

Analytical thinking and clout in the context of COVID-19: psychological analysis of the verbal behaviours

Pensamiento analítico e influencia en el contexto de la COVID-19: análisis psicológico de las conductas verbales

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ABSTRACT

The discourses of the leaders of eight countries regarding prevention and vision of the COVID-19 pandemic were examined in terms of analytical thinking and clout using psycholinguistic analysis. In the context of this pandemic, little psychological research has been produced regarding the psycholinguistic analysis of populations, so this study of verbal behaviour aims to characterize the psychological dimensions and the impact of the discourses. Resorting to a corpus of 39,000 words, a psycholinguistic analysis of eight discourses of world leaders in two periods of the first half of 2020 was conducted using a qualitative thematic analysis by combining topic modeling and sentiment analysis. Two language functions were examined: analytical thinking and clout (social and political empowerment given by leaders to the people). The qualitative thematic analysis focused on: (1) identifying, interpreting (encoding) and analyzing variation in the analytical thinking of the leaders in two periods of the first half of 2020, through verbal discourses collected from official government sources; (2) characterizing words related to clout pattern for the same countries in that period. We conclude that there were fewer analytical discourses in period 2 when the levels of clout increased.

KEYWORDS

COVID-19; psycholinguistic analysis; analytical thinking; clout; qualitative thematic analysis.

RESUMEN

Los discursos de los líderes de ocho países sobre la prevención y la visión de la pandemia de COVID-19 fueron examinados en términos de pensamiento analítico e influencia mediante el análisis psicolingüístico. En el contexto de esta pandemia, se han producido pocas investigaciones psicológicas en cuanto al análisis psicolingüístico de las poblaciones, por lo que este estudio del comportamiento verbal tiene como objetivo caracterizar las dimensiones psicológicas y el impacto de los discursos. Recurriendo a un corpus de 39.000 palabras, se realizó un análisis psicolingüístico de ocho discursos de líderes mundiales en dos periodos del primer semestre de 2020 utilizando un análisis temático cualitativo combinando modelado de tópicos y análisis de sentimientos. Se examinaron dos funciones del lenguaje: pensamiento analítico e influencia (empoderamiento social y político otorgado por los líderes a la gente). El análisis temático cualitativo se centró en: (1) identificar, interpretar (codificar) y analizar la variación en el pensamiento analítico de los líderes en dos periodos del primer semestre de 2020, a través de discursos verbales recogidos de fuentes oficiales del gobierno; (2) caracterizar palabras relacionadas con el patrón de influencia para los mismos países en ese período. Concluimos que hubo menos discursos analíticos en el período 2 cuando los niveles de influencia aumentaron.

PALABRAS CLAVE

COVID-19; análisis psicolingüístico; pensamiento analítico; influencia; análisis temático cualitativo.

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Introduction

In the first half of 2020, the psychosocial effects of COVID-19 were analyzed regarding the direct consequences of the disease (deaths, infected and recovered persons), and the impact of the discourses of leaders of countries regarding prevention and vision of this pandemic. The aim was to understand the movement of populations and the effectiveness of the psycholinguistic components of the discourse. The movement of populations was analysed regarding the construction of new identities resulting from the outbreak (Barreneche, 2020) despite the uncertainties and social consequences (Kasapoglu & Akbal, 2020)

The misinformation spread by the social media regarding COVID-19 has been studied since the beginning of the crisis (Bastani & Bahrami, 2020), as it hampers understanding real information about the pandemic (Cinelli et al., 2020; Kim, 2020). The lockdown affected the full comprehension of discourses, especially the information available in social media like twitter (Xue et al., 2020). A more recent study has established the risk of mental health and associated the negative impact of people's unguided perception with the discourses of their leaders (Ding et al., 2020).

Anxiety and depressive conditions amply observed in the samples have demonstrated a culturally distinct change in social behaviour and perception regarding COVID-19 (Abuelgasim et al., 2020; Alafnan, 2020; Bastani and Bahrami, 2020; Xue et al., 2020). Given that this pandemic continues to affect all nations, the linguistic production of the leaders has varied over the periods of the virus's evolu-

tion. This variation indicates changes in psycholinguistic terms and in decision-making (McHaney et al., 2018).

Psycholinguistics is decisive to identify and predict the reactions of populations during the outbreak and lockdown stages. Leaders are responsible for language management and for the negative impact on the population's emotional response (van Dijk, 2006).

It is interesting to note that the responses vary between genders as to their basic concerns regarding the pandemic (van der Vegt and Kleinberg, 2020). Women have more messages indicating concern about the family, while men focus more on the economic aspect. Another study has reached to the same conclusion about the differences in the language use determined by gender (Newman et al., 2008).

A study conducted in the early months of 2020 proved how the emotional tone has changed radically in terms of health and economics, especially in the families' dynamic (Daks et al., 2020). It also affected education and teaching when the instructions to implement new methods were not clearly understood by teachers (Hadar et al., 2020). Families, policy makers, teachers and students denote low levels of positive emotional tone and struggle with instructions on online platforms. Concerning politics, through the leaders' linguistic segments, personality traits and differences in analytical thinking have been identified (Pennebaker et al., 2003; Tausczik & Pennebaker, 2009; Xue et al., 2020).

Analytical thinking is characterized by the presence, in oral and written texts, of words

related to formality, hierarchy and logical decision mechanisms (Jordan et al., 2019). The psychological distance is more evident at high levels of analytic thinking (Faasse et al., 2016). Low levels of analytical thinking are shown through excess of narrative, verbal items focused on 'here' and 'now', and personal experiences with greater psychological proximity (Abdo et al., 2020; Cohn et al., 2004; Essam & Abdo, 2020). This 'proximity', in the context of discourses on health and vaccination, is evident in narratives that refer to body parts and health (Faasse et al., 2016). In cognitive terms, a reduced value of the analytical thinking variable triggers a more intuitive tone in individuals (Pennycook & Rand, 2019).

Between January and April 2020, analytical thinking patterns varied substantially in the leaders (AUTHOR, YEAR). Naturally, the 'culture' variable defines part of the variation mentioned above, given that cultures like China or Spain are clearly distinct. These differences shape the perception of the lockdown held mainly between March and May 2020, since more multicultural countries like the United Kingdom and the USA denoted less analytical implementation methods, via discourse, after March 2020 (Abdo et al., 2020). Affective proximity was seen more in these cases, through the language used.

The extreme variation of the cognitive processes (mainly from analytical to intuitive) in the leaders' discourse about the management of the situation resulted in contingency or adaptive leaderships (Stoller, 2020; Weible et al., 2020). The high number of deaths and the reduced control of the epidemic aggravated

controlled leadership mostly due to the absence of measures such as vaccines, as shown in the ambiguous information transmitted in these discourses (Essam & Abdo, 2020). One of the effects of communication (not just from leaders) in the USA was recently seen. The results were extremely negative (poor levels of analytical thinking and anarchy) in the younger strata, whose messages on social media were studied (Moore et al., 2020).

High levels of analytical thinking favour less contingent leadership and greater results. In addition to the analytical function, there is 'power' in the discourse that is conveyed to influence the sense of egalitarian social dominance, or to exclude it from this setting's importance (Essam & Abdo, 2020). The power or form of leadership, in psycholinguistic terms, is identified in the "clout" category.

Psycholinguistic analysis could be performed in a quantitative way: by using validated instruments for computing observable verbal behaviours such as the Linguistic Inquiry Word Count (LIWC 2015, v. 1.6.0. 2019). The LIWC, with a well-founded theoretical background, generates analysis models to check linguistic and psychological differences based on the verbal selection of the subjects (Kahn et al., 2007; Xue et al., 2020). The LIWC ensures the linguistic analysis of the various language, affective, cognitive, and biological functions by coding, computing and calculating the words used in specific samples (Chung and Pennebaker, 2012; dos Santos et al., 2019; Tausczik and Pennebaker, 2009; Tobin, 2005; Kahn et al., 2007).

On the other hand, the qualitative method could be qualitative thus allowing the segmentation, codification and discourse analysis. A qualitative analysis examines the association between verbal items and constructs such as analytical thinking and clout in 'language functions' domains. These functions were examined in this study, consistent with recent research published in the field of health (Smith-Keiling & Hyun, 2019).

Using the LIWC as statistic method, the evolution and variation had already been seen in Psychology and Psycholinguistics studies when analyzing analytical thinking, namely in discourses after 9/11 (Cohn et al., 2004) and in the psycholinguistic features of Trump's campaign (Pennycook & Rand, 2019). In the first case, as the weeks progressed, the levels of analytical thinking decreased and were replaced by discourses of greater affective proximity and less psychological distance. In the second case, it was found that the voting population had two types of cognitive output: analytical and intuitive, with greater advantage for intuitive thinking (Pennycook & Rand, 2019).

On the other hand, the same variability of verbal behaviours (and their psycholinguistic traits) can be explored through non-quantitative computerized instruments, for example the text-mining methods are spreading in qualitative and quantitative studies regarding the online discourses and other public published texts (Xing & Gao, 2018). Computerized dictionaries such as the LIWC and other types of textual quantitative analysis methods (Boyd & Pennebaker, 2015) make it possible to identify the populations' mental states and current

perceptions, as well as their evolution and fluctuation in the period under analysis. But the computerized tools such as LIWC might compromise the understanding of the language use and the pragmatic function.

Regarding fluctuation, it is important to realize how the daily discourse can indicate emotional changes in the subjects. This variation is not fully captured by the LIWC (Sun et al., 2020). Additionally, the LIWC and topic classification techniques are not reliable when we are dealing with small and specific number of samples (<100), considering texts and documents (not the number of words). Qualitative studies with topic modeling and sentiment analysis are well recommended for the discourse analysis in this field (Kangas, 2014). The cognitive, emotional and social dimensions are mostly focused during this psycholinguistic analysis (Xiang et al., 2021).

Regarding social dimension, the clout function is identified with power, differentiated from the concept of authority, the subjects' understanding and response to the leaders and the suggested measures are compromised by the culture, ethnicity, and literacy of the different socio-economic groups (Chan & Leong, 2020; Hu et al., 2020; Hutchins et al., 2009). The "clout" function appears to assist the analysis of those who use discourses with greater confidence and seduction in order to involve the population in their leadership, or the opposite.

Studies such as those by Essam and Abdo (2020) revealed how the response and perception (especially affective processes) of Arab populations of COVID-19 were very idiosyncratic compared to other cultures. The cul-

ture factor is a moderating variable. Studies indicate that China, Japan and Italy are very focused nations as to the cause and spread of the disease. Anxiety and anger were the most observed emotions regarding the affective processes during discourses in analysis (Negri et al., 2020).

Additional studies showed an association between certain verbal items (with high lexical frequency) as indicators of depression and suicidal ideas. These associations are legitimized by the clout and emotional tone indexes interpreted from the documents in a systematic review as another qualitative technique. The lower (referring to clout and emotional functions) they are, the more they indicate a negative mental picture of the subjects (Lumontod, 2020). In the case of analytical thinking, when the subjects' narratives become focused on the "me" and the "now", they indicate low resistance to the crisis and consequent depression (Lumontod, 2020).

The first studies that correlated emotional tone and analytical thinking with psychotic discourse (Caplan et al., 1990; Caplan et al., 2006) also focused on the discourse of politicians. The significant fluctuation of the prosody or the type of phoneme segmentation was an aspect that prevailed in the change of the speakers' mental state between discourses in different periods (Strauss, 2005; Whissell, 1999).

In the field of psycholinguistic testing, its of upmost importance the reliability for the assessment of emotional traits in pieces of discourse (Kahn et al., 2007) and aspects of the populations' well-being through their type of

language and posts, even if geographically diverse (Xue et al., 2020). Attending to this importance and the cross-cultural variable involved, the LIWC algorithm is not feasible to answer with prediction sensitivity as in the case of machine learning tools (Bantum et al., 2017). Thematic analysis answer in best way to the word count, interpretation and definition of core of meaning (Xiang et al., 2021).

Given the existence of validated instruments used in the psychological analysis of persons in the different linguistic domains, and that little research has been done on the characterization and impact of the analytical thinking and power of world leaders in their verbal communication about measures during COVID-19, this study aims to: (1) identify, encode and analyze the variation in the analytical thinking of the leaders of eight countries in two periods of the first half of 2020. The qualitative thematic analysis will be used by segmentation and coding (and the topic modeling). The discourses collected from official government and press sources were transcribed and translated into English, when applicable, by recognized bodies in each country; (2) according to that variation, estimate clout indices for the same countries in the same period. The discourses were analyzed in two periods to identify the variation between the levels of analytical thinking and clout.

Method

Sample

Based on the discourses of eight country leaders, in two periods of the first semester of 2020 and in the context of COVID-19 preven-

tion and information, 39 073 words were collected from 16 documents available online. The linguistic samples were collected from the subjects' messages in the media, with emphasis on the television networks of the respective countries. The selection of the discourses was made immediately after the announcement of the two states of emergency: the first period was the middle of March (across the eight countries, except China, which declared the state of emergency in early February). The periods selected to extract the discourses are comparable across the countries because they match the first discourse of state of emergency in each country, disseminated through and validated by media platforms.

To understand the situation (infected and death cases) and the results of our study concerning each country at the time of the two discourses, the following data is provided in figure 1.

All verbal samples are in English. The data were randomly selected, but with a clear representation of the northern hemisphere: Germany (period 1: March 19th 2020; period 2: April 15th 2020), China (period 1: February 3rd 2020; period 2: March 26th 2020); Spain (period 1: March 10th 2020; period 2: April 18th 2020); France (period 1: March 16th 2020; period 2: April 14th 2020); Italy (period 1: March 11st 2020; period 2: April 21st 2020); UK (period 1: March 16th 2020; period 2: April 12nd 2020); Russia (period 1: March 25th 2020; period 2: April 20th 2020); USA (period 1: March 13rd 2020; period 2: April 19th 2020).

Instruments and data analysis

Qualitative thematic analysis was used to count and determine patterns of meaning by topic modeling and sentiment analysis: the linguistic corpora were collected and coded

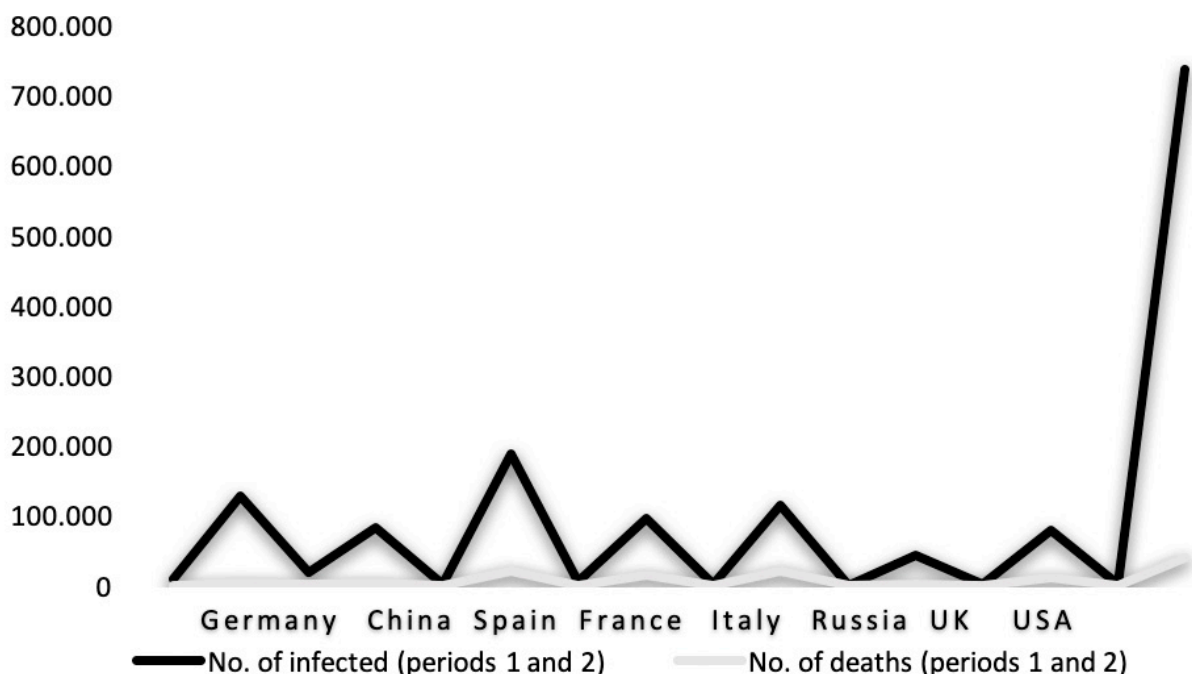


Figure 1. N.º of infected cases and n.º of death cases in the 8 countries, considering the period 1 and period 2.

based on the extraction of sixteen discourses of eight world leaders. In total, 39 073 words were collected. Linguistic uniformity was one of the criteria ensured for this analysis. Considering the topic modeling approached in this qualitative analysis and attending to the main theme of the management of the COVID-19 pandemic, we combined the topic modeling with the sentiment analysis. No conventional statistics were used, neither the topic classification (involved in the computation models of instruments such as LIWC).

The combination of these methods ensured the encoding of the discourses and the sentiments involved, specifically referring to the analytic thinking and clout in two different contexts (periods). Each discourse implies itself a specific cultural context and the intuitive interpretation with the topic modeling allow us to contextualize latent concepts (the thematic qualitative analysis itself does not ensure the retrieval of latent meanings) and differentiate them to enable the distribution of top words (relevant words extracted from random samples of thousands of words) and meanings in the two language functions here in focus.

The sentiment analysis reinforces the qualitative analysis by referring to emotional tone and another sentiment (not emotions) traits (like fear and sadness, mostly applying to the COVID-19 outbreak) expected during the lexicon retrieval (segmentation): semantic interpretation is conducted and coding is generated. During the word counting, the top words were mostly considered in sentiment analysis, but the preposition and less dominant 'sentiment' words were also considered in the topic

modeling (to classify and distribute words and percentages to be achieved in the two semantic cores of the discourse: analytic and clout). Attending to the pandemic situation, the discourses and lexicon became specified in meaning and dominant themes (Xiang et al., 2021).

Analytic thinking and clout functions were, in the present study, the two dependent variables. Besides top words, the analytic thinking category is assessed using textual markers that identify a formal register and logical thinking, such as pronouns in the 3rd person and grammatical organization according to complex topics and phrases.

The clout is defined by textual segments showing power shared with the public and empathy. When clout rates (frequency of words more related to power and engagement between leader-public) are more evident, this means there is greater psychological proximity and authenticity between sender-receiver. For example, in the second period in Spain, there are specific segments in this part of the discourse:

those who have lost a loved one, often without being able to offer comfort or say goodbye. To them, I convey a message of deep sorrow on behalf of the entire Spanish society and the Government of Spain. And to all those people we have lost, as soon as possible, we will pay the tribute they all deserve (...) to our healthcare professionals (...) our compatriots who have given an exemplary response, I cannot say it enough (...) we have saved (...) we have managed to contain the virus from spreading (...).

Results

Of the 39.073 words, "COVID-19", "coronavirus", "epidemic", "hospitals" "prevention", "job" (job of the government), "control", "democracy", "serious", "health", "people", "help", "serious" were the most used vocabulary. The lexicon and semantics used referred to the outbreak and eminent risk of the nations if the populations do not understand the instructions and need of protection (for them and for others). Top words appeared constantly such as "stay home", and "use masks", but also sentences as "this is about people", "every individual can do to hep" and "transparent communication". These topwords and type of phrasing charac-

terize the engagement with people – the clout dimension. In the cases where the documents present high frequency of these expressions, the analytic thinking is less present. The analytic discourse displayed, instead, other type of linguistic terms: the pronouns as "I" and "me" are very frequent and another lexicon that establishes small proximity (in the psychological perspective) with the people: "the state", "the health professionals", "social". The figure 2 presents a summary of percentages from the corpora observed in this study.

This figure presents two big cores of language analysis under the two themes determined for this qualitative analysis (analytic

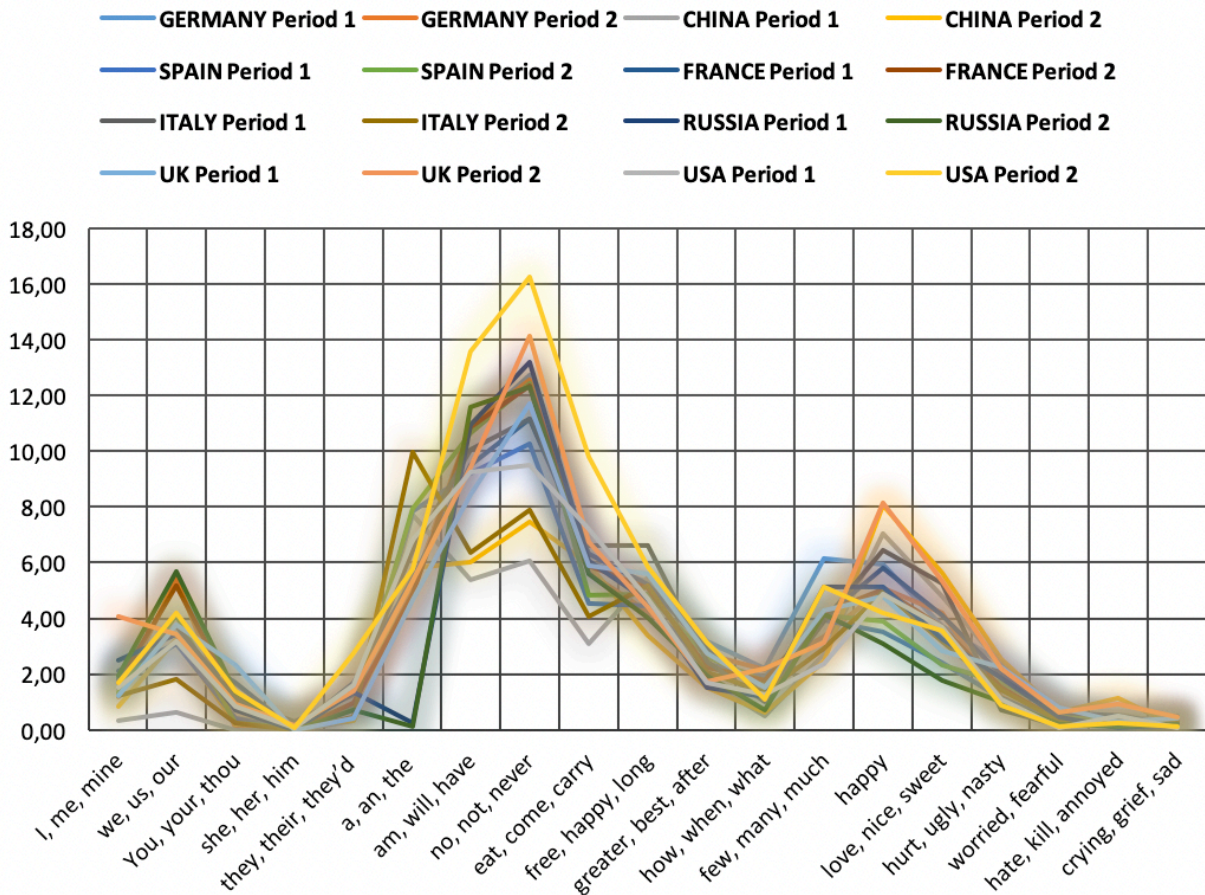


Figure 2. Prevalence and frequency of themes (words and meanings) across the discourses in the 8 countries (periods 1 and 2).

thinking and the clout or power/engagement): language function (type of words such as adjectives) and the emotional language (see figure 2). There were changes clearly observed from period 1 to period 2. The prevalence was noticed in the utilitary language (“eat”, for example) and considering the pronouns used in the first person. On the other hand and attending to the sentiment analysis, positive emotions were higher by comparing to the negative wording (“love”, “happy” contrasts “hurt” and “ugly”), despite of being the negative COVID-19 scenario. The proportion of words also showed variation between periods, but also between countries. The positive evaluation toward the future of the pandemic context reveals empathy between generations and between leaders and population (Xiang et al., 2021).

Regarding the word count, it should be noticed that France, Spain and Italy were the only nations with differences from period 1 to period 2: in the the second period the discourses were higher in number of words, as well concerning the repetitions of top words such as “COVID-19”, “coronavirus”, “democracy”, “community”, “people”. Comparing to the another nations, the first discourse was always higher in words (period 1).

We ran a descriptive analysis – using an excel database - to characterize the distribution and the percentiles regarding the sample of > 39.000 words. It was found differences for all dependent variables (analytical thinking and clout, in both periods). In the 25th percentile, the frequency of words (frequency here referring to the number of words occurrence dur-

ing discourses (1) and also to the different levels of lexical frequency (2): high and low level of words usage – more utilitary or more descriptive words) is higher in period 1 for both categories, compared to period 2. On the contrary, in the 75th percentile, period 2 presents a much higher percentage of words for both categories (greater analytical thinking and greater indicator of power or social control).

The frequency of words is higher in period 1 for both categories (Clout and Analytical Thinking), compared to period 2. On the contrary, in the 75th percentile, period 2 presents a much higher percentage of words for both categories (greater analytical thinking and greater indicator of power or social control than in period 1). Second, the data show significant differences in the discourses between period 1 (phase 1 of the COVID-19 lockdown) and period 2 (more acute phase 2 of the isolation period, with measures aggravated for different nations and with a higher rate of deaths and infected cases). However, we notice a greater variability of words frequency and fluency for the analytical thinking category. Figure 3 shows the percentages for the two dimensions and in the two periods analysed (considering the excel database).

Regarding analytical thinking, the discourse varied considerably in leaders and countries considering pre-to-post discourses’ intervention. In period 2, the level of analytical thinking rise from the first to the second period only in Germany and Italy (less evidently in the case of the German chancellor). The corpora indicate that the type of linguistics used shows greater psychological distance from the pan-

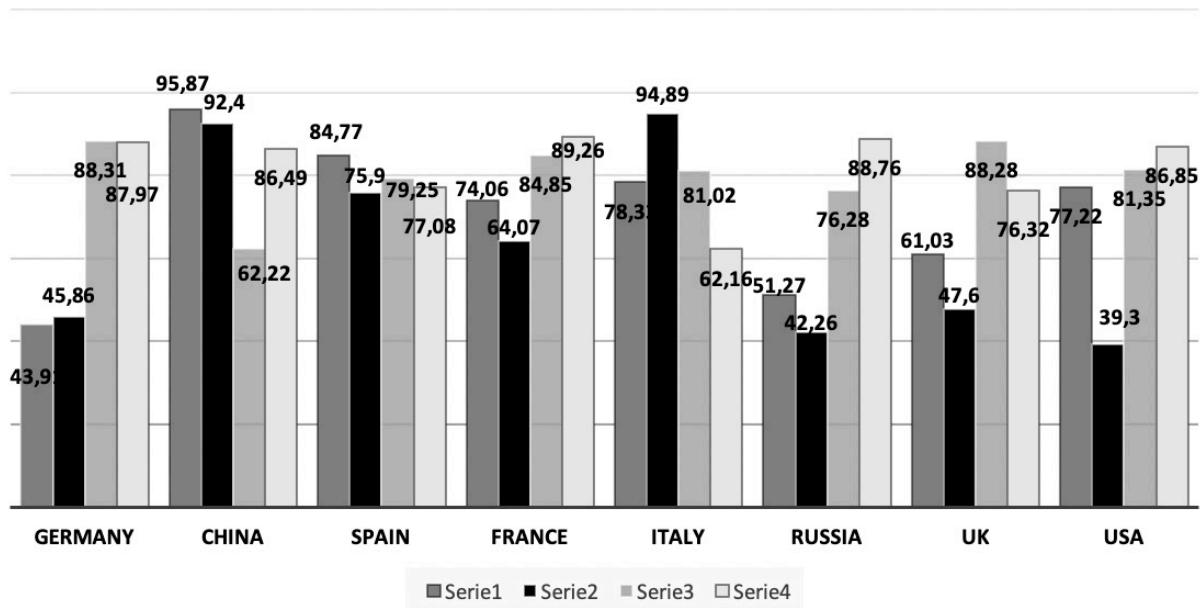


Figure 3. Percentages according to the analytic and clout categories based in topic modeling (selection of words and themes) in two periods of semester 1 (February to May 2020) of COVID-19.

Note 1. In the case of analytical thinking, considering the analysis of formality and logical thinking in the discourse, a higher percentage indicates greater analytical thinking and greater distance from the receiving population; in clout, considering the analysis of words related to power and the need for power. A greater number of words in the series indicate greater leadership with an impact on people receiving the message (compliance with directives and empathy with messages).

Note 2. Series 1 refers to analytical thinking, series 2 refers to analytical thinking in period 2, series 3 refers to period 1 clout and series 4 refers to period 2 clout.

demic and the public in period 2, with measures announced in a more formal and logical tone. For example, the use of pronouns (not top words) in the first person and the narrative style was much more present, especially in the Italian case, in period 2. The number of fatal cases may have influenced those countries in the second period, particularly Italy (period 1: 33 deaths; period 2: > 20 000 deaths).

With the exception of Italy, the speeches of the other six leaders (in Germany the drop is not visible) showed a significant drop in the indexes of analytical thinking, which translated into a type of presentation closer to the public and announcement of measures in a less formal way. China, Spain, Italy and the USA (in the

latter case only referring to period 1) are the cases with the highest number of words or indicator segments of high analytical thinking. In the USA (period 1: 77.22; period 2: 39.30) and in the UK (period 1: 61.03; period 2: 47.60), the LIWC scores showed scenarios with more differentiating values between the two periods.

The countries whose leaders had a discourse indicating the highest clout (therefore associated with the least analytical) were Russia (period 1: 76.28; period 2: 88.76), Germany (period 1: 88,31; period 2: 87.97), the UK (period 1: 88.28; period 2: 76.32) and the USA (period 1: 81.35; period 2: 86.85). With regard to periods, there was significant variation in the 'clout' of the different countries, but only in period 1.

It should be noted that the leaders of the United Kingdom and Germany have the highest levels of clout (> 76), in contrast to China, which has the lowest index (62.22, only in period 1, since clout rises immensely in China in period 2). In fact, in the figure 3, the 'clout' percentages are very similar between the periods in the countries, except in period 2, when Italy stands out the most, in a negative way (62.16).

Discussion

Taking into account the objectives and hypothesis of the study, the verbal discourses of the eight leaders in two periods of the pandemic were identified and interpreted in a qualitative thematic analysis, by using the topic modeling and including the sentiment analysis. We considered periods of the acute phase 1 of COVID-19. The discourses extracted from various media platforms of the official bodies of each country allowed to characterize the evolution of the analytical thinking and the clout of the eight leaders.

Germany, and above all Italy, modified their verbal behaviour and showed greater analytical thinking from period 1 to period 2. The discourses became more fixed narratives and had greater psychological distance (more in the Italian leader's discourse), as the norms were verbalized in a more formal (analytical) aspect. The USA reduced this type of discourse in period 2 considerably, revealing greater proximity to the public and to perceptions in a more empathic perspective. China showed a significant rise in 'clout' discourse in period 2, while Russia also has a very clout discourse in that period. Spain and Italy were the countries where the

clout dropped significantly in period 2, which can be related to the number of deaths they experienced abruptly.

There were changes that were expected to occur between the two periods. The psycholinguistic analysis indicates that the clout goes down in contexts of less controlled pandemic scenarios, where there were large numbers of deaths and infected cases (Spain and Italy rose from about three dozen to thousands in a short period). The clout, on the other hand, rises when there is empathic proximity (as in the case of Russia). This is not from the perspective of psychological proximity that opposes the functional dimension of analytical thinking, but when leaders (i.e. from Spain and Italy) realized that including public groups in the power relationship helped to maintain compliance and reduced pessimism and anxiety.

The results of the analytical thinking regarding the eight leaders' confirm the previous psycholinguistic analysis by Abdo et al. (2020). The authors found less analytical discourses in the USA and in the UK in phase two of the pandemic, which resulted in discourses with greater affection in terms of the type of lexicon and semantics used. That affection is illustrated across the sentiment analysis (the emotions in the figure 3).

It is important to focus on the fragile issue of the speakers because, according to the study by Lumontod (2020), when analytical discourse decreases, it means that resilience is weak to address the crisis. In common with the audience that receives the message, the linguistic situations start to be directed towards the present and not towards the future, even

denoting pessimistic indicators (Strauss, 2005; Whissell, 1999).

Likewise, our data are in line with a psycholinguistic and psychological study on the verbal behaviour and stance of leaders in other contexts of crisis such as terrorist attacks (Cohn et al., 2004). The population seems to adhere more obviously to intuitive and less analytical discourses, even in discourses in political campaigns (Pennycook & Rand, 2019). However, these more intuitive discourses use words more focused on the emerging situation such as 'death', 'pessimism', 'isolation', and 'uncertainty' (Kolic & Dyer, 2020).

On the other hand, in this study we had reached the conclusion that positive wording resulting in a best way of address the populations. In a recent study, after the first half of 2020, Negri et al. (2020) observed the importance of linguistically evaluating the emotions of social media users regarding the lockdown (Italian context).

The recent study by Sergent and Stajkovic (2020) on the most successful female leaders during COVID-19 found they were more empathetic and intuitive. They use lexicon and semantics focused on the family, unlike the opposite gender (van der Vegt & Kleinberg, 2020). There was only one discourse produced by a female leader in our study (Germany) where the analytical and clout levels were very linear in all periods, with emphasis on the rise of empathy (clout dimension).

It should be noted that the cases identified above - Russia, Germany, USA, UK and China (the latter only in period 2) - that had the high-

est rates of clout were the ones with the greatest social and pandemic control.

In the case of China, the clout was evident in period 2, but not in the first. COVID-19 numbers had dropped and verbal leadership reflected the successful compliance measures. The perception of risk must be mitigated in the leaders' discourses in order to ensure high levels of clout that lead to optimism (Ding et al., 2020). Our data are in accordance with the study indicators for the second half of 2020, such as those by Ding et al. (2020), mainly because leaders, in period 2, when the levels of clout increased, reducing risk perception, which has immediate consequences in depressive situations (Ding et al., 2020; Essam & Abdo, 2020; Kasapoglu and Akbal, 2020; Kim, 2020; Xue et al., 2020).

Conclusion

This combined techniques (topic modeling and sentiment analysis) of qualitative analysis for this psycholinguistic examination makes an important contribution to the current pandemic situation because our results allow us to understand: i) how leaders and entities are addressing the people of each country regarding the pandemic and its measures; ii) how leaders are leading with perceptions about the crisis. These results indicate that the psycholinguistic features fluctuate according to individual/country, personality, culture and mostly considering the pandemic periods.

As limitations of our study, a deeper statistical analysis might reinforce our results and discussion. For future studies, psycholinguistic research in the context of COVID-19 should

be improved because it is sparse and requires validation beyond the qualitative method for gathering and examining lexical corpora associations through combined qualitative and quantitative methods (Pennebaker et al. 2003; Smith-Keiling & Hyun, 2020; Su et al., 2020; Sun et al., 2020). It is important also to examine more documents and higher corpora, but mostly focusing more languages and populations that allow deeper functional analysis and data access. A last limitation that we address here: the speeches as not being in the natural language of leaders could influence the word- ing analysis. All speeches were officially translated to English from legitimate sources (press sources).

References

- Abdo, M. S., Alghonaim, A. S., & Essam, B. A. (2020). Public perception of COVID-19's global health crisis on Twitter until 14 weeks after the outbreak. *Digital Scholarship in the Humanities*. *fqaa037*, 1-16. <https://doi.org/10.1093/llc/fqaa037>
- Abuelgasim, E., Saw, L. J., Shirke, M., Zeinah, M., Harky, A. (2020). COVID-19: Unique public health issues facing Black, Asian and minority ethnic communities. *Current Problems in Cardiology*, 100621. <https://doi.org/10.1016/j.cpcardiol.2020.100621>
- Alafnan, M. A. (2020). COVID 19-The Foreign Virus: Media Bias, Ideology and Dominance in Chinese and American Newspaper Articles. *International Journal of Applied Linguistics and English Literature*, 9(1), 56-60. <https://doi.org/10.7575/aiac.ijalel.v9n.1p.56>
- Arias Tapia, S. A., Martínez-Tomás, R., Gómez, H. F., Hernández del Salto, V., Sánchez Guerrero, J., Mocha-Bonilla, J. A., ... Chicaiza Redin, V. (2016). The dissociation between polarity, semantic orientation, and emotional tone as an early indicator of cognitive impairment. *Frontiers in computational neuroscience*, 10(95), 1-9. <https://doi.org/10.3389/fncom.2016.00095>
- Baas, M., De Dreu, C. K., Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus?. *Psychological bulletin*, 134(6), 779. <https://doi.org/10.1037/a0012815>
- Bantum EO, Elhadad N, Owen JE, Zhang S, Golant M, Buzaglo J, Stephen J, Giese-Davis J. (2017). Machine Learning for Identifying Emotional Expression in Text: Improving the Accuracy of Established Methods. *J Technol Behav Sci*. 2(1), 21-27. doi: 10.1007/s41347-017-0015-5. Epub 2017 Apr 4. PMID: 32885036; PMCID: PMC7467127.
- Barreneche, S. M. (2020). Somebody to blame: on the construction of the other in the context of the COVID-19 outbreak. *Society Register*, 4(2), 19-32. <https://doi.org/10.14746/sr.2020.4.2.02>
- Bastani, P. & Bahrami, M. A. (2020). COVID-19 Related Misinformation on Social Media: A Qualitative Study from Iran. *Journal of medical Internet research*. <https://doi.org/10.2196/18932>
- Blendon, R. J., Koonin, L. M., Benson, J. M., Cetron, M. S., Pollard, W. E., Mitchell, E. W., ... Herrmann, M. J. (2008). Public response to community mitigation measures for pandemic influenza. *Emerging infectious diseases*, 14(5), 778. <https://doi.org/10.3201/eid1405.071437>
- Boyd, R. L., & Pennebaker, J. W. (2015). Did Shakespeare write double falsehood? Identifying individuals by creating psychological signatures with text analysis. *Psychological Science*, 26(5), 570-582. <https://doi.org/10.1177/0956797614566658>
- Braun, L., Wolfgang, M., Dickersin, K. (2013). Defining race/ethnicity and explaining difference in research studies on lung function. *Eur Respir J*, 41(6), 1362-1370. <https://doi.org/10.1183/09031936.00091612>
- Caplan, R., Perdue, S., Tanguay, P.E., Fish, B. (1990). Formal thought disorder in childhood onset schizophrenia and schizotypal personality

- disorder. *Journal of Child Psychology and Psychiatry*, 31(7), 1103-1114. <https://doi.org/10.1111/j.1469-7610.1990.tb00849.x>
- Caplan, R., Siddarth, P., Bailey, C. E., Lanphier, E. K., Gurbani, S., Shields, W. D., Sankar, R. (2006). Thought disorder: a developmental disability in pediatric epilepsy. *Epilepsy & Behavior*, 8(4), 726-735. <https://doi.org/10.1016/j.yebeh.2006.03.009>
- Chan Sun, M. & Lan Cheong Wah, C. B. (2020). "COVID-19 in Mauritius: Discourse Analysis of the Public Health Response Against the Pandemic". <http://dx.doi.org/10.2139/ssrn.3593537>
- Chen, X. & Hu, J. 2019. 'Evolution of US presidential discourse over 230 years: A psycholinguistic perspective', *International Journal of English Linguistics*, 9(4), 28-41. <https://doi.org/10.5539/ijel.v9n4p28>
- Chiu, R.W.K., Tang, N.L.S., Hui, D.S.C., Chung, G.T.Y., Chim, S.S.C., Chan, K.C.A., Y. Sung, L.Y.S. Chan, Y. Tong, W. Lee, P.K.S. Chan, Y.M.D. Lo. (2004). ACE2 gene polymorphisms do not affect outcome of severe acute respiratory syndrome, *Clin Chem*, 50(9), 1683-1686. <https://doi.org/10.1373/clinchem.2004.035436>
- Chung, C. K. & Pennebaker, J. W. (2012). Linguistic inquiry and word count (LIWC). *Applied Natural Language Processing*, 206-229. <https://doi.org/10.4018/978-1-60960-741-8.ch012>
- Cinelli, M., Quattrociochi, W., Galeazzi, A., Valensise, C. M., Brugnoli, E., Schmidt, A. L., ... Scala, A. (2020). "The covid-19 social media infodemic", *arXiv preprint arXiv:2003.05004*.
- Cohn, M. A., Mehl, M. R., & Pennebaker, J. W. (2004). Linguistic markers of psychological change surrounding September 11, 2001. *Psychological science*, 15(10), 687-693.
- Daks, J. S., Peltz, J. S., & Rogge, R. D. (2020). Psychological flexibility and inflexibility as sources of resiliency and risk during a pandemic: Modeling the cascade of COVID-19 stress on family systems with a contextual behavioral science lens. *Journal of Contextual Behavioral Science*, 18, 16-27.
- Ding Y, Xu J, Huang S, Li P, Lu C, Xie S. (2020). Risk Perception and Depression in Public Health Crises: Evidence from the COVID-19 Crisis in China. *Int J Environ Res Public Health*, 17(16):5728. doi: 10.3390/ijerph17165728
- Dos Santos, W. R., Ramos, R. M., Paraboni, I. 2019. 'Computational personality recognition from Facebook text: Psycholinguistic features, words and facets', *New Review of Hypermedia and Multimedia*, vol. 25, no. 4, pp. 268-287. <https://doi.org/10.1080/13614568.2020.1722761>
- Essam, B. A., & Abdo, M. S. (2020). How Do Arab Tweeters Perceive the COVID-19 Pandemic? *Journal of psycholinguistic research*, 1-15.
- Faasse K, Chatman CJ, & Martin LR. (2016). A comparison of language use in pro- and anti-vaccination comments in response to a high profile Facebook post. *Vaccine*, 34(47), 5808-5814. doi: 10.1016/j.vaccine.2016.09.029
- AUTHOR. (YEAR).
- Hadar, L. L., Ergas, O., Alpert, B., & Ariav, T. (2020). Rethinking teacher education in a VUCA world: student teachers' social-emotional competencies during the Covid-19 crisis. *European Journal of Teacher Education*, 43(4), 573-586.
- Hutchins, S. S., Fiscella, K., Levine, R. S., Ompad, D. C., & McDonald, M. (2009). Protection of racial/ethnic minority populations during an influenza pandemic. *American journal of public health*, 99(S2), 261-270. <https://doi.org/10.2105/AJPH.2009.161505>
- Jordan, K. N., Sterling, J., Pennebaker, J. W., & Boyd, R. L. (2019). Examining long-term trends in politics and culture through language of political leaders and cultural institutions. *Proceedings of the National Academy of Sciences*, 116(9), 3476-3481.
- Kahn JH, Tobin RM, Massey AE, Anderson JA. (2007). Measuring emotional expression with the Linguistic Inquiry and Word Count. *Am J Psychol*, 120(2), 263-86.
- Kangas, S. E. (2014). What can software tell us about political candidates?: A critical analysis of a computerized method for political discourse. *Journal of Language and Politics*, 13(1), 77-97.
- Kasapoglu, A. & Akbal, A. (2020). Relational Sociological Analysis of Uncertainties: The case of COVID-19 In Turkey. *Advances in*

- Social Sciences Research Journal*, 7(4), 197-228. <https://doi.org/10.14738/assrj.74.8116>
- Khunti, K., Singh, A. K., Pareek, M., Hanif, W. (2020). "Is ethnicity linked to incidence or outcomes of covid-19?" <https://doi.org/10.1136/bmj.m1548>
- Kim, B. (2020). Effects of social grooming on incivility in COVID-19, *Cyberpsychology, Behavior, and Social Networking*. <https://doi.org/10.1089/cyber.2020.0201>
- Kolic, B., & Dyer, J. (2020). Data-driven modeling of public risk perception and emotion on Twitter during the Covid-19 pandemic. *arXiv preprint arXiv:2008.00854*.
- Kuznar, L. A. & Aviles, W. 2018. *Comparative Analysis of Kim Family Political Discourse*. NSI, Inc.
- Lumontod III, R. Z. (2020). Seeing the invisible: Extracting signs of depression and suicidal ideation from college students' writing using LIWC a computerized text analysis. *International Journal of Research*, 9(4), 31-44.
- McHaney, R., Tako, A., & Robinson, S. (2018). Using LIWC to choose simulation approaches: A feasibility study. *Decision Support Systems*, 111, 1-12.
- Moore RC, Lee A, Hancock JT, Halley M, & Linos E. (2020). Experience with Social Distancing Early in the COVID-19 Pandemic in the United States: Implications for Public Health Messaging. medRxiv [Preprint]. 2020 Apr 11:2020.04.08.20057067. doi: 10.1101/2020.04.08.20057067.
- Nail, B., Rabehi, A., Bekhiti, B., & Arbaoui, T. (2020). *A new design of an adaptive model of infectious diseases based on artificial intelligence approach: Monitoring and forecasting of COVID-19 epidemic cases*. <https://doi.org/10.1101/2020.04.23.20077677>
- Negri, A., Andreoli, G., Barazzetti, A., Zamin, C., & Christian, C. (2020). Linguistic Markers of the Emotion Elaboration Surrounding the Confinement Period in the Italian Epicenter of COVID-19 Outbreak. *Frontiers in Psychology*, 11, 2464.
- Pennebaker, J. W., Mehl, M. R., & Niederhoffer, K. G. (2003). Psychological aspects of natural language use: Our words, our selves. *Annual Review of Psychology*, 54(1), 547-577. <https://doi.org/10.1146/annurev.psych.54.101601.145041>
- Pennycook, G., & Rand, D. G. (2019). Cognitive reflection and the 2016 US Presidential election. *Personality and Social Psychology Bulletin*, 45(2), 224-239.
- Quinn, S. C., Kumar, S., Freimuth, V. S., Musa, D., Casteneda-Angarita, N. & Kidwell, K. (2011). Racial disparities in exposure, susceptibility, and access to health care in the US H1N1 influenza pandemic. *American journal of public health*, 101(2), 285-293. <https://doi.org/10.2105/AJPH.2009.188029>
- Sergent, K., & Stajkovic, A. D. (2020). Women's leadership is associated with fewer deaths during the COVID-19 crisis: Quantitative and qualitative analyses of United States governors. *Journal of Applied Psychology*, 105(8), 771-783.
- Sirkeci, I. & Yucesahin, M. (2020). Coronavirus and Migration: Analysis of Human Mobility and the Spread of Covid-19. *Migration Letters*, 17(2), 379-398. <https://doi.org/10.33182/ml.v17i2.935>
- Smith-Keiling, B. L., & Hyun, H. I. F. (2019). Applying a computer-assisted tool for semantic analysis of writing: Uses for STEM and ELL. *Journal of microbiology & biology education*, 20(1), 1-6.
- Stoller, J. K. (2020). Reflections on leadership in the time of COVID-19. *BMJ Leader*. doi:10.1136/leader-2020-000244
- Strauss, C. (2005). Analyzing discourse for cultural complexity. In *Finding culture in talk* (pp. 203-242). Palgrave Macmillan. doi. [org/10.1007/978-1-137-05871-3_6](https://doi.org/10.1007/978-1-137-05871-3_6)
- Sun J, Schwartz HA, Son Y, Kern ML, & Vazire S. (2020). The language of well-being: Tracking fluctuations in emotion experience through everyday speech. *J Pers Soc Psychol.*, 118(2), 364-387. doi: 10.1037/pspp0000244
- Tausczik, Y. R. & Pennebaker, J. W. (2009). The psychological meaning of words: LIWC and computerized text analysis method. *Journal of Language and Social Psychology*, 29(1), 24-54. <https://doi.org/10.1177/0261927x09351676>

- Tobin, R. M. (2005). Measuring emotions with the linguistic inquiry and word count (LIWC), *PsycEXTRA Dataset*. <https://doi.org/10.1037/e525752006-001>
- van der Vegt, I. & Kleinberg, B. (2020). "Women worry about family, men about the economy: Gender differences in emotional responses to COVID-19", *arXiv preprint arXiv:2004.08202*.
- VanDijk, T.A. (2006). Discourse and manipulation. *Discourse & society*, 17(3), 359-383. <https://doi.org/10.1177/0957926506060250>
- Venuleo, C., Gelo, C. G. O., & Salvatore, S. (2020). Fear, affective semiosis, and management of the pandemic crisis: COVID-19 as semiotic vaccine. *Clinical Neuropsychiatry*, 17(2), 117-130.
- Weible, C. M., Nohrstedt, D., Cairney, P., Carter, D. P., Crow, D. A., Durnová, A. P., ... & Stone, D. (2020). COVID-19 and the policy sciences: initial reactions and perspectives. *Policy sciences*, 53(2), 225-241.
- Whissell, C. (1999). Phonosymbolism and the emotional nature of sounds: evidence of the preferential use of particular phonemes in texts of differing emotional tone. *Perceptual and Motor Skills*, 89(1), 19-48. <https://doi.org/10.2466/pms.1999.89.1.19>
- Wu, C., Chen, X., Cai, Y., Zhou, X., Xu, S., Huang, H., ... Song, J. (2020). Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease pneumonia in Wuhan, China. *JAMA internal medicine*. <https://doi.org/10.1001/jamainternmed.2020.0994>
- Wu, Y., Tseng, C., Cheng, M., Ho, H., Shih, S., Chiu, D. (2008). Glucose-6-phosphate dehydrogenase deficiency enhances human coronavirus 229E infection. *J Infect Dis*, 197, 6, 812-816. <https://doi.org/10.1086/528377>
- Xiang, X., Lu, X., Halavanau, A., Xue, J., Sun, Y., Lai, P. H. L., & Wu, Z. (2021). Modern senicide in the face of a pandemic: An examination of public discourse and sentiment about older adults and COVID-19 using machine learning. *The Journals of Gerontology: Series B*, 76(4), e190-e200.
- Xing, W., & Gao, F. (2018). Exploring the relationship between online discourse and commitment in Twitter professional learning communities. *Computers & Education*, 126, 388-398.
- Xue S. J, Liu X, Wu P, Chen J, Chen C, Liu T, Gong W, & Zhu T. (2020). Examining the Impact of COVID-19 Lockdown in Wuhan and Lombardy: A Psycholinguistic Analysis on Weibo and Twitter. *Int J Environ Res Public Health.*, 17(12), 4552. doi: 10.3390/ijerph17124552. PMID: 32599811; PMCID: PMC7344534.
- Zhao, S., Musa, S. S., Lin, Q., Ran, J., Yang, G., Wang, W., Lou, Y., Yang, L., Gao, D., He, D., Wang, M. H. (2020). 'Estimating the unreported number of novel coronavirus (2019-nCoV) cases in China in the first half of January 2020: A data-driven modelling analysis of the early outbreak', *Journal of Clinical Medicine*, 9(2), 388. <https://doi.org/10.3390/jcm9020388>