament cannot be temporally specified (\**He has a fiery temperament when...*), but someone's bad temper can (*He has a bad temper when...*). *Temper* is in that respect perhaps more similar to *anger*. (However, these two nouns behave differently with some of the constructions examined here. For instance, *temper* is not acceptable in the locative existential, as stated above, but *anger* is: \**There is a bad temper in him*; *There is an intense anger in him*.)

A more theoretical question that we have not gone into is whether HPNs have a stable meaning or whether their meaning, through a constructional 'coercion' process, adapts to the environment in which they are used.



## 6. Conclusion

In this study, we have explored the constructional behavior of human property nouns (HPNs), such as *temperament*, *skinniness*, *courage*, *hate* or *sadness*, in French and English. Previous work on French had suggested that such nouns fall into subclasses and that these classes can be ordered on a cline from less to more conceptually autonomous. For instance, *temperament* has been claimed to be much less conceptually autonomous than *sadness*. Here, we have examined this claim by considering speakers' ratings of HPNs in a range of constructions – not just (i) the locative existential (*there is N in X*) and (ii) the possessive existential (*X has N*) – two constructions which had previously been argued to correlate with a noun's degree of conceptual autonomy – but also (iii) the genitive of quality (*be of N*), (iv) a pattern in which the noun is portrayed as an external location that one can enter (*go into a state of N*), (v) pluralization of the noun, and (vi) a pattern in which the noun is conceptualized as being of limited duration (*N didn't last long*). All these constructions had been claimed to play a role in assigning (French) HPNs to particular subclasses. Based on speakers' judgements, we found that it is mainly the *N didn't last long* pattern that distinguishes the different nouns and that this pattern is fairly strongly correlated with the locative existential. The possessive existential also captures a significant portion of the variation in speakers' ratings of HPNs in different environments, but this variation is orthogonal to the main dimension of variation, which has to do with temporal limitability (and ease of use in the locative existential). It is along this essentially temporal dimension that the previously established classes could be seen to be most widely distributed and to form neatly distinguishable subclasses.

If temporal limitability of HPNs – and the confirmed classification of these nouns – is linked to these nouns' conceptual autonomy, we have to reject the previously made claim that a noun's conceptual autonomy correlates with its ease of use in the locative existential *as opposed to* the possessive existential. If we want to maintain the general validity of this latter correlation (conceptual autonomy and choice of existential type), we are forced to conclude that, in the domain of HPNs, it is not the degree of conceptual autonomy of HPNs that provides the basis of the classification but the (apparently not obviously related) notion of temporal limitability.

Comparing the data obtained for French with those obtained for English, we found that some constructional patterns display somewhat different correlational clusters and oppositions. For instance, we found that the possessive existential correlates positively with the locative existential in English but not in French. Despite such differences, the overall classification of HPNs is strikingly similar in both languages. The previously established classification of HPNs for French,

which we here propose to be based on temporal limitability, and not in the first place on conceptual autonomy (cf. *supra*), is valid for both languages.

In future work, we might extend our methodology (the use of questionnaires to obtain more objective acceptability judgements and the use of principal component analysis to analyze the data) to a larger range of nouns and/or a larger range of constructional environments. In particular, it would be interesting to find out whether we find certain ‘super-lexical’ categories (cf. Vermote, 2014a, b) in either or both languages. PCA has proved here to be a very useful method to extract, summarize and visualize the main dimensions along which items vary. Compared to Semantic Vector Spaces, a currently much-used distributional semantic method for visualization of similarity in use and, thus, semantic proximity of lexical units, the use of PCA has as a disadvantage that only a limited number of constructional environments is used to plot the similarity between lexical units on a two-dimensional map. An advantage, however, is that we can gain an important insight in how the lexical units relate to particular patterns (something which in Vector Space Models remains hidden from view), and how these patterns relate to one another.

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## Appendix

Table A and Table B summarize the results obtained for the French and English questionnaires, respectively. Each table shows twelve HPNs as row variables and the different constructional environments as column variants. The numerical values are the average speaker ratings for a given HPN in a given pattern.

Table A. Average scores for twelve French HPNs in six constructions

	Group	<i>Il y a un(e)</i>		<i>X est entrée</i>		<i>X a eu (or fait preuve de)</i>	
		N	X a un(e)	X est d'un(e)	dans un état de N	de N	plusieurs Ns par le passé
		chez X	N Adj	N Adj (PP)	Adj		<i>Le/la N de X n'a pas duré longtemps</i>
<i>poids</i>	dimension/ nature	1.43	4.79	3.88	2.13	1.81	1.38
<i>tempérament</i>	dimension/ nature	3.08	4.75	4.69	2.35	2.72	1.94
<i>beauté</i>	physical characteristic	3.74	3.85	4.88	2.08	2.07	3.36
<i>maigreur</i>	physical characteristic	2.47	2.89	4.57	3.18	1.53	3.28
<i>bêtise</i>	behavioral trait	2.46	1.56	4.24	2.64	4.86	3.67
<i>courage</i>	behavioral trait	3.89	4.74	4.56	2.63	1.61	3.93
<i>gentillesse</i>	behavioral trait	3.86	2.78	4.86	2.92	2.49	4.01
<i>prudence</i>	behavioral trait	3.65	3.03	4.61	2.67	1.68	4.32
<i>amour</i>	directed feeling	3.71	3.50	2.36	1.96	3.58	4.29
<i>haine</i>	directed feeling	4.07	3.82	2.04	3.40	1.96	4.46
<i>colère</i>	psychological state	3.72	3.39	2.51	4.39	3.38	4.53
<i>tristesse</i>	psychological state	4.35	3.47	4.07	4.49	2.26	4.25


Table B. Average scores for twelve English HPNs in six constructions

	Group	<i>There</i>	<i>X has</i>	<i>X is of</i>	<i>X has</i>	<i>X has had</i>	<i>X's N</i>
		<i>is a(n)</i> Adj N <i>in X</i>	<i>a(n)</i> Adj N	<i>a(n)</i> Adj N (PP)	<i>gone</i> <i>into</i> <i>state of</i> Adj N	<i>(or shown)</i> <i>several Ns in</i> <i>her life</i>	<i>didn't</i> <i>last</i> <i>long</i>
<i>weight</i>	dimension/ nature	1.27	3.41	4.22	2.11	2.25	1.91
<i>temperament</i>	dimension/ nature	3.22	4.91	4.30	2.16	2.69	2.33
<i>beauty</i>	physical characteristic	4.47	4.80	3.38	2.02	1.58	4.52
<i>skinniness</i>	physical characteristic	2.00	2.58	2.41	2.38	1.11	3.22
<i>stupidity</i>	behavioral trait	2.38	2.33	2.94	2.77	2.27	3.86
<i>courage</i>	behavioral trait	4.19	3.63	2.25	2.52	1.61	4.83
<i>kindness</i>	behavioral trait	4.44	3.50	2.38	2.58	3.72	4.58
<i>carefulness</i>	behavioral trait	3.25	3.30	1.86	2.13	1.16	4.00
<i>love</i>	directed feeling	3.80	4.75	1.33	1.91	4.02	4.72
<i>hate</i>	directed feeling	3.63	4.50	1.25	3.36	2.11	4.69
<i>anger</i>	psychological state	4.52	4.55	1.52	3.41	1.80	4.80
<i>sadness</i>	psychological state	4.83	4.41	1.47	4.27	2.97	4.61

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