



## Social context effects on emotional language: The influence of the COVID-19 pandemic on the emotional evaluation of words

Clara Planchuelo<sup>a</sup>, Ana Baciero<sup>b</sup>, José Antonio Hinojosa<sup>a,c,d</sup>, Manuel Perea<sup>a,e</sup>,  
Jon Andoni Duñabeitia<sup>a,f,\*</sup>

<sup>a</sup> Centro de Investigación Nebrija en Cognición, Universidad Antonio de Nebrija, Madrid, Spain

<sup>b</sup> Faculty of Science and Technology, Bournemouth University, Dorset, United Kingdom

<sup>c</sup> Instituto Pluridisciplinar, Universidad Complutense de Madrid, Madrid, Spain

<sup>d</sup> Departamento de Psicología Experimental, Procesos Cognitivos y Logopedia, Universidad Complutense de Madrid, Madrid, Spain

<sup>e</sup> Departamento de Metodología and ERI-Lectura, Universitat de València, Valencia, Spain

<sup>f</sup> Department of Languages and Culture, The Arctic University of Norway, Tromsø, Norway

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### ABSTRACT

The COVID-19 pandemic has altered our routines, our conversations, the specific social contexts in which we hear or use certain words, and potentially, the representation of the words related to the disease and its consequences. Here we investigated whether the effects of the pandemic have changed the representation of the affective features of COVID-19-related words. To this aim, we collected new ratings of valence (from unpleasant to pleasant) and arousal (from calm to activated) dimensions for COVID-19-related words (e.g., hospital) and COVID-19-unrelated words (e.g., whale). Subsequently, we compared these scores with those from databases that reported ratings for the same pool of words before the pandemic. Our results showed significant changes in arousal for COVID-19-related words but not unrelated words, thus revealing that the pandemic social context modified their affective representation. These findings support the flexibility of emotional representations and the malleability and dynamicity of the mental lexicon as a function of contextual factors.

### 1. Introduction

Social context, defined as the specific environment that shapes directly or indirectly our day-to-day experiences, affects behavior and emotions. Critically, the relationship between the individuals and the social framework is dynamic, as the emotional processes experienced by individuals are an active function of social events (Jakobs et al., 1996). Historically, emotions have been understood as intraindividual phenomena shaped by elements such as individual subjectivity, cognitive appraisals, and specific bodily changes (Fischer et al., 2003). However, at present, social context, referring to both a concrete social event and the persons' reactions to a particular event, has been claimed to influence emotional processing, thus suggesting its major role in the triggering and modulation of emotions (van Kleef et al., 2016).

Regarding social context, at the beginning of the second decade of the 21st century, the more pressing social framework has been the COVID-19 pandemic. This disease has provoked a radical change in the daily life of all people in the entire world. In this line, an increasingly

larger number of recent studies have highlighted the existence of psychological (e.g., Xiong et al., 2020) and emotional consequences of the COVID-19 on worldwide society (Canet-Juric et al., 2020; Steinert, 2020; Stieger et al., 2021).

Of particular interest to the present study, the measures taken by governments to contain disease transmission, including quarantine, social isolation, social distancing, as well as the prohibition of many regular activities (e.g., being separated from the loved ones, loss of freedom, and the fear of infection) have caused a general decline in overall mood and dominance of negative feelings (e.g., see Gismero-González et al., 2020; Pérez-Fuentes et al., 2020). Furthermore, the pandemic has triggered a deterioration of the mental well-being of individuals, as shown when comparing emotions before and at the time of the pandemic through different psychological and emotional online surveys (e.g., see Rothe et al., 2021). In the same vein, there has been a decrease in different emotional states, like worry, fear, boredom, and anger/annoyance during the COVID-19 pandemic over time (Sadiković et al., 2020). Similarly, other investigations (e.g., Canet-Juric et al.,

\* Corresponding author at: Universidad Nebrija, Campus Berzosa, Hoyo de Manzanares, 28240 Madrid, Spain.

E-mail address: [jdunabeitia@nebrija.es](mailto:jdunabeitia@nebrija.es) (J.A. Duñabeitia).

2020) have shown that as negative emotions (such as depression) tended to increase slightly, levels of anxiety and affect (positive and negative) tended to decrease during the COVID-19 pandemic.

Since the particular social context that constitutes the COVID-19 pandemic influences how we think and feel, it could also affect how we interact and communicate with each other (Calbi et al., 2021). Regarding communication, it has been claimed that a primary function of words consists of shaping the way we interact with the physical and social environment around us (Borghi et al., 2018). More precisely, words are physical tools within our social niche, as they dynamically interact with social context.

The reason why words constitute a relevant social tool is that they are a way to physically embody (both phonetically and graphically) of our thoughts and feelings, as they serve us to encode and decode people's ideas, general knowledge, intentions, and senses (Dove, 2014). Hence, the mental representation of words crucially includes their emotional features (Citron, 2012; Hinojosa et al., 2009; Kuperman et al., 2014), based on dimensional approaches to emotion (Russell, 2003) like *valence* (from pleasant to unpleasant) and *arousal* (from calming to exciting). Both dimensions tend to be associated by a U-Shaped quadratic relationship: words with positive and negative valence tend to be more arousing than neutral ones (Gobin et al., 2017; Hinojosa et al., 2020). Regarding the dynamic interaction between social context, emotions, and communication (van Kleef et al., 2016), it is feasible to consider whether social context (in this case, the pandemic) can influence or change the emotional features of words (that is, *valence* and *arousal*). Indeed, several recent studies have analyzed this relationship between emotional communication and the present social framework through press headlines (Aslam et al., 2020), digital systems, and social media statements (Steinert, 2020). In the first case, the headlines (Aslam et al., 2020) were classified into positive, negative, and neutral sentiments after calculating unbounded text polarity at the sentence level score and incorporating the valence shifters. Aslam et al. (2020) showed that the news headlines yielded high emotional scores with a negative polarity. More precisely, around 52 % of the news headlines evoked negative feelings, and only 30 % evoked positive sentiments, while 18 % were neutral. This research revealed that news headlines had an impact in individuals' affective experience, which might had implications for the representation of the emotional features (either valence, arousal or both) of COVID-related concepts. When analyzing social media statements, Steinert (2020) found similar evidence and suggested that it was the result of a change in persons' value structure due to the pandemic, where emotions are predominantly negative, thus resulting in a generally negative emotional climate.

Importantly, few studies have analyzed whether the specific social context created by the pandemic has changed the evaluation of the emotional features of words per se, that is, taking as the object of study *words* and not *sentences*. Keep in mind that words constitute the main and more essential pieces of communication (i.e., they are like cells for biologists). In this regard, a recent study that studied implicit COVID-19 behaviors using affective priming techniques showed that, although individuals consciously rated COVID-related words as unpleasant, no affective priming effect was observed with these lexical units (Moro & Steeves, 2021). This effect could be explained in terms of lack of changes in the representation of the emotional features of the unpleasant COVID-related meanings despite the explicit rating of these words as unpleasant, thus showing on the one hand a differential processing and evaluation of words that allude to emotional aspects of the pandemic, and a potentially unaltered implicit representation, on the other hand.

In this line, the main aim of the present study consists of analyzing whether a particular social context, the COVID-19 pandemic, has modulated the mental representation of emotional COVID-19-related words. For this purpose, we collected new ratings of *valence* and *arousal* dimensions for a large set of COVID-19-related words (e.g., *hospital*, *hug*, *kiss*, *subway*), and COVID-19-unrelated words (e.g., *anger*, *humor*, *neckline*). Subsequently, we compared these scores with those

from databases that reported ratings for the same pool of words before the pandemic (Stadthagen-Gonzalez et al., 2017).

Despite the absence of specific knowledge about the pandemic as a social framework that may modulate the affective mental representation of lexical units, we should take into consideration recent investigations (e.g., Lusnig et al., 2021) that revealed the fundamental importance of external context in the alteration of the affective-emotional processing of words. In this line, a recent study on meditation has shown that after a meditation process of seven weeks, the two meditation groups (*mindfulness* and *loving-kindness*) rated the valence of nouns as more neutral than the control group, pointing to a general regulation in the processing of emotional lexical units. In addition, in the *loving-kindness* group, positive words were rated as more positive than in the control group, suggesting an intensification of positive feelings. Moreover, other studies have also shown the contribution of similar meditation practices to the regulation of emotions, not only in general aspects (Brefczynski-Lewis et al., 2007; Desbordes et al., 2012), but also in the neutralization of valence ratings of emotional words (Lusnig et al., 2020), pointing to the noticeable malleability of the lexicon due to external factors. With these findings in mind, in the present study we aimed at investigating whether an external generalized social, emotional and medical situation such as the COVID-19 pandemic could also modulate the processing of emotional lexical items. Considering that the representation of the affective features of words involves the combination of mainly verbal information, affective experience and motor components associated to emotions (Hinojosa et al., 2020), we hypothesized that the affective experience related to the COVID-19 pandemic may have altered the emotional representation of the notions depicted by COVID-related words.

In sum, in the present study we investigated whether the effects of the pandemic have changed the representation of the affective features of recurrent COVID-19-related words. To this end, we obtained valence and arousal ratings for COVID-19-related and unrelated matched words and contrasted them taking the ratings obtained before the pandemic into account. Considering the idiographic malleability of the cognitive organization of affect, we tentatively hypothesized that the pandemic context would modify the affective representation and evaluation of emotional words, and consequently predicted changes in the ratings for COVID-19-related words, but not for COVID-19-unrelated words. This outcome would support the idea that the emotional dimensions of words constitute a function of social factors, and speak for the flexibility of emotional representations and the malleability and dynamicity of the lexicon. The current study was carried out in Spain during the COVID-19 pandemic, a country in which the pandemic situation yielded the imposition of a long national lockdown between March 2020 and June 2020, which occurred before this research was conducted. The impact of the COVID-19 pandemic in this country has been disproportionately high as compared to other neighboring countries; thus, one would expect that the effects derived from the pandemic could have extended to different domains.

## 2. Methodology

### 2.1. Participants

A total of 263 voluntary participants, all adult native Spanish speakers, took part in our study. To decide sample size, we assumed a Cohen's *f* of 0.25 (i.e., a medium-sized effect), an alpha of 0.05, and a statistical power of 0.95 in a two-tailed repeated-measure test with GPower (Faul et al., 2009), for which *N* was 210. We collected data from more participants because we assumed that a small proportion of participants would not fully complete the survey. We only accepted responses from those 210 who completed the survey (169 women, 80.5 %; mean age = 24.32 [SD = 7.79]). Their mean perceived socioeconomic status was 6.19 (measured on a scale from 1 to 10). Regarding their education level, 103 participants had completed high school, 55 had

completed a master's degree, 45 had completed a bachelor's degree, three had completed a Ph.D., and four had completed professional training. Participants were recruited from participant databases of Universidad Nebrija, Universidad Complutense de Madrid, and Universitat de València. To motivate their participation, they were entered in a drawing to win one of ten 25 € Amazon-vouchers after completing the study. The study was approved by the Ethics Committee of Nebrija University in February 2021 and participants filled an informed consent before starting.

## 2.2. Materials

The experimental material was extracted from [Stadthagen-Gonzalez et al. \(2017\)](#) database. This database was created with responses from participants that were of similar characteristics to the ones tested in the current study: undergraduate Spanish native speakers that rated valence (350 participants: 80 % female; mean age: 22.3), and arousal (395 participants: 82.7 % female; mean age: 22.5).

390 words were chosen. Of these, 150 words whose emotional and semantic features were COVID-19-related. These words were semantically and emotionally most closely related to the symptoms of the pandemic, the hygiene and distance from family and friends to avoid contagion or the rules imposed by the authorities (e.g., *abrazo* [hug in Spanish], *hospital* [hospital]). Another set of 150 COVID-19-unrelated words was also selected (e.g., *elogio* [compliment], *infarto* [heart attack]). Finally, 90 not emotionally loaded words were included as fillers in order to create a distraction from the critical items (e.g., *poesía* [poetry], *jersey* [pullover]). The COVID-19-unrelated words were selected controlling for a similar rating of valence and arousal than the COVID-19-related words ( $\pm 0.5$  punctuation). COVID-19-related words were selected to cover the whole valence and arousal spectra (see [Appendix A](#)), and the distribution of positive/negative and arousive/non-arousive COVID-19-related and unrelated words was similar. To verify that there were no differences between COVID-19-related and unrelated words in the pre-pandemic database ([Stadthagen-Gonzalez et al., 2017](#)), we computed a paired *t*-test comparing these values. Results showed there were virtually no differences between the two levels of the COVID-19 Relatedness condition (related vs. unrelated) for both arousal ( $t(149) = 0.024, p = .981$ ) and valence ( $t(149) = -0.325, p = .746$ ).

In order to minimize the experiment duration for participants and to avoid cross-dimensional contamination in the ratings (i.e., scores in valence do not bias ratings in arousal), the total list of 390 words (COVID-19-related, COVID-19-unrelated, and Fillers) was divided into two different lists (195 words within each one: 75 COVID-19-related, 75 COVID-19-unrelated, and 45 fillers), to create the two questionnaires for the participants to evaluate Valence and Arousal. Words were presented randomized within each list. In this line, the 4 lists (the two of Valence and the two of Arousal) were considered as 4 different experiments. They were randomized, so each participant entered to only one of them randomly. The experiments were created using the digital tool *Lime-Survey* and they were displayed on the subjects' personal computer.

## 2.3. Procedure

The experiment was conducted online. The link to the survey was sent to the participants via an e-mail invitation. After reading the instructions and filling the consent form, participants completed a socio-demographic questionnaire, which contained questions regarding their native language (which was restricted to Spanish), their vision quality, and their demographic information (i.e., age, gender, education level and socioeconomic level). Then, participants were asked to assess either the *Arousal* or the *Valence* of each item on a 9-point Likert-like scale ranging from 1 (*calming*, for the Arousal task; *unpleasant* for the Valence task) to 9 (*activating* for the Arousal task, *pleasant* for the Valence task). In both cases, intermediate ratings (i.e., 5) would indicate neutral arousal or valence. Participants were asked to rate each item based on

their first impression without spending much time to decide. Participants took around 15 min to complete the survey.

## 3. Results

A total of 263 participants initiated the survey but 56 of them did not complete it (21.29 % of the total), making a final pool of 207 participants. Additionally, we removed from the analysis the data from participants who 1) indicated they had vision problems (not corrected), 2) indicated they did not read or understand the instructions, and 3) took the survey in  $< 7.5$  min (11 participants; 5.24 % of the total). In sum, 199 participants composed the final pool of analysis. [Table 1](#) shows the mean ratings per COVID-19 Relatedness condition for each measure and time point, and [Fig. 1](#) shows the distributions of the ratings and the relationship between the two dependent measures per condition and time point.

We carried out two linear regression analyses (one for Valence and another one for Arousal) and a series of ANCOVAs in R ([R Core Team, 2020](#)) to examine whether the factor COVID-19 Relatedness influenced the valence and arousal scores given by the participants.

### 3.1. Valence

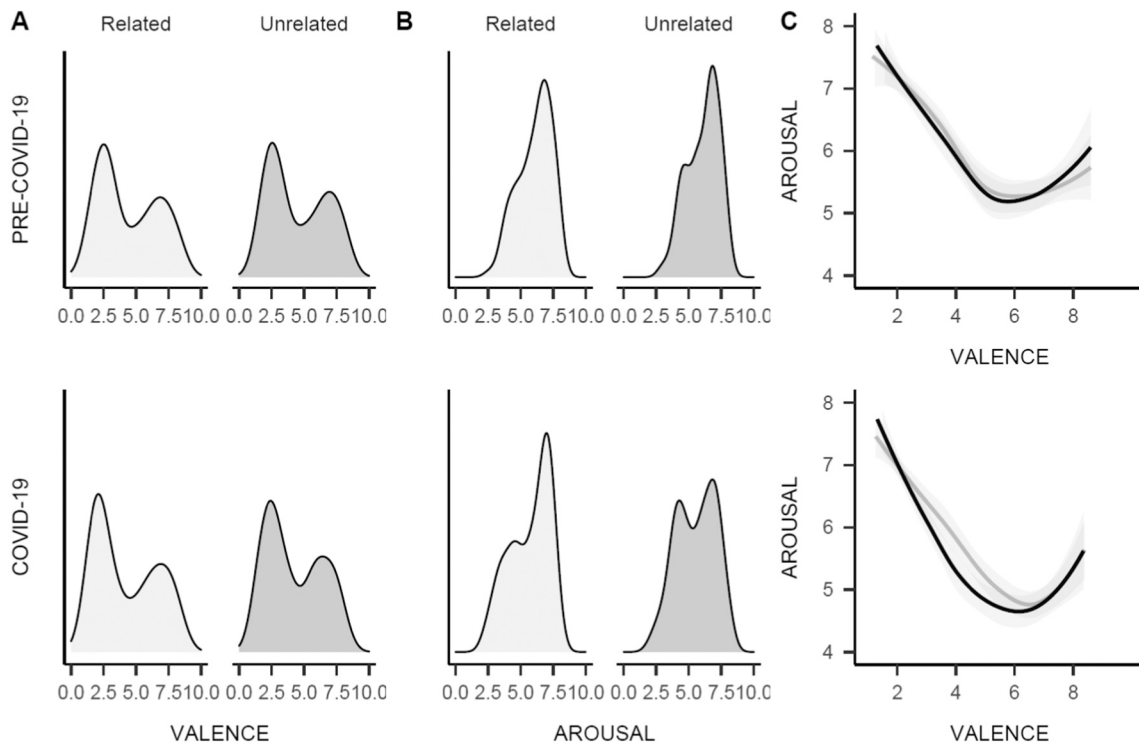
The ratings in valence given during the COVID-19 pandemic were included as the dependent variable, COVID-19 Relatedness (related, unrelated) was included as a factor, and the pre-pandemic valence ratings were added as a covariate. The interaction between the Relatedness and Pre-pandemic valence was also included to examine the potential differences as a function of the valence (see [Fig. 1](#) for evidence of the binomial distribution of valence ratings). The resulting regression model was significant (adjusted  $R^2 = 0.957, F(3,296) = 2214, p < .001$ ). As expected, we found a main effect of pre-pandemic ratings ( $t = 60.35, p < .001$ ) as well as a main effect of COVID-19 Relatedness ( $t = 2.05, p = .042$ ). The interaction between the two variables was also significant ( $t = -2.88, p = .004$ ). That is, the relationship between pre- and post-COVID-19 was different for COVID-19 related words and COVID-19 unrelated words. Specifically, this interaction revealed that, for positive words, COVID-19-related words were considered more positive than COVID-19-unrelated words; in contrast, for negative words, the valence ratings did not change as a function of COVID-19 Relatedness (see [Fig. 2](#)).

To further examine these results, the above analysis was complemented with an ANCOVA that included a categorical classification of the words' valence (i.e., positive, neutral, negative), based on the pre-COVID-19 valence scores (*positive* = values equal or above  $M + 0.5$  SD [5.57], *neutral* = values within  $M \pm 0.5$  SD [5.57 and 3.35], and *negative* = values equal or below  $M - 0.5$  SD [3.35]). This classification resulted in

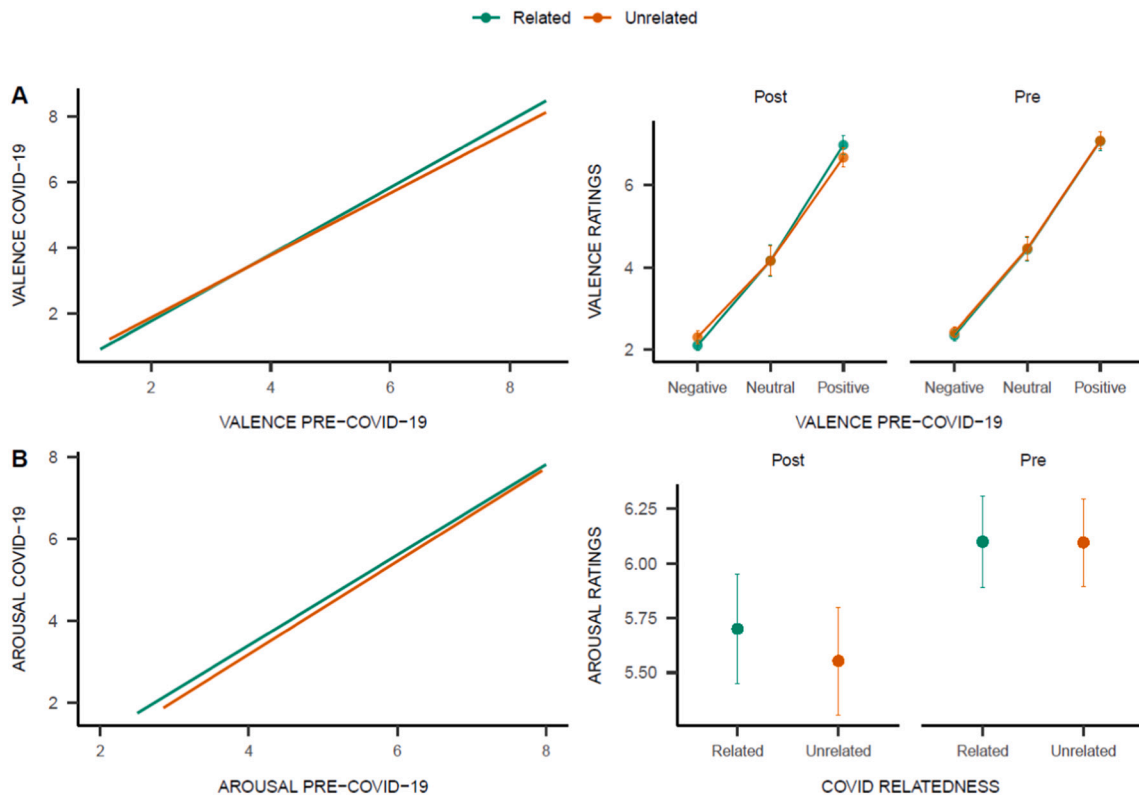
**Table 1**

Descriptive statistics of the valence and arousal ratings split by moment (before or during the COVID-19 pandemic) and type of word (COVID-19-related and -unrelated).

	COVID-19 relatedness	Valence		Arousal	
		Pre-COVID-19	COVID-19	Pre-COVID-19	COVID-19
Mean	Related	4.41	4.22	6.10	5.70
	Unrelated	4.50	4.24	6.10	5.55
Median	Related	3.50	3.46	6.35	6.03
	Unrelated	3.71	3.70	6.43	5.76
Standard deviation	Related	2.25	2.34	1.29	1.54
	Unrelated	2.20	2.12	1.23	1.51
Minimum	Related	1.15	1.27	2.50	2.30
	Unrelated	1.30	1.24	2.85	2.06
Maximum	Related	8.60	8.43	8.25	7.89
	Unrelated	8.60	8.35	8.23	8.10



**Fig. 1.** Distributions of the ratings for valence (panel A) and arousal (panel B), together with the relationship between the two variables (panel C) before the COVID-19 pandemic (*pre-COVID-19*, top charts), and during it (*COVID-19*, bottom charts) for COVID-19-related and -unrelated words (in light and dark grey, respectively).



**Fig. 2.** Panel A) valence. The left chart shows valence ratings post-COVID-19 as a function of ratings pre-COVID-19 as continuous variables separated by COVID-19 relatedness. The middle and right charts show the mean valence rating per type of valence as a function of a categorical classification. Panel B) arousal. The left chart shows arousal ratings post-COVID-19 as a function of ratings pre-COVID-19 as continuous variables separated by COVID-19 relatedness. The middle and left charts show the mean arousal rating by COVID-19 relatedness and time point (pre- and post-COVID-19, respectively). All error bars depict  $\pm 2$  standard errors.

55 COVID-19-related high-valence words, 55 COVID-19-unrelated high-valence words, 24 COVID-19-related neutral words, 27 COVID-19-unrelated neutral words, 71 COVID-19-related low-valence words and 68 COVID-19-unrelated low-valence words. Not surprisingly, the continuous pre-pandemic scores showed a significant effect ( $F(1,293) = 549.84, p < .001, \eta^2_{\text{partial}} = 0.652$ ), indicating that post-pandemic ratings were lower than pre-pandemic ratings (see Fig. 2). The categorical classification of valence was not significant ( $F(2,293) = 1.36, p = .26, \eta^2_{\text{partial}} = 0.009$ ), nor was the effect of COVID-19 Relatedness ( $F(1,293) = 1.30, p = .26, \eta^2 = 0.004$ ). More importantly, the interaction between Type of valence and COVID-19 Relatedness was significant ( $F(2,293) = 7.40, p < .001, \eta^2 = 0.048$ ). Post hoc pairwise tests with Tukey's correction showed that COVID-19-related positive words (namely, highly valenced items) were rated as more positive than the COVID-19-unrelated positive words ( $t(293) = 3.63, p < .001$ ), while this was not the case for negative and neutral words (all  $t$ -values  $< 1.7$ ; see Fig. 2).

### 3.2. Arousal

The analyses were parallel to those with valence. The resulting model was significant (adjusted  $R^2 = 0.842, F(2,297) = 799, p < .001$ ). The arousal ratings given before the pandemic were significant predictors of the pandemic ratings in arousal ( $t = 39.93, p < .001$ ). The COVID-19 Relatedness factor also resulted significant ( $t = -2.04, p = .042$ ), showing that COVID-19-related words received higher arousal scores than COVID-19-unrelated words (see Fig. 2). Given the distribution of the arousal scores and considering that the addition of the interaction term did not explain additional variance ( $F(1,296) = 0.645, p = .422$ ), it was not included in the final model.

To further explore these relationships, we also conducted an ANCOVA for arousal ratings, including a categorical classification of pre-pandemic arousal ratings using the same division technique as for valence ratings (i.e., *high* = values equal or above  $M + 0.5 \text{ SD}$  [6.73], *neutral* = values within  $M \pm 0.5 \text{ SD}$  [6.73 and 5.47], and *negative* = values equal or below  $M - 0.5 \text{ SD}$  [5.47] – note that items were selected to be arousing. The classification resulted in 58 COVID-19-related high-arousal words, 56 COVID-19-unrelated high-arousal words, 48 COVID-19-related neutral words, 49 COVID-19-unrelated neutral words, 44 COVID-19-related low-arousal words and 45 COVID-19-unrelated low-arousal words. The ANCOVA on the arousal ratings also showed a significant effect of COVID-19 Relatedness ( $F(1,295) = 4.04, p = .045, \eta^2_{\text{partial}} = 0.014$ ), indicating that words related to the COVID-19 pandemic were rated higher than words unrelated to the pandemic (see Fig. 2). As expected, the continuous co-variate of the pre-pandemic scores showed a significant effect ( $F(1,295) = 205.22, p < .001, \eta^2_{\text{partial}} = 0.410$ ), indicating that the post-pandemic ratings were lower than the pre-pandemic ratings (see Fig. 2). The categorical classification of arousal was not significant ( $F(2,295) = 0.593, p = .55, \eta^2_{\text{partial}} = 0.004$ ). Given there is no interaction nor effect of the categorical variable of arousal ratings, and because of the continuous nature of this variable, we did not perform further analysis based on the categorical classification of the items.

## 4. Discussion

Social context, understood as the environmental conditions that shape the individuals' day-to-day experiences, influences behavior, thoughts, and emotions. Therefore, the relationship between external framework, emotions, and communication is assumed to be continuously dynamic, since they are constantly influencing each other over time (Jakobs et al., 1996; van Kleef et al., 2016). In this line, as the main pieces of human communication, words can shift their affective representations due to changes in the external context (Lusnig et al., 2021). In recent days, the most relevant global social context has been the COVID-19 pandemic. The consequences of the pandemic (e.g., self-isolation, distancing from loved ones, etc.) have resulted in a psychological and

emotional weakening of people around the world (Pérez-Fuentes et al., 2020; Rothe et al., 2021; Steinert, 2020; Stieger et al., 2021).

The present study analyzed whether the COVID-19 pandemic as a specific social context changed the emotional evaluation of COVID-19-related words (*hospital, hug, pandemic, subway*). To this aim, we collected new ratings of valence and arousal for COVID-19-related and unrelated sets of words to compare those values with those for the same pool of words but extracted from a pre-COVID database (Stadthagen-Gonzalez et al., 2017). On the one hand, valence ratings in the present database were not different between words that were related to COVID-19 and those that were not related. Curiously enough, a significant difference in post-COVID-19 valence values was shown for high-valence COVID-19-related words (positive words), which resulted in higher valence ratings than the corresponding COVID-19-unrelated control words. While the origin of this effect is unclear, we tentatively suggest that it could be partially due to a *boosting effect* derived from the nostalgia due to the absence, loss, or difficulty of accessing the realities depicted by these concepts (e.g., *kiss, hug*). In addition, this effect may also explain the apparently counterintuitive effect of the lack of differences in neutral and negative words. We interpret these findings as showing that the changes in the processing and possibly in the representation of the positive words could be due to a *nostalgia boosting effect*, which would also explain why the notions designated by neutral and negative words showed the same values as in the pre-pandemic period, revealing no alteration (e.g., *medication, wash, deceased, fear, depression*).

Apart from that, and more importantly, these findings revealed an effect of COVID-19 relatedness in the evaluation of arousal: COVID-19-related words were rated higher in arousal than COVID-19-unrelated words during the pandemic—critically, these words showed similar ratings in pre-pandemic databases—. This dissociation favors the idea that the COVID-19 pandemic could have changed the representation of the affective features of words, as it can be observed a general decrease of arousal values regarding the pre-pandemic ratings, suggesting certain degree of *pandemic fatigue* (see Rudroff et al., 2020). This *pandemic fatigue effect* could be influenced by the general deterioration of people's mental well-being and lowering of general mood (Gismero-González et al., 2020; Pérez-Fuentes et al., 2020; Rothe et al., 2021), as the emotional representation of concepts is partially related to human beings' own affective experience (Hinojosa et al., 2020).

We acknowledge, however, that a limitation of the present study is that different participants completed the pre- and post-pandemic data collections, and that the potential contribution of additional factors cannot be dismissed. Nonetheless, the critical differential effect between the arousal ratings for COVID-19-related and unrelated terms can hardly be explained by between-subject differences among the samples. Moreover, the number of words that were shown to participants was large, as well as their representativeness of a wide range of semantic contexts, which can reduce the impact that individual variables may have. In addition, participants' sociodemographic information from pre- and post-pandemic data collections are very similar in terms of age and gender (see Method section), making them comparable.

Considering that emotional experience is one of the main factors that can alter the affective representations of concepts depicted by words (Hinojosa et al., 2020), and in light of the current results, we believe that the pandemic and its consequences as a relevant social context could have changed the emotional representations of COVID-related notions. However, the reversibility of these changes remains an open question. We tentatively suggest that the representation of emotional features is dynamic, so that new affective experiences linked to these COVID-related concepts may progressively modify their semantic representations reverting them to their pre-pandemic baselines. Of note, a recent study has revealed a dissociation between the explicit assessment of word emotional features and the implicit representation of these properties (Moro & Steeves, 2021). Thus, although participants in their study rated as unpleasant different COVID-related words, no affective priming effect (a marker of implicit attitudes) was observed for this type of

words, revealing a lack of interiorization of COVID-related notions. Nonetheless, future studies should expand the present research by using longitudinal approaches that will draw conclusions about the evolution of the affective representations of COVID-related words in the human mind over time. Moreover, the role of individual variables that can also modulate the affective evaluation of words should be considered, such as age (Fairfield et al., 2017), health condition (Tárrega et al., 2021) and cognitive resources (Gasper & Hackenbracht, 2015).

In summary, this study is pioneering in demonstrating how the COVID-19 pandemic, understood as a specific social context, has changed the emotional evaluation of words. Individuals consistently report higher arousal levels for COVID-19-related words, suggesting that the COVID-19 lexicon results in higher levels of activation than COVID-19-unrelated words. Besides, positive COVID-19-related words showed higher valence ratings (namely, were rated as more positive) than positive COVID-19-unrelated words, suggesting a *nostalgia boosting effect*. These findings favor the idea that the emotional dimensions of words are

markedly influenced by social factors, thus revealing the dynamicity of the emotional lexicon resulting from an idiographic plasticity of the cognitive organization of affect.

### Declaration of competing interest

The authors of the article entitled “Social context effects on emotional language: The influence of the COVID-19 pandemic on the emotional evaluation of words” hereby declare that this study has been conducted in the full absence of conflicts of interest.

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## Appendix A

COVID-19-related	Valence	Arousal	COVID-19-unrelated	Valence	Arousal
abrazo ( <i>hug</i> )	8.5	4	delicia ( <i>delight</i> )	8.2	4.35
abuelo ( <i>grandpa</i> )	8.5	4.4	dulce ( <i>sweet</i> )	8.25	4.6
aburrimiento ( <i>boredom</i> )	2.7	3.8	insignificante ( <i>insignificant</i> )	3.15	4.3
acompañar ( <i>accompany</i> )	7.05	4.2	voluntaria ( <i>voluntary</i> )	6.9	4.45
adversidad ( <i>adversity</i> )	2.85	6.55	asustadizo ( <i>scary</i> )	3.15	6.7
aerolínea ( <i>airline</i> )	5.8	5.9	alabanza ( <i>praise</i> )	6.1	5.95
afecto ( <i>affection</i> )	7.9	4.65	jamón ( <i>ham</i> )	7.6	4.7
aglomeración ( <i>agglomeration</i> )	4.05	6.3	alucinación ( <i>hallucination</i> )	4.25	6.6
agobiado ( <i>overwhelmed</i> )	1.88	7.8	atracador ( <i>robber</i> )	2	7.75
agonía ( <i>agony</i> )	2.3	7.75	tiroteo ( <i>shooting</i> )	2.2	7.75
agotamiento ( <i>exhaustion</i> )	2.95	4.2	arzobispado ( <i>archbishopric</i> )	3.2	4.32
aislamiento ( <i>isolation</i> )	3.05	6.15	sacerdotal ( <i>priestly</i> )	3.5	4.3
alegría ( <i>joy</i> )	8.35	6.75	genial ( <i>genius</i> )	8.05	6.65
alimentación ( <i>feeding</i> )	7.4	4.8	intelectual ( <i>intellectual</i> )	7.65	5
alivio ( <i>relief</i> )	8	2.95	jardín ( <i>garden</i> )	7.85	3
ambulancia ( <i>ambulance</i> )	3.3	6.98	inadmisible ( <i>unacceptable</i> )	3.5	6.7
amenaza ( <i>threat</i> )	2.68	7.77	maníaco ( <i>maniac</i> )	2.38	7.43
angustia ( <i>anguish</i> )	1.95	7.25	hambrión ( <i>famine</i> )	1.95	7.35
ansiedad ( <i>anxiety</i> )	2.1	7.7	fracasar ( <i>fail</i> )	2.3	7.25
antídoto ( <i>antidote</i> )	6.5	5.5	empezar ( <i>start</i> )	6.55	5.8
aplaudir ( <i>clap</i> )	7.3	7	exótico ( <i>exotic</i> )	7.3	7.1
apoyo ( <i>support</i> )	7.75	3.95	bonito ( <i>nice</i> )	7.7	4
ataúd ( <i>coffin</i> )	1.46	7.33	sexo ( <i>sex</i> )	7.7	7.43
aterrador ( <i>frightening</i> )	2.8	7.65	explosión ( <i>explosion</i> )	3.1	7.55
avión ( <i>plane</i> )	6.53	6.4	escote ( <i>neckline</i> )	6.25	6.3
balcón ( <i>balcony</i> )	6.9	5	collar ( <i>necklace</i> )	6.8	5.05
bar ( <i>bar</i> )	6.55	5.98	oso ( <i>bear</i> )	6.65	5.85
beso ( <i>kiss</i> )	8.2	6.88	gozar ( <i>enjoy</i> )	8.25	6.7
cadáver ( <i>corpse</i> )	1.73	7.9	machista ( <i>macho</i> )	1.8	7.85
caos ( <i>chaos</i> )	3.13	7.75	furia ( <i>fury</i> )	3.15	8.05
catástrofe ( <i>catastrophe</i> )	1.5	7.7	desnutrición ( <i>malnutrition</i> )	2	7.85
cerrado ( <i>closed</i> )	3.45	5.3	omisión ( <i>omission</i> )	3.2	5.35
cerveza ( <i>beer</i> )	7	6	infinito ( <i>infinity</i> )	7.15	5.95
chino ( <i>Chinese</i> )	5.35	4.35	avena ( <i>oatmeal</i> )	5.3	4.3
colegio ( <i>school</i> )	6.45	4.5	ballena ( <i>whale</i> )	6.4	4.6
confinamiento ( <i>confinement</i> )	3	6	degeneración ( <i>degeneration</i> )	2.65	6.05
contagio ( <i>contagion</i> )	1.95	6.95	avaricia ( <i>greed</i> )	2.15	6.95
convivencia ( <i>cohabitation</i> )	6.9	5.05	beneficiado ( <i>beneficiary</i> )	6.9	5.2
crisis ( <i>crisis</i> )	2.23	7.18	verdugo ( <i>executioner</i> )	2.5	7
cuarentena ( <i>quarantine</i> )	2.8	6.95	manicomio ( <i>madhouse</i> )	2.65	6.95
culpable ( <i>guilty</i> )	2.85	7.25	dinamita ( <i>dynamite</i> )	2.8	7.3
dañino ( <i>harmful</i> )	2.25	6.95	enfado ( <i>anger</i> )	2.3	6.83
depresión ( <i>depression</i> )	1.5	6.28	homicidio ( <i>homicide</i> )	2	6.6
desconfianza ( <i>distrust</i> )	2.9	7.3	persecución ( <i>persecution</i> )	3	7.45
desesperación ( <i>despair</i> )	2.45	6.6	impertinente ( <i>impertinent</i> )	2.4	7
desgracia ( <i>misfortune</i> )	2.55	7.05	adulterio ( <i>adultery</i> )	2.5	7.05
despedida ( <i>farewell</i> )	1.9	6.95	defraudar ( <i>disappoint</i> )	2	6.75
difunto ( <i>deceased</i> )	1.65	6.75	fracaso ( <i>failure</i> )	1.95	6.8
distanciamiento ( <i>distancing</i> )	2.85	5.6	incomprensible ( <i>incomprehensible</i> )	2.65	6
dolor ( <i>grief</i> )	2.15	8.25	odiar ( <i>hate</i> )	2.08	7.95
domicilio ( <i>domicile</i> )	6.3	3.6	catacumbas ( <i>catacombs</i> )	3.71	6.45

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COVID-19-related	Valence	Arousal	COVID-19-unrelated	Valence	Arousal
egoísmo ( <i>selfishness</i> )	2.05	6.85	fraude ( <i>fraud</i> )	2.1	6.75
empatía ( <i>empathy</i> )	7.55	5.45	avanzar ( <i>advance</i> )	7.65	5.6
empobrecimiento ( <i>impoverishment</i> )	1.45	6.35	discriminación ( <i>discrimination</i> )	1.9	6.5
encierro ( <i>confinement</i> )	2.85	6.5	calumnia ( <i>slander</i> )	2.7	6.7
enfermedad ( <i>illness</i> )	1.75	7.58	bombardeo ( <i>bombing</i> )	1.75	7.3
enfermera ( <i>nurse</i> )	5.6	5.38	anticipo ( <i>advance</i> )	5.55	5.4
enfermo ( <i>sick</i> )	2.6	6.78	derrama ( <i>spill</i> )	2.6	6.6
entierro ( <i>burial</i> )	1.15	7.35	masacre ( <i>massacre</i> )	1.3	6.9
epidemia ( <i>epidemic</i> )	1.55	7.6	mentiroso ( <i>liar</i> )	2	7.35
erradicar ( <i>eradicate</i> )	4.95	5.8	conducta ( <i>behavior</i> )	5.1	5.55
escuela ( <i>school</i> )	6.65	4.85	cocinero ( <i>cook</i> )	6.55	5.05
estrés ( <i>stress</i> )	2.33	7.78	infarto ( <i>heart attack</i> )	1.4	7.35
fallecimiento ( <i>death</i> )	1.65	7.2	endeudamiento ( <i>indebtedness</i> )	2	7.6
familia ( <i>family</i> )	7.88	4.25	elegante ( <i>elegant</i> )	7.45	4.5
farmacia ( <i>pharmacy</i> )	5.2	4.45	círculo ( <i>circle</i> )	5.33	4.53
fármaco ( <i>drug</i> )	4.2	5.6	clerical ( <i>clerical</i> )	4.44	4.44
fiebre ( <i>fever</i> )	2.6	6.15	retraso ( <i>delay</i> )	2.75	6.2
fiesta ( <i>party</i> )	7.83	7.35	éxito ( <i>success</i> )	8.18	7.1
funeral ( <i>funeral</i> )	1.52	6.5	hipoteca ( <i>mortgage</i> )	1.95	6.7
futuro ( <i>future</i> )	6.35	6.35	móvil ( <i>mobile</i> )	6.45	6.75
gobierno ( <i>government</i> )	2.9	5.75	desmayo ( <i>fainting</i> )	2.85	5.8
gripe ( <i>flu</i> )	2.25	6.8	hundir ( <i>sink</i> )	2.6	6.8
guante ( <i>glove</i> )	4.95	4.6	besugo ( <i>breem</i> )	5	4.6
hacinamiento ( <i>overcrowding</i> )	3.36	6.25	improcedente ( <i>inappropriate</i> )	3.4	6.16
héroe ( <i>hero</i> )	7.4	6.2	juego ( <i>game</i> )	7.45	6.35
higiene ( <i>hygiene</i> )	7	3.9	librería ( <i>bookstore</i> )	7	3.95
higiénico ( <i>hygienic</i> )	6.7	3.5	angelical ( <i>angelic</i> )	6.7	3.35
hospital ( <i>hospital</i> )	3.45	6.83	fantasma ( <i>ghost</i> )	3.75	6.9
hotel ( <i>hotel</i> )	7.08	4.05	fresa ( <i>strawberry</i> )	7.05	4.35
impotencia ( <i>impotence</i> )	2.8	6.95	dominante ( <i>dominant</i> )	2.8	6.85
incertidumbre ( <i>uncertainty</i> )	3.55	7.2	contrarreloj ( <i>time trial</i> )	3.6	7.2
incontrolable ( <i>uncontrollable</i> )	3.2	7.45	psiquiátrico ( <i>psychiatric</i> )	3.35	7.4
incurable ( <i>incurable</i> )	1.65	7.7	puñalada ( <i>stab</i> )	1.65	7.9
ineficaz ( <i>ineffective</i> )	2.8	5.7	estiércol ( <i>manure</i> )	3	5.78
inmunidad ( <i>immunity</i> )	6.75	4.75	afirmación ( <i>statement</i> )	6.75	4.8
inyectar ( <i>inject</i> )	3.05	6.7	portazo ( <i>slam</i> )	3.05	7
irresponsabilidad ( <i>irresponsibility</i> )	3	6.5	desestabilización ( <i>destabilization</i> )	3.3	6.55
jabón ( <i>soap</i> )	5.8	3.6	bambú ( <i>bamboo</i> )	5.7	4
juventud ( <i>youth</i> )	8	5.23	encantar ( <i>love</i> )	8.05	5.45
lavar ( <i>wash</i> )	5.85	4.05	hilo ( <i>thread</i> )	5.75	4
libertad ( <i>freedom</i> )	8.6	4.68	simpatía ( <i>sympathy</i> )	8.6	4.75
limpieza ( <i>cleanliness</i> )	5.85	3.75	codorniz ( <i>quail</i> )	5.85	4
medicamento ( <i>medicine</i> )	4.25	5.5	antagonismo ( <i>antagonism</i> )	4.5	5.58
médico ( <i>doctor</i> )	6	5.8	elegante ( <i>elevate</i> )	6	5.4
mejoría ( <i>improvement</i> )	7.55	4.95	gustoso ( <i>glad</i> )	7.4	5
metro ( <i>subway</i> )	5.3	5.45	brujo ( <i>wizard</i> )	5.3	5.4
miedo ( <i>fear</i> )	2	8	bomba ( <i>bomb</i> )	1.75	8.23
morir ( <i>die</i> )	1.7	7.35	enojar ( <i>anger</i> )	2.2	7.4
muerte ( <i>death</i> )	1.45	7.93	paliza ( <i>beating</i> )	1.65	7.9
multa ( <i>fine</i> )	2.1	7.3	balazo ( <i>bullet</i> )	2	7.5
multitud ( <i>crowd</i> )	4.45	6.2	borrasca ( <i>squall</i> )	4.25	6
navidad ( <i>christmas</i> )	7.55	5.95	elogio ( <i>praise</i> )	7.65	5.8
neumonía ( <i>pneumonia</i> )	2.16	7.35	anorexia ( <i>anorexia</i> )	2.3	7.05
niño ( <i>child</i> )	7.58	5	ágil ( <i>agile</i> )	7.4	4.85
normalización ( <i>standardization</i> )	6.1	4.3	democrático ( <i>democratic</i> )	6.4	4.35
nostalgia ( <i>nostalgia</i> )	4.9	4.8	estatura ( <i>height</i> )	5	4.8
obediencia ( <i>obedience</i> )	4.5	5.65	carburante ( <i>fuel</i> )	4.6	5.65
obsesión ( <i>obsession</i> )	2.68	7.15	ruidoso ( <i>noisy</i> )	2.8	7.15
ocio ( <i>leisure</i> )	7.45	6.25	jugar ( <i>play</i> )	7.8	6.15
paciencia ( <i>patience</i> )	6.3	3.5	almendro ( <i>almond tree</i> )	6.45	3.55
pandemia ( <i>pandemic</i> )	2.21	7	enemistad ( <i>enmity</i> )	2.15	7.1
paseo ( <i>walk</i> )	7.3	2.5	monte ( <i>mount</i> )	7.45	2.85
patógeno ( <i>pathogen</i> )	3.35	6.58	lumbago ( <i>lumbago</i> )	3.3	6.35
peligro ( <i>danger</i> )	2.93	8	gritar ( <i>shout</i> )	3.2	7.7
pérdida ( <i>loss</i> )	2.3	7.3	venganza ( <i>revenge</i> )	2.5	7.55
pesadilla ( <i>nightmare</i> )	1.8	7.6	terrorismo ( <i>terrorism</i> )	1.6	7.55
peste ( <i>plague</i> )	2.32	6.65	peor ( <i>worst</i> )	2.25	6.7
plaga ( <i>plague</i> )	2.3	7	mafia ( <i>mafia</i> )	2.2	6.95
política ( <i>policy</i> )	3.55	6.65	demandar ( <i>sue</i> )	3.55	6.55
preocupación ( <i>concern</i> )	2.35	7.3	esquizofrenia ( <i>schizophrenia</i> )	2.3	7.4
prohibición ( <i>ban</i> )	2.65	6.7	profanación ( <i>profanation</i> )	2.65	6.74
prudencia ( <i>prudence</i> )	6.4	3.7	inocente ( <i>innocent</i> )	6.6	3.75
psicológico ( <i>psychological</i> )	7.2	6.55	submarinismo ( <i>diving</i> )	7.1	6.35
quirófano ( <i>operating room</i> )	2.7	8.2	explosivo ( <i>explosive</i> )	2.75	7.7
reencuentro ( <i>reencounter</i> )	7.45	6.5	apareamiento ( <i>mating</i> )	7	6.5
resfriado ( <i>cold</i> )	2.95	5.95	presidio ( <i>prison</i> )	3	5.94

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COVID-19-related	Valence	Arousal	COVID-19-unrelated	Valence	Arousal
restricción ( <i>restriction</i> )	2.95	6.35	conveniencia ( <i>convenience</i> )	3.05	6.4
reunión ( <i>meeting</i> )	5.05	5.5	comino ( <i>cumin</i> )	5	5.53
riesgo ( <i>risk</i> )	4.6	7.1	fiera ( <i>beast</i> )	4.55	7.2
salud ( <i>health</i> )	8.13	4.8	guapa ( <i>pretty</i> )	7.83	5.25
sanidad ( <i>healthcare</i> )	6.3	5	fabricar ( <i>manufacture</i> )	6	5
síntoma ( <i>symptom</i> )	3.1	6.55	someter ( <i>subdue</i> )	3	6.45
suicidio ( <i>suicide</i> )	1.23	7.88	maltrato ( <i>abuse</i> )	1.65	7.45
supermercado ( <i>supermarket</i> )	5.6	4.15	autenticación ( <i>authentication</i> )	5.8	4.41
supervivencia ( <i>survival</i> )	6.5	6.8	presentimiento ( <i>premonition</i> )	6.4	6.75
temor ( <i>fear</i> )	2.65	7.58	sumiso ( <i>submissive</i> )	2.75	4.4
terracea ( <i>terrace</i> )	6.7	4.9	bilingüe ( <i>bilingual</i> )	6.7	4.9
terror ( <i>terror</i> )	2.35	7.95	furioso ( <i>furious</i> )	2.55	7.8
tos ( <i>cough</i> )	2.95	6.8	rock ( <i>rock</i> )	6.65	6.6
transmisión ( <i>transmission</i> )	5	5.95	culminación ( <i>culmination</i> )	5	5.85
tratamiento ( <i>treatment</i> )	4.6	5.45	entredicho ( <i>interdict</i> )	4.7	5.47
turismo ( <i>tourism</i> )	6.6	5.75	propina ( <i>tip</i> )	6.7	5.6
vacuna ( <i>vaccine</i> )	5.05	5.55	rotonda ( <i>traffic circle</i> )	5	5.65
vecino ( <i>neighbor</i> )	5.4	5.5	payaso ( <i>clown</i> )	5.55	5.5
ventilación ( <i>ventilation</i> )	6.3	4.9	elasticidad ( <i>elasticity</i> )	6.3	4.85
viaje ( <i>travel</i> )	8.35	6.75	humor ( <i>humor</i> )	7.93	6.75
vida ( <i>life</i> )	8.25	6.6	placer ( <i>pleasure</i> )	8.18	6.55
viral ( <i>viral</i> )	3.89	6.42	exigir ( <i>demand</i> )	3.7	6.55
vulnerable ( <i>vulnerable</i> )	2.8	6	retrasado ( <i>delayed</i> )	2.83	6

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