A database distinguishing concreteness, imageability and emotional valence values for nouns and verbs in French

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ABSTRACT

Concreteness, imageability or emotional valence are known to determine performance in different psycholinguistic tasks. Yet, existing databases for these psycholinguistic parameters in the French language are limited and the difference between imageability and concreteness is often neglected. The present work extends existing database by providing imageability, concreteness and emotional valence values for 177 nouns and 165 verbs. Data were collected from 258 native French speakers from France and Belgium. We provide mean imageability, concreteness and emotional valence values, as well as inter-rater reliability values for each value and stimulus. The database is available on https://osf.io/453ft/.

Keywords: concreteness, imageability, emotional valence, norms, verbs

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Une base de données distinguant concrétude, imageabilité et valence émotionnelle pour des noms et des verbes en français

RÉSUMÉ
La concrétude, l'imageabilité ou la valence émotionnelle sont connues pour influencer la performance dans différentes tâches psycholinguistiques. Pourtant, les bases de données existantes pour ces paramètres psycholinguistiques en langue française sont limitées et la différence entre l'imageabilité et la concrétude est souvent négligée. Le présent travail étend les bases de données existantes en fournissant des valeurs d'imageabilité, de concrétude et de valence émotionnelle pour 177 noms et 165 verbes. Les données ont été collectées auprès de 258 locuteurs français natifs de France et de Belgique. Nous fournissons les valeurs moyennes d'imageabilité, de concrétude et de valence émotionnelle, ainsi que les valeurs de fiabilité inter-juges pour chaque valeur et stimulus. La base de données est disponible sur https://osf.io/453ft/.

Mots-clés : concrétude, imageabilité, valence émotionnelle, normes, verbes

INTRODUCTION

Psycholinguistic variables such as concreteness, imageability or emotional valence are known to influence processing of verbal stimuli in many different cognitive tasks (Rofes *et al.*, 2018). Concreteness refers to the perceptual semantic dimension(s) associated with a word/concept[1], such as its associated visual, auditory, tactile, motor, olfactory or gustative features (Bonin *et al.*, 2018). For example, "cat", as opposed to "freedom", is a highly concrete word as it refers to a concept associated with vivid sensory characteristics (visual: the color of the fur, the size and shape of the animal; auditory: the sounds it emits; tactile; what it feels like when we touch/caress a cat). Imageability is often considered to be a subdimension of concreteness referring to the ease with which a mental (often visual) image can be formed for a word/concept (Desrochers & Thompson, 2009; Thomas, 2014). Emotional valence refers to the emotional characteristics associated with a word/concept, which are often qualified as positive vs. negative emotional features, that is, their degree of pleasantness (Bonin *et al.*, 2003; Bradley & Lang, 1999b, 1999a; Lang *et al.*, 1997). Among these three variables, the existing French databases lack information about specific item categories, especially verbs, and ratings

[1] It is also noteworthy to underline that in psycholinguistics, a word refers to a unit of language that carries meaning. In our example, "cat" is a word that refers to a specific type of animal – thus, when using the word "cat", we directly refer to its referent.

for the different variables lack uniformization in terms of type of rating scales. Therefore, the present study provides normative data for concreteness, imageability and emotional valence values for a selection of nouns and verbs.

Concreteness

In psychological studies, the processing of concrete words leads to faster response times or/and less errors as compared to abstract words (Bonin *et al.*, 2018). Advantages for processing concrete words have been observed in many different cognitive domains such as declarative long-term memory (Paivio, 1971), oral and written language (Roxbury *et al.*, 2014), working memory (Walker & Hulme, 1999; van Schie *et al.*, 2005) language comprehension (for a review, see Fischer & Zwaan, 2008) and episodic memory (Jessen *et al.*, 2000; Sadoski, 2009). For instance, responses to concrete words in lexical decision tasks are characterized by faster reaction times and higher accuracy compared to responses to abstract words (van Schie *et al.*, 2005). This effect is stable across the developmental lifespan (Roxbury *et al.*, 2016) and can be particularly marked in case of patients with acquired or progressive language impairment (Jefferies *et al.*, 2007; Sandberg & Kiran, 2014), with sometimes reversed concreteness effects in patients with a specific loss of perceptual semantic features such as in fluent primary progressive aphasia (semantic dementia) (Breedin *et al.*, 1994; Jefferies *et al.*, 2009).

Paivio (1991, 2010, 2013) explained the concreteness effect via a dual coding hypothesis. Concrete concepts would benefit from dual coding as they can be processed through both verbal and visual modalities. At the opposite, abstract concepts can be processed only through verbal coding. This account suggests that concreteness has an effect on cognitive processing because concrete concepts are more easily and vividly represented in the mind compared to abstract concepts. Later, the field of embodied and grounded cognition, proposed by Barsalou (1999, 2008) suggested that cognitive processes are fundamentally grounded in sensorimotor information. This theory posits that our conceptual understanding of the world is closely tied to our bodily experiences and interactions with the environment. The two frameworks are not exclusive and can be considered as complementary as Paivio's works emphasis that mental representation can take various forms, with some of these forms (i.e., mental image) relying on experience-based sensory representations.

Norms for the concreteness dimension have been provided in a relatively extensive manner for words of the English language, although the norms are often restricted to nouns (see for example Coltheart, 1981) (but see, for verbs, Klee & Legge, 1976; see also Palazova *et al.*, 2013, for German verbs and Tsai *et al.*, 2009, for Chinese verbs). In French, available concreteness ratings are limited to nouns (Bonin *et al.*, 2003 and 2018, for 866 nouns and 1659 nouns, respectively).

Imageability

Like the concreteness effect, the imageability effect is characterized by faster and more accurate processing for words/concepts associated with high imageability values, and this across the same cognitive domains as the concreteness effect (oral and written language, Coltheart *et al.*, 1988, Ferrand *et al.*, 2011, Majerus *et al.*, 2002; working memory, Kowialiewski & Majerus, 2018, 2020; episodic memory, Burger *et al.*, 2017). For example, higher immediate recall performance was observed for lists of high vs low imageability words in a verbal working memory paradigm by Kowialiewski and Majerus (2020). Because imageability and concreteness may give rise to quasi-perceptual experiences (Thomas, 2014), they are likely to influence cognitive functioning according to this field of research (memory embodiement: de Vega *et al.*, 2021; Dutriaux *et al.*, 2019; language functioning Bidet-Ildei & Toussaint, 2015).

While imageability could be considered as a sub-dimension of the concreteness effect and explains an important part of this effect (Kousta *et al.*, 2011; Reilly & Kean, 2007), it is important to distinguish both variables as words can be matched for imageability and yet differ for concreteness(for example, “bread” and “stone” may both be highly imageable but they will differ regarding other concrete dimensions such as olfactory, gustative and tactile features associated with the word). Concreteness is indeed often considered to refer to different sensory dimensions and, contrary to a frequent usage of the ‘imageability’ variable, is not restricted to the visual dimension. (Brysbaert *et al.*, 2014; Lynott & Connell, 2009; Paivio *et al.*, 1968)

Some studies tried to dissociate imageability and concreteness dimensions in a more formal manner. Richardson (1976) used a latent variable approach to examine whether concreteness and imageability load on the same latent variable or if they represent two different constructs. He suggested that imageability and concreteness are theoretically and experimentally different constructs, despite their high correlation. More recently,

Khanna and Cortese (2021), noted that imageability has a stronger effect on recognition memory task than concreteness. The authors used imageability, concreteness, perceptual strength, and action strength ratings to predict reading performance, recognition memory and lexical performances. They showed that imageability was the best predictor among the different investigated variables. As for concreteness, there are several important databases of imageability rating for the English language, both for noun and verb stimuli (Chiarello *et al.*, 1999; Cortese & Fugett, 2004; Davies *et al.*, 2016; Stadthagen-Gonzalez & Davis, 2006). In French, there are a number of databases for imageability ratings. Content *et al.* (1990) reported in their BRULEX database 1086 imageability values for nouns initially determined by Hogenraad and Orianne (1981). Bonin *et al.* (2011) collected imageability data for 1493 nouns, Ballot *et al.* (2022) for 1286 nouns and Desrochers and Thompson (2009) for 3600 nouns, each study using a 7-point scale. Recently, Ballot *et al.* (2022) provided imageability ratings for words from various grammatical categories (i.e., 50.5% nouns, 13.2% adjectives, 36.1% verbs, 0.2% adverbs). Only Bonin *et al.* (2003) reported values for both imageability and concreteness for 866 nouns, using a 5-point rating scale. However, verbs are also strongly affected by imageability processes, as a function of the extent to which verbs evoke sensory and perceptual experiences that can be easily imagined or more abstract actions. For example, the verb "to run" is more imageable than the verb "to think" because it evokes a more vivid and concrete sensory experience that can be easily imagined. Therefore, our aim was to complete and extend the available databases, especially with regards to verbs where the imageability dimension could be particularly determining (e.g., action verbs vs. other categories of verbs).

Emotional valence (EV)

Emotional valence, like concreteness and imageability, represents a semantic feature of a word/referent and provides information about its emotional polarity in this specific study. In general, words with strong positive or negative emotional valence can be considered to have a richer semantic representation compared to words with neutral emotional valence due to their added emotional semantic features. The effect of emotional valence of verbal stimuli on cognitive tasks is more complex than the effect of concreteness and imageability given that emotional valence does not only differ in polarity (positive-negative) but also in

arousal (high-low; see also Note 1 in the Methodology section). Note that we limit our discussion here only on the immediate impact of the emotional valence of a word on a cognitive/psycholinguistic task, and we do not consider the situation of emotional induction where sets of emotional stimuli are used to manipulate the emotional mood of participants in an experiment. While both positive and negative valence can have an effect on processing words in oral and written language processing (Briesemeister *et al.*, 2011), episodic memory (Comblain *et al.*, 2004; D'Argembeau & Van der Linden, 2005; Kensinger & Corkin, 2003; Thomas, 2006) or working memory (Ferré, 2002; Lindström & Bohlin, 2011; Majerus & D'Argembeau, 2011), the directionality of this effect still remains poorly understood. Positive and negative words often lead to facilitated and more accurate processing, relative to neutral words, but no effect or a reversed effect have also been reported (e.g., Kensinger & Corkin 2003; Majerus & D'Argembeau, 2011; Garrison & Schmeichel 2019). For example, Majerus and D'Argembeau (2011) showed better memory recall performance for word lists with emotional content compared to word lists with neutral content, indicating a strong impact of emotional valence on pure list recall. However, when lists were mixed (i.e., neutral and positive/negative), the list with the least emotional items were best recalled. This is likely due to the additional interaction between emotional semantic features and attentional processes. Emotional stimuli are preferentially captured by the attentional focus, leading to facilitated or decreased performance depending on the amount of emotional stimuli to be processed and the nature of attentional control processes required by the specific task (see Majerus & D'Argembeau, 2011, for a theoretical discussion and model of the interactions between semantics, attentional control and working memory processes). Other authors have suggested that emotional effects may vary according to the categorical vs. continuous manner in which emotional valence is manipulated, and this more specifically in the context of lexical decision tasks (Briesemeister *et al.*, 2011; Estes & Adelman, 2008; Larsen *et al.*, 2008). In sum, emotional valence is associated with complex effects in cognitive tasks which are not yet fully understood and hence is an important variable to control.

Regarding databases focusing specifically on emotional valence (and not on other emotional dimensions such as arousal, type of emotion), a number of databases for word stimuli exist in different languages (see Hinojosa *et al.*, 2016, for a recent synopsis). For the French language, we can cite the databases proposed by Bertels *et al.* (2009), Gilet *et al.* (2012), Monnier et Syssau (2014), Syssau et Monnier (2009), Bonin *et al.* (2003), Syssau et Font (2005) and Gobin *et al.* (2017). These databases mainly

focus on nouns and none of them controls for other associated dimensions such as imageability or concreteness. These variables can have shared effects as demonstrated by Ballot *et al.* (2022) in which emotional words were estimated as more imageable than neutral words or in Bonin *et al.* (2018) where emotional valence and concreteness were positively correlated.

The present study

This study aims at extending existing databases for concreteness, imageability and emotional valence[2] ratings of French words, by providing scores for the three dimensions at the same time and by including not only nouns but also verbs. Existing databases in French are particularly poor regarding ratings for these three dimensions for verb stimuli and/or do not consider all of these three dimensions at the same time. Imageability, concreteness and emotional valence ratings may be particularly relevant for verbs as one of the main function of verbs is to describe actions, actions being defined by rich sensory-motor experiences and associated emotional consequences (e.g., to punch vs. to caress). We report rating scores for 342 items including 165 verbs and 177 nouns, respectively representing 48.2% and 51.8% of the material. All items were evaluated for emotional valence, concreteness and imageability, but by separate groups of raters so that the ratings for one dimension were not influence by the rating for the other dimension (Moors *et al.*, 2013).

METHOD

Participants

We randomly recruited participants via social network platforms and university-based communication platforms to obtain a representative sample of the young adult general population. There was a total of 258

[2] This study was conducted during the first year of the Covid-19 pandemic, potentially associated with a globally increased arousal level in participants that may have led to exaggerated estimations of arousal levels of specific words. Since the goal of this study was to collect generally representative, normative data, we chose not to ask participants to rate arousal levels associated with the items.

participants with 86 participants for the rating of each of the three dimensions. All participants were native French speakers from either Belgium (Concreteness: N = 44; Imageability: N = 32; Emotional Valence: N = 39) or France (Concreteness: N = 42; Imageability: N = 52 + 2 both French & Belgian; Emotional Valence: N = 47). Demographic information for each participant group is given in Table I. The ethical committee of the Faculty of Psychology, Speech and Language Pathology and Educational Sciences at the University of Liège had approved this study (file number 1779-46), following Helsinki declaration. A secure online questionnaire platform developed and hosted by our Faculty was used for data collection, and no other specific online software were used to retrieve participants responses. All participants electronically signed a consent form before starting the questionnaire and anonymized data were collected.

Table 1. Demographic Characteristics of the Participants
Tableau 1. Caractéristiques Démographiques des Participants

	Concreteness group	Imageability group	Emotional valence group
Mean age in years (standard deviation)	26 (11)	25 (7)	23 (7)
Sex	Men = 23 Women = 63	Men = 28 Women = 58	Men = 19 Women = 66 Other = 1
Mean number of years of education (standard deviation)	15 (2)	15 (3)	14 (2)

Material

The general psycholinguistic characteristics of the nouns and verbs (including pronominal and non-pronominal verb forms) selected are presented in Table II and in Appendix 2. These verbs were chosen from the PLAViMoP database of human action displays (Decatoire *et al.*, 2019) and the nouns were chosen to match the verbs in terms of word length and lexical frequency range. The stimuli we selected stemmed from nouns and verbs already used in existing tasks (for the nouns, Attout *et al.*, 2022; for the verbs Villatte *et al.*, 2022) and planned to be used in future studies

(see Grégoire, C., & Majerus, S. (2024) from https://osf.io/x4eha/, and Grégoire *et al.*, 2024). The verbs further corresponded to videos of actions stored in a free online database and frequently used as material in the studies by the authors – https://plavimop.prd.fr/index.php/en/.

	N-Letters		N-Syllabes		Freq films	
	V	N	V	N	V	N
Mean	7,09	6,20	2,44	1,88	27,61	50,96
Std. Deviation	1,27	1,80	0,66	0,84	50,35	93,02
Minimum	4,00	3,00	1,00	1,00	0,01	0,20
Maximum	11,00	13,00	4,00	5,00	345,68	570,30

Note. V = verbs; N = nouns; N-Letters = Number of letters; N-Syllables = Number of syllables; Freq Films = frequency of the word according to the subtitle corpus (per million occurrences), from Lexique.org (New *et al.*, 2001, 2004). 23 values are missing for the verbs as it corresponds to pronominal verbs

Procedure

Each participant launched an online questionnaire from their own computer at a time of their choosing and could take part in only one questionnaire. The order of the words within the questionnaires was randomized between group of participants. Answers were given using 5-point assessment placed below each item to be assessed. The 5-point Likert scales were chosen to be consistent with previous studies (Alario & Ferrand, 1999; Bonin *et al.*, 2003, 2018). Specific instructions and examples were given for each questionnaire (see Appendix 1 for the original instructions and their translation).

For the assessment of concreteness, participants were asked to rate the degree of concreteness of the items on a scale ranging from not concrete to very concrete, using a 5-point scale: 1 = not concrete; 2 = not very concrete; 3 = moderately concrete; 4 = somewhat concrete; 5 = strongly concrete. In order to guarantee a good understanding of the instructions, participants were provided the following instructions and examples*: Think for example of the word "cat". This word will probably seem very concrete to you quickly, so it will get a high concreteness score. On the other hand, the word "loyalty" will not seem very concrete and will get a low concreteness score. In the same way, the verb "to cook" designates an action that will*

undoubtedly seem concrete to you, whereas the verb "to think" will undoubtedly seem to designate a less concrete action. In addition, to avoid any confusion, we also specified the participant to be careful and to make sure they rated the concreteness of the items: *Be careful, it is not about the image you have of the words, but about how well they represent a concrete concept.*

For the assessment of imageability, participants were asked to score the imageability dimension of the 342 items by using a 5-point scale ranging from 1 = not/very poorly imageable; 2 = poorly imageable; 3 = moderately imageable; 4 = well imageable; to 5 = strongly imageable. The following instructions/examples were provided: *Think of the word "cat" for example. You can probably form a mental image corresponding to this word in an easy and quick manner. The word cat will therefore get a high imageability score (5 = strongly imageable). On the other hand, you will find it probably be more difficult and time-consuming to form a mental image corresponding to the word "loyalty". Therefore, this word will get a low imageability score (1 = not/very poorly imageable). In the same way, the verb "to cook" refers to an action that you will probably find easy and quick to mentally visualize. Conversely, the verb "to think" will probably elicit an image only with some difficulty.*

For the assessment of emotional valence, participants were asked to determine whether the items present were pleasant or not by using a 5-point scale ranging from 1 = very negative; 2 = somewhat negative; 3 = neutral; 4 = somewhat positive; to 5 = very positive. The following instructions/examples were provided: *Think about the word "charity". This word will probably sound very positive to you, and will get a score of "5, very positive". On the other hand, the word "table" might seem neutral and get a score of "3, neutral" while the word "betrayal" might get a score of "1, very negative". Similarly, a verb like "to offer" will probably sound very positive. Other verbs, such as "to sit down", might seem more neutral, whiles still other verbs, such as "to betray", might seem very negative.* Moreover, we also wanted to make sure that participants were rating emotional valence and no other dimensions, by adding: *It is not the image you have of these nouns and verbs you should assess, but the emotional value you attribute to them.*

As already noted, in the given examples, as well in all other examples mentioned in our manuscript, when we mention the label 'word', it refers to its referent. This was done to make the instructions simple and easy-to-follow for the participants. Making a distinction between a word and its referent in the instructions could have added unnecessary complexity.

For all three questionnaires, participants were instructed to evaluate the items by using the entire scale. Participants had the possibility to stop the questionnaire whenever they wanted but only full data sets were retained for analysis. The questionnaire started with the display of the general instructions along with the consent form, and demographic information were then collected on a second page. On the third page, detailed instructions and examples were displayed, followed by the stimuli to be assessed. Verbs and nouns were on different assessment blocks, organized vertically.

RESULTS

Reliability and concurrent validity

Reliability was assessed with intraclass correlations coefficients with both participants and items as random factors (Shrout & Fleiss, 1979). To examine the validity of our ratings, we correlated the scores obtained with those of previous studies (for shared stimuli) using Spearman correlation tests. Intraclass correlations coefficients were calculated using JASP 0.16.0.0 for concreteness, imageability, and emotional valence. These analyses confirmed high agreement (Koo & Li, 2016) between the 86 raters, with kappa $r = .97$ for concreteness, kappa = .98 for imageability, and kappa $r = .98$ for emotional valence. To examine the concurrent validity of our database, between-database Spearman correlations were conducted for mean concreteness, imageability, or emotional valence ratings for stimuli shared with other databases which also used a 5-point rating scale. For concreteness, our database shared 77 words in common with Bonin *et al.* (2018) and 83 words in common with Bonin *et al.* (2003). Strong positive correlations were observed with Bonin *et al.* (2018) ($r = .88$) and Bonin *et al.* (2003) ($r = .75$). Concerning imageability, our database shared 83 words with Bonin *et al.* (2003), leading also to a strong positive correlation $r = .78$. For emotional valence, our database shared 96 items in common with Syssau and Font (2005), 83 in common with Bonin *et al.* (2003) and 77 in common with Bonin *et al.* (2018). Strong positive correlations were found with the three datasets ($r = .89$, $r = .83$, and $r = .90$, respectively). All these correlations are significant at $p < .001$.

Ratings of the different variables

The database is freely accessible at https://osf.io/453ft/ as fully searchable.xls and .csv files (Grégoire *et al.*, 2023). It contains the 342 French items in alphabetical order, as a function of grammatical class, together with their English translation as well as the means, standard deviations, and intra-class correlation coefficients, separately for concreteness, imageability and emotional valence values. For ease of use, we have also included already existing information about lexical frequency (freqfilm), number of letters and number of syllables, taken from Lexique 3.83 (New *et al.*, 2001, 2004).

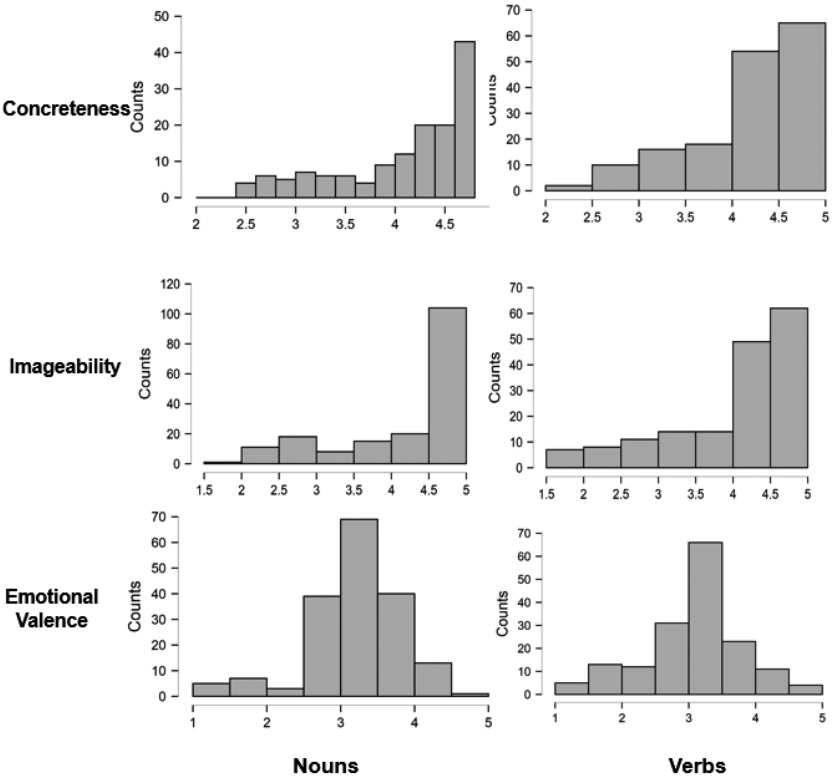
Descriptive statistics for the ratings of emotional valence, imageability and concreteness are presented in Table III. Figure 1 shows the distributions of the ratings. For concreteness and imageability values, distributions appeared to be skewed to the right and the kurtosis estimates were positive (i.e., a leptokurtic distribution), indicating an overrepresentation of highly concrete (similar to Bonin *et al.* 2003, 2018) and imageable items. Regarding emotional valence, the distribution appeared to be less skewed and to follow a mesokurtic normal distribution, indicating that most items were rated as neutral in line with Bonin *et al.* (2003) who also showed that emotional valence values were centered on the neutral midpoint.

Table 3. General Statistical Characteristics of the Imageability, Concreteness and Emotional Valence Ratings
Tableau 3. Caractéristiques Statistiques Générales des Évaluations pour l'Imageabilité, la Concrétude, et la Valence Émotionnelle

	Imageability		Concreteness		Emotional Valence	
	V	N	V	N	V	N
N	165	177	165	177	165	177
Mean	4.014	4.205	4.171	4.244	3.095	3.205
Std. Deviation	0.859	0.867	0.643	0.675	0.724	0.615
Skewness	-1.177	-1.191	-1.205	-1.173	-0.332	-0.921
Kurtosis	0.293	0.105	0.535	0.203	0.314	1.897
Minimum	1.682	1.744	2.279	2.442	1.233	1.105
Maximum	4.906	4.976	4.953	4.907	4.860	4.547

Note. V = verbs; N = nouns.

Figure 1. *Distribution of the ratings for Concreteness, Imageability, and Emotional Valence*
Distribution des Evaluations pour la Concrétude, l'Imageabilité et la Valence Emotionnelle



Correlations between variables

Next, we examined the interrelations between the three variables. Tables IV and V and Figure 2 show the Spearman correlations between mean imageability, concreteness and emotional valence values. A highly positive correlation was observed between imageability and concreteness rating for both verbs and nouns. These positive correlations are in line with previous studies (Paivio *et al.*, 1968; Richardson, 1976). On the other hand, emotional valence ratings correlated only (very) weakly with the imageability dimension for verbs (p = .037).

Table 4. Correlations between Imageability, Concreteness and Emotional Valence for Verbs
Tableau 4. Corrélations entre l'Imageabilité, la Concrétude, et la Valence Emotionnelle des Verbes

Variable	Imageability	Concreteness	Emotional Valence
Imageability	—		
Concreteness	.91***	—	
Emotional Valence	.16*	.14	—

* $p < .05$, *** $p < .001$

Table 5. Correlations between Imageability, Concreteness and Emotional Valence for Nouns
Tableau 5. Corrélation entre l'Imageabilité, la Concrétude, et la Valence Emotionnelle des Noms

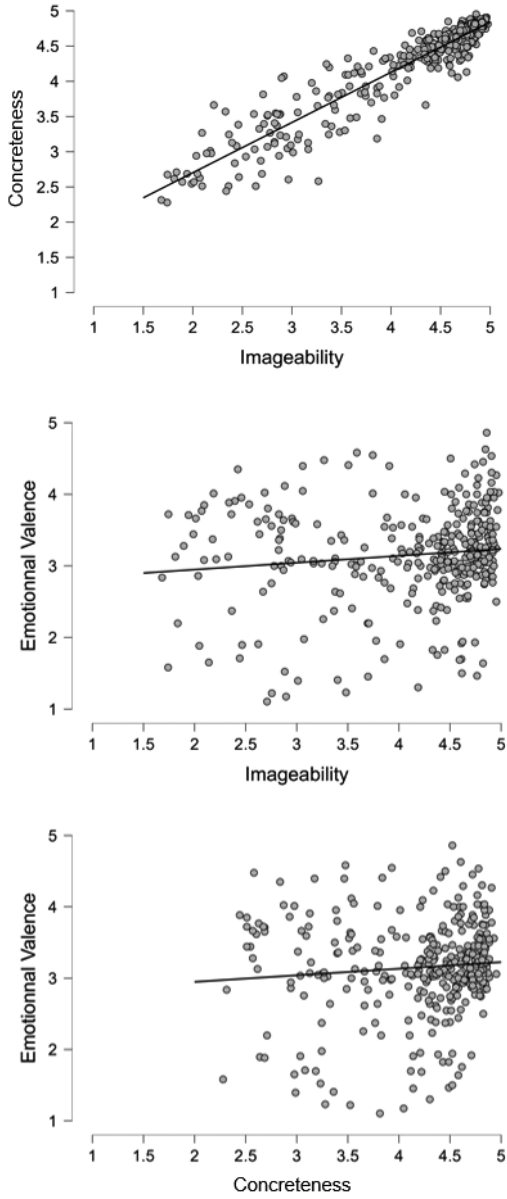
Variable	Imageability	Concreteness	Emotional Valence
Imageability	—		
Concreteness	.92 ***	—	
Emotional Valence	.12	.09	—

*** $p < .001$

DISCUSSION

We collected norms from 342 French nouns and verbs for concreteness, imageability and emotional valence variables from 258 young adult raters. All ratings were associated with high inter-rater reliability. Contrary to previous databases, our database is not limited to nouns but also includes verbs in various forms (including pronominal and non-pronominal verb forms). Finally, the ratings are based on a larger sample than most of the samples used in previous French studies when focusing on the number of participants who rated all the different items. For example, in Bonin *et al.* (2021), 31 participants completed one questionnaire/variable; in Bonin *et al.* (2018), there were between 25 to 33 participants per questionnaire; in Bonin *et al.* (2013), 30 participants rated the items; in Bonin *et al.* (2005), there were around 25 participants per item; in Gilet *et al.* (2012) there were between 19 to 22 participants per age group for each variable; there were 72 participants per questionnaire in Desrochers et Thompson (2009), and only one study (Syssau and Font,

Figure 2. Scatterplots for mean concreteness, imageability and emotional valence values
Figure 2. Scatterplots (Diagrammes de dispersion) des valeurs moyennes de Concrétude, d'Imageabilité et de Valence Émotionnelle



2005) had each item judged by 100 participants. We should however acknowledge that these studies were able to assess more items overall (even if by different participants).

In accordance with previous studies (Bonin *et al.*, 2003, 2018 for French norms), we observed a high positive correlation between concreteness and imageability, for both nouns and verbs. Both dimensions depend on the sensory experience associated with words, and such a strong correlation may thus not appear surprising. This also raises the questions of the separability of these two dimensions, which are, at the very least, strongly overlapping. Dellantonio *et al.* (2014) suggested that contrary to concreteness, imageability may rely on proprioceptive, interoceptive or affective states associated with the words. Imageability would engage both external (vision, audition) and internal perception (interoception) while concreteness would only be determined by external perception. A study on French stimuli (Miceli *et al.*, 2021) collected norms by distinguishing between external and internal perceptual experiences elicited by a set of 270 words. The study showed that the higher the interoceptive ratings, the smaller both concreteness and imageability ratings, disconfirming the proposal of Dellantonio *et al.* It should however be noted that the study by Miceli *et al.* included mostly concrete words, and hence a full assessment of the claim still needs to be undertaken. For this purpose, the inclusion of verbs could be highly informative. Verbs, and particularly action verbs, are not only defined by strong sensory-motor experiences but verb processing may be more self-centered than noun processing and associated with particularly pronounced interoceptive, aspects. Furthermore, presenting verbs in a first-person format (e.g., I play) versus a third person format (e.g., he/she plays) may further modulate interoceptive experiences elicited by verbs (Dellantonio *et al.*, 2014). In the present study, there appears to be no difference between verbs and nouns in terms of concreteness, imageability, and emotional valence while other studies have shown nouns to be more imageable for verbs (Bird *et al.*, 2000; Simonsen *et al.*, 2013). Again, the role of pronominal versus non-pronominal verbs needs to be examined here. In French, verbs can endorse a reflexive form (e.g., "se lever", to get up), a reciprocal pronominal form (e.g, "s'embrasser", to kiss (each other)), an essential pronominal form (e.g., "s'évanouir", to faint) and even idiomatic pronominal form (e.g., "se dépêcher", to hurry up). We could hypothesize that a pronominal form involves the first-person point of view to a greater extent, leading to a stronger perceptual experience associated with a verb presented in its pronominal form, a hypothesis to be tested in future studies.

Regarding emotional valence, an interesting finding of the present study is that emotional valence ratings did not correlate with imageability or concreteness ratings, unlike the results of some previous studies (e.g., Bonin et al, 2003; Khanna & Cortese, 2021; Yee, 2017). One may argue that this situation mirrors the mixed impact of emotional valence overall on cognitive and psycholinguistic tasks (Delaney-Busch *et al.*, 2016; Ferré *et al.*, 2015). On the other hand, it should be noted that most of the material used in this study was associated with neutral emotional valence values, meaning that only very few words were associated with high emotional valence. This specific situation makes it difficult to draw any strong conclusions about the lack of association between emotional valence and concreteness/imageability ratings observed in the present study. We should note here that the exploration of this association was not the actual goal of our study, as our study simply aimed at providing a database of ratings about emotional valence and word imageability/concreteness for a set of nouns and verbs.

One limitation of this work is that we did not include arousal (i.e., activation or alertness that an individual experiences in response to stimuli or situations). For example, emotionally arousing words or sentences, such as those associated with fear or excitement, can elicit a heightened state of arousal compared to neutral words or sentences. This arousal level can affect how individuals process and interpret language. It would be particularly important to obtain additional normative data on this specific dimension for verbs given the scarcity of data for this specific word category. Moreover, perceptual features associated with words could be assessed in a deeper and more fine-grained manner via a 5-senses rating procedure (Chedid *et al.*, 2019; Khanna & Cortese, 2021; Lynott & Connell, 2009; Miceli *et al.*, 2021).

Finally, our normative data for these dimensions will complete the already existing French databases (see Bertels *et al.*, 2009; Bonin *et al.*, 2003, 2011, 2018, 2021; Desrochers & Thompson, 2009; Gilet *et al.*, 2012 for different norms and variables) particularly for verb stimuli. Providing accurate and precise norms for language-specific stimuli is also important as languages may differ with respect to the semantic richness implied by specific words. Indeed, perceptual and sensorimotor features associated with a specific word rely on personal experience which can differ across different cultures (see, for example, Simonsen *et al.* (2013) on semantic specificities of the Norwegian cultural background). Also, Ma *et al.* (2009) observed that Chinese verbs were found to be more imageable than English verbs. In line with the frameworks of Paivio and Barsalou discussed in the Introduction, perceptual and sensorimotor features associated

with a specific word rely on personal experience which can differ across different cultures.

In sum, this study presents a database providing concreteness, imageability and emotional valence ratings for a set of nouns and verbs. This freely available database should allow researchers to more fully control the different semantic dimensions associated with verbal material in cognitive and psycholinguistic experiments. The database currently includes a relatively limited set of nouns and verbs that can be enlarged by future studies.

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APPENDICES

APPENDIX 1 – INSTRUCTIONS FOR THE EMOTIONAL VALENCE, CONCRETENESS AND IMAGEABILITY QUESTIONNAIRES

Instructions for the emotional valence questionnaire

Lors de cette étude, il vous sera présenté des mots et des verbes de la langue française. Nous allons vous demander de juger la valeur émotionnelle que vous évoquent ces mots.

Pour ce faire, nous vous demanderons de répondre sur une échelle allant de 1 à 5:

1 = Très négatif ; 2 = Assez négatif ; 3 = Neutre ; 4 = Assez positif ; 5 = Très positif

N'hésitez pas à utiliser toutes les réponses possibles de l'échelle.

Pensez par exemple au mot « charité ». Ce mot va sans doute vous sembler très positif, il obtiendra une note de « 5, très positif ». En revanche, le mot « table » vous semblera peut-être neutre et obtiendra une note de « 3, neutre » tandis que le mot « trahison » pourrait obtenir une note de « 1, très négatif ». De même, un verbe comme « offrir » vous semblera probablement très positif. Un autre comme « s'asseoir » vous

semblera peut-être plus neutre, tandis qu'un dernier, comme « trahir » vous semblera très négatif

Attention, il ne s'agit pas de l'image que vous vous faites de ces mots et verbes, mais d'évaluer quelle valeur émotionnelle vous leurs attribuez.

Pour chaque mot présenté, évaluez son niveau de valeur émotionnelle en utilisant toute l'échelle.

English translation:

In this study, you will be presented with words and verbs from the French language. We will ask you to judge the emotional value associated with these words

To do this, we will ask you to answer on a scale from 1 to 5:

1 = Very negative; 2 = Somewhat negative; 3 = Neutral; 4 = Somewhat positive; 5 = Very positive

Please consider to use all the possible answers on the scale.

For example, think of the word "charity". This word will probably sound very positive to you, you will rate it as "5, very positive". The word "table" might seem neutral and it will get a score of "3, neutral" and the word "treason" might get a score of "1, very negative". Similarly, a verb like "to offer" will probably sound very positive. You will probable the "to sit down" as being more neutral, while "to betray" will be rated as very negative.

Be careful, you should not consider the image you have of these nouns and verbs, but the level of emotional value you associate to them.

For each word presented, assess its level of emotional value using the entire scale.

Instructions for the concreteness questionnaire

Lors de cette étude, il vous sera présenté des mots et des verbes de la langue française. Nous allons vous demander de juger dans quelle mesure ils vous semblent concrets.

Pour ce faire, nous vous demanderons de répondre sur une échelle allant de 1 à 5 :

1 = Pas/Très peu concret ; 2 = Peu concret ; 3 = Moyennement concret ; 4 = Assez bien concret ; 5 = Fortement concret

Mots et verbes diffèrent selon leur niveau d'abstraction. Certains mots font référence à des objets palpables, des matériaux ou des personnes qui peuvent être facilement perçus par nos sens. :

Nous pouvons considérer de tels mots comme des mots concrets. D'autres mots font référence à des concepts abstraits. Ces mots abstraits, au contraire des mots concrets, ne font donc pas référence aussi aisément

à des objets palpables, des matériaux ou des personnes qui peuvent être facilement perçus par nos sens.

De même, certains verbes font référence à des actions concrètes, facilement perceptibles par nos sens, et produisant des conséquences tangibles. D'autres font références à des activités abstraites, difficilement perceptibles lorsqu'elles sont réalisées.

En résumé, mots et verbes varient dans leur capacité à être considérés comme concrets. Certains nous semblent plus concrets et ce, très rapidement et très spontanément, tandis que d'autres nous évoquent des concepts plus abstraits, qui nécessitent un certain délai ou, même que l'on ne peut pas du tout concrétiser.

Les éléments qui vous sembleront très concrets auront un haut score de concrétude, ceux qui ne vont sembleront pas du tout concret auront un faible score de concrétude.

Pensez par exemple au mot « chat ». Ce mot va sans doute vous sembler très concret rapidement, il obtiendra une cote élevée de concrétude. En revanche, le mot « loyauté » vous semblera peu concret, il obtiendra une cote faible de concrétude. De même, le verbe « cuisiner » désigne une action qui vous paraitra sans doute concrète, alors même que le verbe « penser » vous semblera sans doute désigner une action moins concrète.

Attention, il ne s'agit pas de l'image que vous vous faites des mots, mais d'évaluer à quel point ils représentent un concept concret.

English translation:

In this study, you will be presented with nouns and verbs from the French language. We ask you to judge to what extent they seem concrete to you.

To do this, we ask you to answer on a scale from 1 to 5:

1 = Not/very little concrete; 2 = Not very concrete; 3 = Moderately concrete; 4 = Fairly concrete; 5 = Strongly concrete.

Nouns and verbs differ in their level of abstraction. Some nouns refer to palpable objects, materials, or people, that can be easily perceived by our senses.:

We can consider such nouns as concrete words. Other nouns refer to abstract concepts. These abstract nouns, unlike concrete nouns, do not refer as easily to palpable objects, materials or persons that can be easily perceived by our senses.

Similarly, some verbs refer to concrete actions, easily perceived by our senses, and producing tangible consequences. Others refer to abstract activities that are difficult to perceive when performed.

In summary, nouns and verbs vary in their level of concreteness. Some are very quickly and spontaneously identified as being rather concrete, while others evoke more abstract concepts, for which a concrete representation cannot be reached or only after a certain amount of time.

The items that seem very concrete will have a high concreteness score, those that do not seem concrete at all will have a very low concreteness score.

Think for example of the word "cat". This word will probably quickly seem very concrete to you, so it will get a high concreteness score. On the other hand, the word "loyalty" will not seem very concrete, and you will give it a low concreteness score. In the same way, the verb "to cook" designates an action that will undoubtedly seem concrete to you, whereas the verb "to think" will undoubtedly seem to you as designating a less concrete action.

Be careful, you should not consider the image you have of the words, but the extent to which they seem to represent a concrete concept to you.

Instructions for the imageability questionnaire

Ainsi, les mots et les verbes varient en termes d'imageabilité : Pour certains d'entre eux il est facile, rapide et spontané de former une image mentale leur correspondant. D'autre en revanche ne vont évoquer une image mentale que lentement, difficilement, voire même ne vont pas en évoquer du tout.

Les mots et verbes qui, pour vous, provoquent l'apparition d'une image mentale très rapidement et très facilement obtiendront une cote élevée en valeur d'imagerie ; les mots et verbes qui provoquent l'apparition de cette image avec difficulté ou encore ne provoquent l'apparition d'aucune image obtiendront une cote faible de valeur d'imagerie.

Ainsi, il pourra être noté selon l'échelle suivante :

1 : Pas/Très peu imageable ; 2 : Peu imageable ; 3 : Moyennement imageable ; 4 : Assez bien imageable ; 5 : Fortement imageable

Pensez par exemple au mot « chat ». Il est sans doute facile et rapide pour vous de former une image mentale correspondant à ce mot. En conséquence, le mot chat obtiendra une note élevée d'imagerie (5 : fortement imageable). En revanche, il vous sera sans doute plus difficile et long de former une image mentale correspondant au mot « loyauté ». Ce mot obtiendra donc une faible note d'imagerie (1 : très peu imageable). De la même façon, le verbe « cuisiner » fait référence à une action qui vous paraitra sans doute facilement et rapidement imageable. A l'inverse, le verbe « penser » n'évoquera sans doute une image qu'avec difficulté.

English translation:

Nouns and verbs vary in terms of imageability: for some of them a mental image is formed easily, quickly and spontaneously. Others, on the other hand, will evoke a mental image only slowly, with difficulty, or even not at all.

The nouns and verbs that, for you, generate a mental image very quickly and very easily will obtain a high imageability rating; the nouns and verbs that generate a mental image with more difficulty or not at all will obtain a low imageability rating.

Thus, the word will be scored according to the following scale:

1: Not/Very poorly imageable; 2: Poorly imageable; 3: Moderately imageable; 4: Well imageable; 5: Strongly imageable.

Think of the word "cat" for example. It is probably easy and quick for you to form a mental image corresponding to this word. As a result, the word cat will get a high imageability score (5: strongly imageable). On the other hand, it will probably be more difficult and time-consuming for you to form a mental image corresponding to the word "loyalty". Therefore, this word will get a low imageability score (1: Not/Very poorly imageable). In the same way, the verb "to cook" refers to an action that you will probably find easy and quick to represent as an image. Conversely, the verb "to think" will probably only evoke an image with difficulty.

Appendix 2. Items

Items	Phonology	Translation	Category	Imageability	Concretness	Emotionnal Valence	Letters	puorth	puphon	Syllables	Lexique383 freqfilms2
accroupir	akRupiR	squat	V	4,435294118	4,26744186	2,941860465	9	9	7	3	0,09
acquiescer	akjese	nod	V	4,023529412	4,069767442	3,569767442	10	10	4	3	0,18
adopter	adOpte	adopt	V	2,458823529	3,38372093	3,953488372	7	6	6	3	7,25
agripper	agRipe	grab	V	4,141176471	4,511627907	2,686046512	8	8	6	3	0,44
allonger	al§Ze	extend	V	4,2	4,302325581	3,406976744	8	8	5	3	9,96
allumer	alyme	lighting	V	4,435294118	4,337209302	3,302325581	7	7	5	3	11,98
allumer une allumette		to light a match	V	4,8	4,860465116	3,197674419					
altérer	alteRe	alter	V	1,835294118	2,709302326	2,197674419	7	6	6	3	0,83
appeler	ap°le	call	V	4,411764706	4,558139535	3,279069767	7	7	5	3	192,69
applaudir	aplodiR	applaud	V	4,905882353	4,779069767	4,534883721	9	9	7	3	3,16
asseoir	aswaR	asseoir	V	4,105882353	4,290697674	3,197674419	7	5	5	2	65,1
attaquer	atake	attack	V	3,776470588	4,209302326	1,953488372	8	8	5	3	25,91
attraper	atRape	catch	V	4,529411765	4,465116279	3,244186047	8	8	6	3	35,32
augmenter	ogm@te	increase	V	2,717647059	3,395348837	3,802325581	9	8	6	3	9,94
avancer	av@se	advance	V	4,164705882	4,011627907	3,953488372	7	7	5	3	22,65
avoir peur		be afraid	V	3,858823529	3,186046512	1,697674419					
balayer	baleje	sweep	V	4,752941176	4,709302326	2,872093023	7	7	5	3	3,4
boire	bwaR	drink	V	4,858823529	4,930232558	3,558139535	5	4	4	1	142,15

bondir	b§diR	leap	V	4,376470588	4,348837209	3,279069767	6	6	5	2	2,11
boucher	buSe	butcher	V	3,541176471	4,093023256	2,406976744	7	7	4	2	5,33
bouger	buZe	move	V	4,235294118	4,418604651	3,662790698	6	6	4	2	44,32
briller	bRije	shine	V	3,505882353	3,837209302	4,406976744	7	6	5	2	5,08
brosser	bRose	brush	V	4,6	4,569767442	3,034883721	7	7	5	2	2,76
brûler	bRyle	burn	V	4,376470588	4,61627907	1,755813953	6	6	5	2	23,14
calculer	kalkyle	calculate	V	3,376470588	4,197674419	3,104651163	8	8	7	3	3,09
caresser	kaRese	caressing	V	4,647058824	4,627906977	4,290697674	8	8	5	3	5,66
casser	kase	break	V	4,447058824	4,430232558	1,825581395	6	6	4	2	36,24
citer	site	quote	V	2,211764706	3,662790698	3,093023256	5	5	4	2	4,38
clouer	klue	nail	V	4,305882353	4,709302326	2,976744186	6	6	4	2	1,4
colorier	koloRje	coloring	V	4,764705882	4,848837209	3,744186047	8	7	7	3	0,25
compter	k§te	counting	V	3,941176471	4,313953488	3,104651163	7	7	4	2	45,05
conduire	k§d8iR	driving	V	4,894117647	4,674418605	3,406976744	8	7	6	2	60,56
congeler	k§Z°le	freezing	V	3,823529412	4,430232558	2,930232558	8	7	4	3	1,12
coudre	kudR	sewing	V	4,635294118	4,720930233	3,372093023	6	6	4	1	4,83
couper	kupe	cutting	V	4,670588235	4,465116279	2,546511628	6	6	4	2	41,45
courir	kuRiR	running	V	4,894117647	4,813953488	3,360465116	6	5	4	2	47,19
danser	d@se	dancing	V	4,823529412	4,720930233	4,453488372	6	6	4	2	70,06
déborder	debORde	overflow	V	3,694117647	3,825581395	2,197674419	8	8	7	3	1,78
décamper	dek@pe	scramble	V	3,258823529	3,651162791	2,255813953	8	6	5	3	0,81
décliner	dekline	decline	V	2,364705882	3,244186047	2,372093023	8	7	7	3	0,58

dégoûter	degute	deflategate	V	2,882352941	3,23255814	1,523255814	8	7	6	3	0,66
déposer	depoze	depositing	V	4,094117647	4,372093023	3,034883721	7	7	6	3	15,03
déraper	deRape	slipping	V	3,705882353	4,104651163	2,197674419	7	6	6	3	0,53
descendre	des@dR	descend	V	4,364705882	4,279069767	2,976744186	9	8	6	2	65,28
dessiner	desine	draw	V	4,811764706	4,720930233	3,88372093	8	7	6	3	9,1
dévaler	devale	down	V	3,376470588	3,790697674	2,639534884	7	7	6	3	0,29
dévisser	devise	unscrew	V	4,211764706	4,686046512	3	8	7	6	3	0,48
donner	done	give	V	4,058823529	4,209302326	4	6	6	4	2	233,3
dormir	dORmiR	sleeping	V	4,764705882	4,581395349	4,127906977	6	6	6	2	160,77
douter	dute	doubt	V	2,623529412	3,034883721	1,906976744	6	6	4	2	12,64
durer	dyRe	last	V	1,811764706	2,61627907	3,127906977	5	5	4	2	20,59
écraser	ekRaze	crush	V	4,329411765	4,488372093	1,825581395	7	7	6	3	16,75
écrire	ekRiR	writing	V	4,776470588	4,790697674	3,627906977	6	5	5	2	84,14
effacer	efase	erase	V	4,082352941	4,220930233	2,476744186	7	7	5	3	10,05
embrasser	@bRase	embrace	V	4,847058824	4,604651163	4,627906977	9	9	6	3	43,91
enjamber	@Z@be	embrace	V	4,447058824	4,511627907	3,127906977	8	8	5	3	0,42
enlacer	@lase	embrace	V	4,741176471	4,406976744	4,418604651	7	7	5	3	0,97
enregistrer	@R°ZistRe	record	V	3,047058824	3,779069767	3,093023256	11	11	9	4	7,58
envisager	@vizaZe	consider	V	1,988235294	2,546511628	3,441860465	9	9	7	4	4,83
escalader	Eskalade	escalate	V	4,741176471	4,755813953	3,337209302	9	9	8	4	2,19
espérer	EspeRe	hope	V	2,094117647	2,511627907	3,848837209	7	6	6	3	15,65
essuyer	es8ije	wipe	V	4,576470588	4,465116279	2,872093023	7	7	6	3	3,39

étinceler	et5s°le	sparkling	V	3,058823529	3,174418605	4,395348837	9	8	7	4	0,07
être déçu		to be disappointed	V	3,011764706	2,988372093	1,395348837					
être dégouté		to be disgusted	V	3,4	3,360465116	1,406976744					
evoluer	evol8e	evolve	V	2,423529412	2,837209302	4,348837209	7	6	5	3	2,9
faire des pompes		to do push-ups	V	4,788235294	4,802325581	3,081395349					
faire rebondir		bounce	V	4,211764706	4,337209302	3,244186047					
faire signe		waving	V	4,564705882	4,302325581	3,581395349					
faire une passe		passing the ball	V	4,458823529	4,523255814	3,465116279					
fermer	fERme	close	V	4,494117647	4,406976744	2,720930233	6	6	5	2	48,85
fermer une bouteille		close a bottle	V	4,8	4,88372093	3,011627907					
flotter	flote	float	V	4,2	4,279069767	3,372093023	7	7	5	2	3,16
fondre	f§dR	melt	V	3,8	3,697674419	2,837209302	6	6	4	1	8,05
fouler	fule	whip	V	2,670588235	3,325581395	2,639534884	6	6	4	2	0,65
frapper	fRape	strike	V	4,764705882	4,488372093	1,465116279	7	7	5	2	37,08
frotter	fRote	rub	V	4,352941176	4,581395349	2,930232558	7	7	5	2	4,01
gommer	gome	scrub	V	4,647058824	4,558139535	2,88372093	6	6	4	2	0,26
gratter	gRate	scratch	V	4,435294118	4,534883721	2,790697674	7	7	5	2	5,03

griffer	gRife	scratch	V	4,611764706	4,709302326	1,918604651	7	7	5	2	0,64
inviter	5vite	invite	V	2,882352941	3,534883721	4,11627907	7	7	5	3	22,63
jeter	Z°te	throw	V	4,470588235	4,5	2,38372093	5	5	4	2	59,28
jongler	Z§gle	juggling	V	4,729411765	4,651162791	3,337209302	7	7	5	2	0,83
lancer	l@se	throwing	V	4,729411765	4,558139535	3,023255814	6	6	4	2	18,56
lever	l°ve	lift	V	4,188235294	4,220930233	3,26744186	5	5	4	2	35,9
louer	lwe	rent	V	2,329411765	3,569767442	3,127906977	5	5	3	1	15,03
manger	m@Ze	eat	V	4,870588235	4,860465116	3,941860465	6	6	4	2	207,63
maquiller	makije	make-up	V	4,694117647	4,290697674	3,26744186	9	9	6	3	3,1
marcher	maRSe	walk	V	4,788235294	4,813953488	3,406976744	7	7	5	2	85,34
monter	m§te	go up	V	4,447058824	4,465116279	3,197674419	6	6	4	2	85,7
montrer	m§tRe	show	V	4,023529412	4,23255814	3,23255814	7	7	5	2	136,2
neiger	neZe	snow	V	4,447058824	4,476744186	4,034883721	6	6	4	2	0,59
nettoyer	netwaje	clean	V	4,529411765	4,534883721	2,976744186	8	8	7	3	30,28
nuancer	n8@se	shade	V	1,894117647	2,569767442	3,279069767	7	7	5	2	0,01
organiser	ORganize	organize	V	2,870588235	3,523255814	3,639534884	9	9	8	4	13,93
ouvrir	uvRiR	open	V	4,517647059	4,453488372	3,418604651	6	6	5	2	79,61
passer	pase	pass	V	3,164705882	3,034883721	3,034883721	6	6	4	2	345,68
pédaler	pedale	pedal	V	4,835294118	4,779069767	3,209302326	7	7	6	3	0,37
peindre	p5dR	painting	V	4,858823529	4,73255814	3,744186047	7	5	3	1	12,75
permettre	pERmEtR	allow	V	1,941176471	2,686046512	3,709302326	9	6	5	2	26,32
piger	piZe	piger	V	2,176470588	3,011627907	3,372093023	5	5	4	2	1,78

pleurer	pl2Re	crying	V	4,823529412	4,581395349	1,639534884	7	7	5	2	61,6
pleuvoir	pl2vwaR	raining	V	4,647058824	4,523255814	2,720930233	8	6	5	2	7,98
pointer	pw5te	pointing	V	4,188235294	4,209302326	2,825581395	7	7	5	2	4,63
porter	poRte	carry	V	4,411764706	4,488372093	3,174418605	6	6	4	2	79,04
pousser	puse	pushing	V	4,6	4,325581395	2,755813953	7	7	4	2	27,51
préjuger	pReZyZe	prejudge	V	1,741176471	2,279069767	1,581395349	8	7	6	3	0,02
publier	pyblije	publish	V	2,835294118	3,546511628	3,38372093	7	7	7	3	6,85
ramasser	Ramase	pick up	V	4,564705882	4,627906977	2,930232558	8	8	6	3	13,15
ramper	R@pe	crawl	V	4,647058824	4,604651163	2,558139535	6	6	4	2	3,32
rebondir	R°b$diR	bounce	V	4,129411765	4,23255814	3,546511628	8	8	7	3	1,56
reculer	R°kyle	reverse	V	4,364705882	4,581395349	2,441860465	7	6	6	3	6,83
refermer	R°fERme	close	V	4,129411765	4,360465116	2,61627907	8	6	6	3	3,26
refléter	R°flete	reflect	V	2,823529412	3,139534884	3,220930233	8	5	5	3	0,8
refuser	R°fyze	refuse	V	3,364705882	3,76744186	2,372093023	7	6	5	3	21,34
regrouper	R°gRupe	regroup	V	3,2	3,976744186	3,581395349	9	9	7	3	0,59
renseigner	R@seNe	renseigner	V	2,752941176	3,511627907	3,558139535	10	10	4	3	9,08
résister	Reziste	resist	V	2,847058824	3,372093023	3,5	8	7	7	3	17,54
réunir	ReyniR	reunite	V	3,058823529	3,558139535	4,046511628	6	6	6	3	9,11
rêver	Reve	dream	V	3,588235294	3,476744186	4,581395349	5	5	4	2	20,8
rire	RiR	laughing	V	4,858823529	4,523255814	4,860465116	4	3	3	1	63,29
s'accroupir		crouch	V	4,576470588	4,848837209	2,918604651					
s'agenouiller		kneeling	V	4,552941176	4,720930233	2,906976744					

s'asseoir		sitting	V	4,776470588	4,755813953	3,244186047					
s'enlacer		hugging	V	4,505882353	4,453488372	4,5					
s''ennuyer		bored	V	3,070588235	3,244186047	1,976744186					
s'allonger		to lie down	V	4,682352941	4,686046512	3,755813953					
saluer	sal8e	salute	V	4,517647059	4,546511628	3,802325581	6	6	5	2	11,85
saupoudrer	sopudRe	sprinkle	V	4,294117647	4,337209302	3,313953488	10	10	7	3	0,1
sauter	sote	jump	V	4,835294118	4,651162791	3,209302326	6	6	4	2	57,89
sautiller	sotije	jumping	V	4,552941176	4,604651163	3,895348837	9	9	6	3	0,3
scotcher	skOtSe	scotch	V	4,188235294	4,453488372	3,046511628	8	7	6	2	0,17
se baisser		bending down	V	4,635294118	4,744186047	2,872093023					
se brosser les dents		brush teeth	V	4,894117647	4,88372093	3,5					
se disputer		arguing	V	4,188235294	4,302325581	1,302325581					
se lever		getting up	V	4,682352941	4,744186047	3,290697674					
se maquiller		putting on make-up	V	4,776470588	4,73255814	3,453488372					
se pencher		bending over	V	4,482352941	4,651162791	2,965116279					
sécher	seSe	drying	V	3,564705882	4,325581395	3,023255814	6	6	4	2	5,84
secouer	s°kwe	shaking	V	4,411764706	4,313953488	2,418604651	7	7	5	2	4,5
sembler	s@ble	seem	V	1,682352941	2,313953488	2,837209302	7	6	5	2	6,01
serrer	seRe	shake	V	4,341176471	4,302325581	3,093023256	6	6	4	2	13,68

serrer la main		shake hands	V	4,870588235	4,848837209	3,418604651					
shooter	shooter	shoot	V	3,858823529	3,906976744	2,76744186	7	7	4	2	1,88
signer	signer	sign	V	4,482352941	4,511627907	3,197674419	6	6	4	2	29,25
songer	songer	sigh	V	2,635294118	2,511627907	3,441860465	6	6	4	2	5,56
souffrir	souffrir	suffering	V	3,482352941	3,279069767	1,23255814	8	7	5	2	34,26
souligner	souligner	underline	V	4,411764706	4,337209302	3,023255814	9	6	4	3	1,65
survenir	survenir	happen	V	2,035294118	2,941860465	2,860465116	8	7	7	3	0,8
taper	taper	type	V	4,611764706	4,11627907	1,697674419	5	5	4	2	19,15
taper au clavier		type on keyboard	V	4,858823529	4,953488372	3,058139535					
tartiner	taRtine	spread	V	4,576470588	4,674418605	3,453488372	8	8	7	3	0,41
téléphoner	telefone	phone	V	4,717647059	4,860465116	3,151162791	10	10	8	4	20,22
tirer	tiRe	shoot	V	4,423529412	4,302325581	2,639534884	5	5	4	2	113,71
tomber	t§be	drop	V	4,623529412	4,523255814	1,941860465	6	6	4	2	180,25
tordre	tORdR	twisting	V	4,364705882	4,325581395	2,23255814	6	5	5	1	2,77
toucher	tuSe	touching	V	4,435294118	4,674418605	3,337209302	7	7	4	2	49,43
tourner	tuRne	turning	V	4,364705882	4,465116279	3,069767442	7	7	5	2	51,05
tracer	tRase	tracing	V	3,988235294	4,337209302	3,058139535	6	6	5	2	2,08
tricoter	tRikote	knitting	V	4,741176471	4,779069767	3,209302326	8	8	7	3	1,37
trottiner	tRotine	trotting	V	4,505882353	4,604651163	3,325581395	9	9	7	3	0,03
valser	valse	waltzing	V	3,858823529	3,825581395	3,546511628	6	6	5	2	1,33

verser	vERse	pouring	V	4,541176471	4,604651163	3,069767442	6	6	5	2	4,62
vibrer	vibRe	vibrate	V	3,435294118	3,593023256	3,430232558	6	6	5	2	2,06
visser	vise	screwing	V	4,482352941	4,674418605	3,058139535	6	6	4	2	1,45
abeille	abEj	bee	N	4,894117647	4,860465116	3,627906977	7	4	4	2	3,53
adresse	adREs	adress	N	2,918604651	4,069767442	3,069767442	7	7	5	2	67,28
affiche	afiS	poster	N	4,674418605	4,581395349	3	7	7	4	2	5,38
agilité	aZilite	agility	N	2,534883721	2,930232558	3,860465116	7	5	5	4	1
album	albOm	album	N	4,270588235	4,453488372	3,651162791	5	5	5	2	9,36
allumette	alymEt	match	N	4,858823529	4,872093023	3,069767442	9	7	5	3	4,43
alphabet	alfabE	alphabet	N	4,197674419	4,197674419	3,209302326	8	7	6	3	3,14
ampoule	@pul	light bulb	N	4,905882353	4,802325581	3,174418605	7	7	4	2	4,8
animal	animal	animal	N	4,511627907	4,593023256	4	6	6	6	3	36,89
arc	aRk	bow	N	4,788235294	4,360465116	3,058139535	3	3	3	1	4,52
argent	aRZ@	silver	N	4,709302326	4,313953488	3,581395349	6	6	4	2	515,04
attache	ataS	attachment	N	3,244186047	3,860465116	3,034883721	7	7	4	2	1,82
automne	otOn	fall	N	3,88372093	3,930232558	3,674418605	7	7	4	2	16,88
avocat	avoka	lawyer	N	4,651162791	4,441860465	3,11627907	6	6	5	3	89,28
barbe	baRb	beard	N	4,918604651	4,790697674	3,069767442	5	5	4	1	23,4
bateau	bato	boat	N	4,870588235	4,802325581	3,395348837	6	6	4	2	106,55
bâtiment	batim@	building	N	4,744186047	4,744186047	3,081395349	8	5	6	3	22,73
bébé	bebe	baby	N	4,870588235	4,709302326	3,813953488	4	4	4	2	173,82
bénéfice	benefis	profit	N	2,186046512	2,976744186	4,011627907	8	8	7	3	4,31

berceau	bERso	crib	N	4,705882353	4,813953488	3,546511628	7	6	5	2	6,72
biscuit	bisk8i	cookie	N	4,848837209	4,848837209	3,88372093	7	7	6	2	4,75
blaireau	blERo	badger	N	4,546511628	4,569767442	2,755813953	8	7	5	2	2,64
bombe	b§b	bomb	N	4,61627907	4,523255814	1,5	5	5	3	1	48,7
bouche	buS	mouth	N	4,953488372	4,744186047	3,244186047	6	6	3	1	87,75
boue	bu	mud	N	4,546511628	4,651162791	2,662790698	4	4	2	1	15,09
brigand	bRig@	brigand	N	4,011627907	4,139534884	1,906976744	7	7	5	2	2,1
briquet	bRikE	lighter	N	4,835294118	4,802325581	2,744186047	7	7	5	2	9,98
brosse	bROs	brush	N	4,847058824	4,697674419	3,046511628	6	6	4	1	7,29
bureau	byRo	office	N	4,670588235	4,5	2,744186047	6	6	4	2	156,68
café	kafe	coffee	N	4,823529412	4,546511628	3,23255814	4	4	4	2	157,56
cambriolage	k@bRijolaZ	burglary	N	3,697674419	4,139534884	1,453488372	11	9	9	4	6,6
cancer	k@sER	cancer	N	2,709302326	3,813953488	1,104651163	6	6	5	2	22,34
capacité	kapasite	capacity	N	2,069767442	2,627906977	3,76744186	8	8	5	4	9,42
centre	s@tR	center	N	3,372093023	3,244186047	3,058139535	6	6	4	1	53,46
cerise	s°Riz	cherry	N	4,965116279	4,906976744	3,779069767	6	6	5	2	2,75
chant	S@	song	N	3,744186047	3,790697674	4,011627907	5	5	2	1	17,64
chantier	S@tje	construction site	N	4,441860465	4,244186047	2,802325581	8	7	4	2	9,93
chat	Sa	cat	N	4,952941176	4,906976744	4,26744186	4	4	2	1	57,71
châtaigne	SatEN	chestnut	N	4,755813953	4,76744186	3,290697674	9	9	5	2	0,55
château	Sato	castle	N	4,813953488	4,779069767	3,569767442	7	7	4	2	40,51

cheminée	S°mine	fireplace	N	4,847058824	4,76744186	3,569767442	8	7	6	3	9,99
cheveux	S°v2	hair	N	4,811764706	4,779069767	3,5	7	0	4	2	116,16
cheville	S°vij	ankle	N	4,837209302	4,744186047	2,918604651	8	8	5	2	8,79
chien	Sj5	dog	N	4,976470588	4,813953488	4,023255814	5	5	3	1	158,77
chocolat	Sokola	chocolate	N	4,906976744	4,813953488	4,302325581	8	8	6	3	27,74
clef	kle	key	N	4,894117647	4,686046512	3,360465116	4	4	3	1	14,61
clou	klu	nail	N	4,859575923	4,843023256	2,843023256	4	4	3	1	7,79
collection	kolEksj§	collection	N	3,465116279	3,813953488	3,360465116	10	10	8	3	16,25
collier	kolje	collar	N	4,894117647	4,790697674	3,546511628	7	6	4	2	17,79
consonne	k§sOn	consonant	N	3,348837209	4,244186047	3	8	7	5	2	0,2
copie	kopi	copy	N	3,569767442	4,093023256	2,88372093	5	5	4	2	16,88
coq	kOk	rooster	N	4,870588235	4,825581395	3,162790698	3	3	3	1	10,74
côté	kote	side	N	2,848837209	3,534883721	3	4	4	4	2	250,51
course	kuRs	race	N	4,034883721	3,802325581	3,174418605	6	6	4	1	40,45
couteau	kuto	knife	N	4,952941176	4,825581395	2,5	7	7	4	2	51,08
crapaud	kRapo	toad	N	4,848837209	4,779069767	2,813953488	7	7	5	2	9,6
cruche	kRyS	pitcher	N	4,282352941	4,581395349	2,860465116	6	6	4	1	2,92
cuisine	k8izin	kitchen	N	4,686046512	4,581395349	3,860465116	7	7	6	2	85,08
culture	kyltyR	culture	N	2,686046512	2,872093023	4,023255814	7	7	6	2	18,76
délit	deli	crime	N	2,441860465	3,081395349	1,709302326	5	5	4	2	11,35
dialogue	djalOg	dialogue	N	2,953488372	3,046511628	3,662790698	8	8	5	2	14,11
eau	o	water	N	4,588235294	4,23255814	4,093023256	3	3	1	1	290,61

éclair	eklER	lightning	N	4,674418605	4,058139535	3,174418605	6	6	5	2	7,86
école	ekOl	school	N	4,709302326	4,372093023	3,465116279	5	5	4	2	197,04
élan	el@	momentum	N	3,930232558	3,76744186	3,38372093	4	4	3	2	4,61
ennui	@n8i	boredom	N	2,465116279	2,639534884	1,895348837	5	5	4	2	14,76
enveloppe	@v°lOp	envelope	N	4,88372093	4,709302326	3,046511628	9	9	6	3	11,4
environnement	@viROn°m@	environment	N	2,825581395	3,11627907	3,720930233	13	13	9	5	10,07
épingle	ep5gl	pin	N	4,651162791	4,697674419	2,918604651	7	7	5	2	3,29
esprit	EspRi	mind	N	2,360465116	2,511627907	3,720930233	6	6	5	2	131,7
explosion	Eksplozj§	explosion	N	4,593023256	4,220930233	1,686046512	9	8	8	3	23,11
faculté	fakylte	faculty	N	2,965116279	2,604651163	3,61627907	7	7	7	3	5,93
farine	faRin	flour	N	4,802325581	4,813953488	3,244186047	6	6	5	2	7,93
feu	f2	fire	N	4,761833105	4,131782946	3,034883721	3	3	2	1	215,87
feuille	f9j	leaf	N	4,837209302	4,61627907	3,186046512	7	7	3	1	13,24
flèche	flES	arrow	N	4,811764706	4,558139535	2,872093023	6	3	4	1	8,21
fleur	fl9R	flower	N	4,905882353	4,76744186	4,162790698	5	5	4	1	25,2
fourchette	fuRSEt	fork	N	4,917647059	4,813953488	3,186046512	10	9	6	2	4,98
fraise	fREz	strawberry	N	4,930232558	4,88372093	3,953488372	6	6	4	1	5,28
gant	g@	glove	N	4,811764706	4,825581395	3,069767442	4	4	2	1	9,86
gâteau	gato	cake	N	4,930232558	4,76744186	4,034883721	6	5	4	2	42,33
géranium	ZeRanjOm	geranium	N	4,38372093	4,593023256	3,406976744	8	6	5	3	0,77
gorille	goRij	gorilla	N	4,882352941	4,837209302	3,26744186	7	4	4	2	3,55
goût	gu	taste	N	2,395348837	3,127906977	3,906976744	4	4	2	1	50,51

grenade	gR°nad	pomegranate	N	4,744186047	4,38372093	1,930232558	7	7	6	2	6,32
grue	gRy	crane	N	4,674418605	4,651162791	2,965116279	4	4	3	1	3,54
habileté	abil°te	skill	N	2,011627907	2,569767442	3,662790698	8	7	6	4	2,03
heure	9R	time	N	2,870588235	2,941860465	2,941860465	5	5	2	1	415,4
horloge	ORlOZ	clock	N	4,882352941	4,825581395	3,11627907	7	7	5	2	9,37
horoscope	oRoskOp	horoscope	N	3,534883721	3,302325581	3,023255814	9	4	4	3	2,47
imitation	imitasj§	imitation	N	2,779069767	3,26744186	3	9	8	6	4	3,33
index	5dEks	index	N	4,081395349	3,918604651	2,976744186	5	5	5	2	2,18
juge	ZyZ	judge	N	3,918604651	4,290697674	2,686046512	4	4	3	1	56,4
justice	Zystis	justice	N	2,697674419	2,686046512	3,651162791	7	7	6	2	50,96
lait	lE	milk	N	4,811764706	4,651162791	3,244186047	4	4	2	1	59,41
laitue	lety	lettuce	N	4,717647059	4,755813953	3,197674419	6	5	4	2	1,97
lettre	lEtR	letter	N	4,651162791	4,511627907	3,302325581	6	6	4	1	108,79
lieu	lj2	place	N	2,941860465	3,209302326	3,046511628	4	4	3	1	153,12
livre	livR	book	N	4,860465116	4,837209302	3,953488372	5	5	4	1	112,43
lumière	lymjER	light	N	3,905882353	3,465116279	4,395348837	7	5	4	2	116,02
maison	mEz§	house	N	4,895348837	4,837209302	4,034883721	6	6	4	2	570,3
maladie	maladi	disease	N	2,755813953	3,523255814	1,220930233	7	7	6	3	52,18
manoir	manwaR	manor	N	4,61627907	4,639534884	2,976744186	6	5	4	2	5,87
marécage	maRekaZ	swamp	N	4,337209302	4,453488372	2,372093023	8	8	7	3	2,31
marteau	maRto	hammer	N	4,917647059	4,860465116	2,848837209	7	7	5	2	11,84
matin	mat5	morning	N	2,988235294	3,093023256	3,593023256	5	5	4	2	265,03

mer	mER	sea	N	4,777564979	4,337209302	4,226744186	3	3	3	1	99,49
milieu	milj2	middle	N	3,162790698	3,127906977	3,069767442	6	5	5	2	68,6
moufle	mufl	muffle	N	4,705882353	4,802325581	3,104651163	6	6	4	1	0,28
moulin	mul5	mill	N	4,8	4,662790698	3,26744186	6	6	4	2	6,8
mousse	mus	moss	N	4,476744186	4,302325581	3,569767442	6	6	3	1	6,24
muguet	mygE	lily of the valley	N	4,73255814	4,73255814	3,848837209	6	6	3	2	0,38
mur	myR	wall	N	4,848837209	4,76744186	2,88372093	3	3	3	1	58,9
musique	myzik	music	N	3,744186047	3,930232558	4,546511628	7	7	5	2	168,89
neige	nEZ	snow	N	4,764705882	4,534883721	4	5	5	3	1	37,52
note	nOt	note	N	4,348837209	3,662790698	2,953488372	4	4	3	1	33,42
oiseau	wazo	bird	N	4,837209302	4,813953488	3,755813953	6	6	4	2	43,78
orchestre	ORkEstR	orchestra	N	4,627906977	4,61627907	3,662790698	9	9	7	2	13,71
page	paZ	page	N	4,546511628	4,604651163	3,197674419	4	4	3	1	25,16
palais	palE	palace	N	4,593023256	4,453488372	3,418604651	6	5	4	2	29,55
papier	papje	paper	N	4,76744186	4,662790698	3,151162791	6	6	5	2	56,32
partition	paRtisj§	score	N	4,337209302	4,38372093	3,38372093	9	8	7	3	2,88
pelle	pEl	shovel	N	4,917647059	4,744186047	2,76744186	5	5	3	1	8,75
pensée	p@se	thought	N	2,337209302	2,441860465	3,88372093	6	5	4	2	26,25
pépin	pep5	seed	N	4,674418605	4,372093023	2,581395349	5	5	4	2	4,31
perceuse	pERs2z	drill	N	4,755813953	4,73255814	2,848837209	8	0	0	2	0,97
perle	pERl	bead	N	4,658823529	4,604651163	3,76744186	5	5	4	1	4,13

photo	foto	photo	N	4,658823529	4,627906977	4	5	5	4	2	122,47
pneu	pn2	tire	N	4,905882353	4,825581395	2,941860465	4	4	3	1	5,64
poignée	pwaNe	handle	N	4,776470588	4,488372093	3,023255814	7	6	5	2	11,65
poire	pwaR	pear	N	4,882352941	4,825581395	3,348837209	5	5	4	1	5,67
pomme	pOm	apple	N	4,952941176	4,88372093	3,546511628	5	5	3	1	19,77
pompier	p§pje	fireman	N	4,837209302	4,825581395	3,744186047	7	6	5	2	2,67
porte	pORt	door	N	4,929411765	4,790697674	3	5	5	4	1	288,39
possibilité	posibilite	possibility	N	1,744186047	2,674418605	3,720930233	11	7	6	5	16,79
poste	pOst	post	N	3,736525308	3,843023256	2,970930233	5	5	4	1	72,64
poster	pOste	poster	N	4,174418605	4,186046512	3,174418605	6	6	5	2	1,6
poule	pul	chicken	N	4,905882353	4,88372093	3,26744186	5	5	3	1	23,5
problème	pRoblEm	problem	N	2,139534884	2,976744186	1,651162791	8	6	6	2	391,2
punaise	pynEz	pin	N	4,593023256	4,511627907	2,546511628	7	7	5	2	1,41
raquette	RakEt	racket	N	4,882352941	4,662790698	3,26744186	8	6	5	2	1,77
rasoir	RazwaR	razor	N	4,837209302	4,790697674	2,755813953	6	4	4	2	8,18
recette	R°sEt	recipe	N	3,941860465	4,325581395	3,534883721	7	5	5	2	9,56
répertoire	RepERtwaR	repertoire	N	3,627906977	4,11627907	3,058139535	10	8	7	3	2,04
réplique	Replik	replica	N	2,093023256	3,26744186	3,081395349	8	8	6	2	6,16
rêve	REv	dream	N	3,26744186	2,581395349	4,476744186	4	4	3	1	99,39
réveil	RevEj	alarm clock	N	4,4	4,186046512	2,720930233	6	6	5	2	18,16
ruche	RyS	hive	N	4,705882353	4,720930233	3,337209302	5	5	3	1	2,64
salade	salad	salad	N	4,917647059	4,779069767	3,23255814	6	6	5	2	15,88

saut	so	jump	N	4,418604651	4,372093023	3,11627907	4	4	2	1	13,53
saxophone	saksofOn	saxophone	N	4,709302326	4,779069767	3,453488372	9	9	7	3	1,3
serrure	seRyR	lock	N	4,729411765	4,720930233	2,976744186	7	7	5	2	7,4
signe	siN	sign	N	3,337209302	3,395348837	3,348837209	5	5	3	1	67,74
singe	s5Z	monkey	N	4,917647059	4,837209302	3,441860465	5	5	3	1	21,59
sirène	siREn	siren	N	4,476744186	4,186046512	3,058139535	6	4	4	2	8,06
ski	ski	ski	N	4,764705882	4,488372093	3,627906977	3	3	3	1	13,84
sol	sOl	ground	N	4,406976744	4,395348837	3,081395349	3	3	3	1	45,83
sommaire	somER	summary	N	3,581395349	3,930232558	2,988372093	8	8	5	2	0,21
son	s§	sound	N	2,61627907	3,534883721	3,61627907	3	3	2	1	39,69
souci	susi	worry	N	2,046511628	2,686046512	1,88372093	5	5	4	2	26,73
tasse	tas	cup	N	4,917647059	4,848837209	3,220930233	5	5	3	1	18,52
tennis	tenis	tennis	N	4,447058824	4,302325581	3,337209302	6	6	5	2	11,37
theatre	teatR	theater	N	4,581395349	4,430232558	3,73255814	7	7	5	2	40,51
timbre	t5bR	stamp	N	4,836183311	4,779069767	3,063953488	6	6	4	1	1,82
travail	tRavaj	work	N	2,752941176	3,069767442	2,755813953	7	7	6	2	367,43
tribunal	tRibynal	court	N	4,186046512	4,360465116	2,38372093	8	8	8	3	35,35
trombone	tR§bOn	trombone	N	4,697674419	4,697674419	3,139534884	8	8	6	2	1,78
tumeur	tym9R	tumor	N	2,895348837	4,046511628	1,174418605	6	5	4	2	6,7
université	ynivERsite	university	N	4,441860465	4,337209302	3,476744186	10	10	10	5	38,22
vache	vaS	cow	N	4,929411765	4,825581395	3,313953488	5	5	3	1	36,24
vase	vaz	vase	N	4,847948016	4,813953488	3,255813953	4	4	3	1	9,83

vent	v@	wind	N	3,423529412	3,662790698	2,61627907	4	4	2	1	71,5
vis	vis	screw	N	4,697674419	4,720930233	2,895348837	3	3	3	1	6,89
vitesse	vitEs	speed	N	2,825581395	3,406976744	3,360465116	7	5	4	2	37,89
voiture	vwatyR	car	N	4,917647059	4,837209302	3,360465116	7	7	6	2	388,87
vol	vOl	flight	N	3,651162791	3,488372093	2,848837209	3	3	3	1	74,14
voyelle	vwajEl	vowel	N	3,662790698	4,209302326	3,255813953	7	5	5	2	0,36