

CIENCE SOCIALSCIENCES

Gastronomic culture and tourism

Research results

César Yáñez Santamaría

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Book coordinated by
Academic Body Socioecological Systems,
Tourism and Gastronomic
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Research results**

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Chapter 4. Online Gastronomic Reviews: Taking Stock of the Impact of the COVID-19 Pandemic on the north coast of Baja California

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Summary

With the growing incidence of online reviews on web platforms, the integration of user-generated content in the interaction and feedback processes during the period of the COVID-19 pandemic became strategic for the survival of businesses and the consolidation of an attractive gastronomic offer. Within the context of the new normal in the coastal region of Baja California, Mexico, the study set out to analyze, before and during the pandemic, the differences and comparison of the impact of marketing constructs and their dimensions on star ratings and sentiment scores. The research used 6,046 reviews collected from TripAdvisor during two 21-month periods, before and after the pandemic. To analyze the collected data, computational linguistics and text mining methods, non-parametric statistics to evaluate differences, and regression models were applied to determine the significance and intensity of the analyzed topics for the two blocks of polarities, before and during the pandemic. The results reveal differences and different incidences sustained by behaviors induced by the conditions of the new pandemic.

normalcy. Among other findings, destination satisfaction seems to re-emerge with a significant positive impact after a long and arduous quarantine.

Key words: Gastronomic reviews, ratings and sentiments, COVID-19 pandemic, food quality, satisfaction and intentions, Baja California.

Introduction

Contrary to the importance that online user content is taking on, the proportion of studies dedicated to analyzing these contributions in the context of the restaurant and lodging industry, although still growing, is still scarce compared to research on shopping and, even, on hospitality (Gan et al., 2017; Yu et al., 2021). Beyond fashion effects, the growing theoretical and practical interest in online reviews on platforms such as TripAdvisor and Yelp is probably the result of previous studies that confirmed their impact on both gastronomic supply and demand. Among a variety of topics that were addressed, we will mention text analysis techniques (Luo & Xu, 2021; Pantelidis, 2010), the incidence of reviews on gastronomic supply-demand (Kim, et al., 2016; Luca, 2016; Zhang et al., 2010), sentiment scoring and evaluation (Gan et al., 2017; Kostromitina, et al., 2021; Nakayama & Wan, 2019; Pezenka & Weismayer, 2020) and, finally, satisfaction and semantics expressed by review authors (Cassar et al., 2020; Jia, 2021; Vu et al., 2019; Zhang et al., 2014).

The arrival of the COVID-19 crisis, in addition to initially forcing restaurants to close their doors and consumers to stay home, has changed over time, due to the new normal that integrates risk and social uncertainty into everyday life.

Considering going out to a restaurant as a multidimensional gastronomic experience, hardly comparable to just eating (Björk & Kauppinen Räsänen, 2017; Toudert & Bringas, 2021), approaching these new experiences from a before and during pandemic perspective becomes beneficial for both reflection and action (Jia, 2021; Luo & Xu, 2021). The above finds its justification in the fact that a pandemic crisis, although currently of low intensity, is still ongoing with implications, changes and adaptations, mainly in marketing and lodging management (Kostromitina et al., 2021; Luo & Xu, 2021). In these contexts conducive to analysis, online reviews from third-party platforms, such as TripAdvisor, can be an alternative source of information to dabble in these new research topics (Ayeh et al., 2013; Filieri et al., 2015; Xiang et al., 2017).

The application of computational linguistics and text mining procedures for the extraction of frequent words or word segments allows identifying structuring topics of the discourse of online reviews, such as food quality and waiter service (Gan et al., 2017; Nakayama & Wan, 2019; Pezenka & Weismayer, 2020). However, the extracted segments were generally implicitly associated with e-WOM and rarely with constructs and dimensions traditionally used in the field of gastronomic marketing and management, such as gastronomic quality, consumer satisfaction and future intentions (Kim et al., 2016; Kirilenko et al., 2021).

In this sense, this research seeks to connect with this prior knowledge by building bridges to constructs and their dimensions, and examining their impacts on star ratings and sentiment scores, before and during the pandemic. To achieve this, the study first aims to ascertain whether the diachronic incidence of constructs and their dimensions on TripAdvisor star ratings remained unchanged, and then to determine the significance and intensity of their impacts on sentiment scores before and during the pandemic. With this type of approach, focusing on diachronic similarities and differences, accommodations and tasks may emerge that allow reconciling gastronomic supply and demand after a strong impact of the consequences of the pandemic.

Literature review

Online gastronomic reviews

The increasing adoption of information and communication technologies has fostered significant interaction between supply and demand for services through online user-generated content posted on third-party Internet platforms. These contents, known as online reviews, have gradually become a supporting tool for a formal marketing, pressed to influence the consumer and further increase sales (Kim, et al., 2016). In fact, it is known that, in order to reduce the risk of purchase, the consumer is willing to believe and is often more influenced by another buyer than by the supplier (Cheong & Morrison, 2008; Yang & Mai, 2010). These behaviors, which support a decisive e-WOM (King et al., 2014), translate in the lodging and tourism industry into strategies that include online reviews in decision making at both the supply and demand levels (Kim, et al., 2016; Zhang et al., 2010). In this regard, Kim et al. (2016) claim that recommendations to visit a restaurant depend on the number of reviews

(2010) claim that almost half of the readers end up having a dining experience in one of these establishments. This dynamic also depends on consumer evaluation; Luca (2016) argues that a star earned on Yelp generates 5 to 9% of revenue for the restaurant and the consistent literature review by Yang et al. (2018) confirms that the hotel industry has a similar dependence that would reach, according to Sayfuddin and Chen (2021), a reputation effect of 2.2 to 3% in hotel revenues.

The restaurant industry's interdependence on online reviews to mediate its gastronomic relationship with its diners generally finds meaning in the positive or negative polarity of published views (Kirilenko et al. 2021; Cheong & Morrison, 2008). Indeed, the account of a positive experience, in addition to structuring an appeal to future diners, also contributes to the consecration of a dining option and the validation of a business model (Cheong & Morrison, 2008; Kim et al., 2016). On the contrary, negative online reviews, although few compared to positive ones (Kladou & Mavragani, 2015), become a demotivator for readers and a claim to correct what is imputed by the reviews (Kirilenko et al., 2021). Under this perspective, reviews can be the motive to undertake strategies to reverse them (Leung et al., 2013), but, in other contexts described by ReviewTracker (2021) and Sparks and Browning (2010), complaints can bankrupt even well-established businesses. The incidence of online reviews is such that it emerges, at the level of its authors, as a mixture of logics of interest and values; some who seem to use the medium, as they see fit, to benefit, and others who seek to strengthen the interaction between restaurants and diners to improve the dining experience (Ayele et al., 2013; Gavilan et al., 2018; Mayzlin et al., 2014).

In the restaurant industry, although there are several third-party platforms, such as Yelp and Foursquare, it is TripAdvisor that seems to lead in review density and internet users' trust, with one billion reviews and opinions in the month of February 2022 (TripAdvisor, 2022). In relation to the academic analysis, Xiang et al. (2017) found that, regardless of the weaknesses shared by TripAdvisor with other online sites, it has in its favor a large number of reviews, a diversity of views and a lower level of polarization. For Filieri et al. (2015), the perceived trust in TripAdvisor is also the product of the strategies of this platform to strengthen the reliability of the content generation processes.

In addition to publishing an account of the dining experience, TripAdvisor also asks you to rate it with a number of stars to guide other visitors' choices.

The textual content of the review, which portrays tangible and intangible aspects of the experience, expresses feelings and emotions to arouse positive or negative inclinations in readers seeking to live a similar experience in the same restaurant (Lak & Turetken, 2017; Pezenka & Weismayer, 2020). This is precisely what we seek to emulate with sentimental polarity of the review at the mass level through computational linguistics and text mining (Cambria et al., 2017), with results congruent with overall star ratings for some authors and not others (Barbierato et al., 2021; Gan et al., 2017). In practical terms, although TripAdvisor claims that about 40% of its visitors chose the restaurant after reading the reviews and only 20% did so influenced by the star rating (TripAdvisor, 2021), for other studies this incidence is complex, combined and dependent on the valencies of the text and the star rating (Gan et al., 2017; Hu et al., 2014). In this sense, taking into account that the most used filter to initiate a search process is equal or higher than four stars, ReviewTracker (2021) illustrates well the complexity and the "cruelty" of resorting to a filtering based on the star score, used by 70% of the interviewees.

Online reviews, quality, satisfaction and intentions

As in the lodging and service literature, gastronomic marketing has traditionally considered perceived quality, satisfaction and intentional consumer behavior as fundamental to theoretical reflection and industry practice (Cronin et al., 2000; Erkmen, 2019; Muskat et al., 2019). In this context, perceived food quality is an irrefutable predecessor of diner satisfaction, which, in turn, conditions loyalty to the visited establishment and the use of word-of-mouth (wom) promotion to family and friends (Björk & Kauppinen Räsänen, 2017; Muskat et al., 2019; Toudert & Bringas, 2021). These considerations find in the e-wom of online reviews a scaling of the target audience compared to the conventional wom subscribed in a restricted circle of acquaintances (Gottschalk & Mafael, 2017). Indeed, in addition to reviews being instantly available when needed, for King et al. (2014) e-wom is an anonymous, emotional, and community-serving referent. These aspects usually increase the communicational value; for the sender, the e-wom reflects, explicitly or implicitly, a frank or diluted polarity (negative or positive) vis a vis the reviewed establishment (Kim et al., 2016; Kirilenko et al., 2021). This same polarity generally translates facts present in the different parts of the review relating -among others- to constructs, as in the case of quality

gastronomy, quality of services and accommodations, satisfaction and future intentions, which allow a bridge to conventional knowledge in gastronomic marketing (Gan et al., 2017; Pezenka & Weismayer, 2020; Vu et al., 2019).

In addition to paving the closest path to consumer satisfaction and loyalty, perceived gastronomic quality often occupies a transcendent place in the diner's expectation and, above all, is a primary condition for a satisfactory gastronomic experience (Björk & Kauppinen Räsänen, 2017; Muskat et al., 2019; Toudert & Bringas, 2021). A favorable perception of food quality as a whole turns a satisfied diner into a devoted promoter of the visited establishment, whereas a negative appreciation usually generates a neophobic attitude towards the gastronomic offer (Ting et al., 2016). Under this perspective and other considerations, such as those mentioned by Ho et al. (2020) and Toudert and Bringas (2021), food quality appears as a construct of a multidimensional complexity, characterized by the diversity of its components and the logics of compensation between them. Thus, for this study, a gastronomic quality construct structured by the following dimensions is proposed: quality of food content, food experience, menu variety and food quality, components that were used and validated in previous research (Björk & Kauppinen Räsänen, 2017; Chang et al., 2006; Toudert & Bringas, 2019, 2021; Tsai & Wang 2017; Wei & Huang, 2013).

For a satisfied diner, the quality of the accommodation and services expresses a pronouncement vis a vis the interaction with the staff of the visited establishment and the perception of the atmosphere and physical environment, two dimensions that often stimulate emotions and lived experiences (Kim et al., 2022; Wu, 2013; Wei et al., 2013). These dimensions are broadly related to satisfaction and are determinants of intentions to return and recommend the visited establishment (Cronin et al., 2000; Wu, 2013). The same importance clearly stands out in online reviews, as evidenced by Gan et al. (2017) and Pezenka and Weismayer (2020), where services and ambience are recurrent themes of authors with a significant incidence on both star rating and sentiment polarity. This perspective, inscribed in a context of a pleasant gastronomic experience, also tends to reinforce, for a tourist diner, satisfaction and their intentions to consume in the destination visited (Toudert & Bringas, 2019, 2021). This explains, to a reasonable extent, why the restaurant industry and destination management entities (dmos) will have to pay more attention to highlight and stimulate the articulation of local gastronomy with the other tourism products of the destination (Kim et al., 2022; Tsai & Wang, 2017).

Gastronomic reviews in times of quarantine

As a consequence of the spread of the COVID-19 disease, the decision was taken to apply a strict quarantine throughout Mexico as of April 1, 2020, which resulted, for the restaurant industry, in the limitation of the activity only to the delivery of take-out food (Diario Oficial de la Federación ([DOF], 2020a). This drastic measure for the profession came to ratify the fact that the number of customers had been decreasing significantly during the previous weeks due to fear of the pandemic.

For a restaurant industry, which has 13,776 establishments in the state of Baja California and provides 126,594 jobs (Instituto Nacional de Estadística y Geografía ([INEGI], 2020), closing suddenly translated into millions of dollars in losses and the cancellation of thousands of jobs (Grupo Interinstitucional de Investigación (GDI, 2020). The reopening as of June 1, 2020 was granted under the conditions of the new normality with the application of prevention measures according to a weekly endemic traffic light that limited the capacity of customers to 25% of the capacity in red, 30% in orange, 50% in yellow and 85% in green (DOF, 2020b). With these new measures, restaurant activity was reinitiated in a fluctuating dynamic of on-site consumption that would reach its first week of green traffic light until February 21, 2022. The return to the activity was carried out in the framework of a reconversion

-among others - of working conditions and hygiene, atmosphere and physical environment, to receive and treat diners (Kostromitina et al., 2021; Luo & Xu, 2021). The changes that occurred in the industry during the pandemic were reflected in diners with disparate behaviors in *rating* and review writing. Indeed, the consequences of the pandemic seem to reduce sensitivity to the discomfort experienced, sometimes leaving discrepancies between a positive *rating* and a nuanced sentiment in the written text (Barbierato et al., 2021; Luo & Xu, 2021). The opposite was also documented in diners prone to express negative opinions due, according to Jia (2021), to a context of social uncertainty accompanying the perceived pandemic risk. In another record, Kostromitina et al. (2021) corroborated that perceived shortcomings in the implementation of anti-

COVID-19 measures were prone to negative reviews and stubbornness not to recommend the establishment visited. However, eating in a restaurant is not a trivial act; it is often a source of pleasure, enjoyment and interaction (Björk & Kauppinen Räsänen, 2017; Toudert & Bringas, 2021). After a long quarantine, people longed for an encounter with the referents of a life social, normal and tolerant.

Data and Research Methodology

Data Collection

The restaurant reviews involved in this study were extracted from the TripAdvisor website of establishments located in the coastal region of Baja California, which includes the municipalities of Ensenada, Rosarito, Tecate and Tijuana. These municipalities are part of the border region with the state of California, in the United States, which contributes substantially to the success of the local gastronomic proposal in Baja California (Toudert & Bringas, 2019, 2021).

The collection of the reviews was carried out in two steps. First, we identified the establishments involved in this study and then proceeded to collect the reviews along with other related data. Considering the technical difficulty in processing different languages (Kirilenko et al., 2021; Ruder, Ghaffari & Breslin, 2016) and that the diversity and authenticity of the reviews often depend on their density (Ayeh et al., 2013; Gavilan et al., 2018; Mayzlin et al., 2014), the 201 restaurants with more than 30 reviews in Spanish were selected in this study.

For the selection of the restaurants that would participate in the study, it was decided to choose, from the TripAdvisor site, those that had a record of more than 30 reviews in Spanish. Based on these two criteria, a list of 201 restaurants was generated with the characteristics of the reviews and star ratings shown in Table 1. The criteria that supported this choice obey two different considerations: a subjective and arbitrary one that suggests that the diversity and authenticity of comments depend on the density of reviews per restaurant (Ayeh et al., 2013; Gavilan et al., 2018; Mayzlin et al., 2014), while the second is objective and has to do with the difficulties of data mining to process content from two or more languages (Kirilenko et al., 2021; Ruder, Ghaffari & Breslin, 2016). Under this perspective, we proceeded to collect an extensive list of restaurants located in the study region and, from this universe, we chose those that met the two criteria mentioned above.

Once the list of restaurants was obtained, which is characterized in Table 1, we proceeded to collect the reviews related to each of the 201 establishments chosen.

Table 1. Star ratings and reviews of the restaurants involved.

	Abs	%	Average restaurant score	Total reviews
Characteristics by municipality				
Ensenada	69	34.33	4.25	8001
Rosarito Beaches	27	13.43	4.46	4534
Tecate	6	2.99	4.58	568
Tijuana	99	49.25	4.26	12127
Features per restaurant				
<i>Premium</i> casual	12	5.97	4.54	2700
Family style	20	9.95	4.40	2452
Pop casual	147	73.13	4.47	16626
Fast food	18	8.96	4.42	2424
Buffet	4	1.99	4.38	1028

During the previous stage, a total of 25,230 reviews were collected and integrated into a database. With this information, two data sets were generated. The first extends over a period of 21 months prior to the pandemic and the other, of equal length, corresponds to the period during the confinement and restrictions on socio-economic activities in the state of Baja California. The governmental decision to suspend in-person consumption in restaurants was applied on April 1, 2020 (DOF, 2020a). With the application of the 21 months before and after, the period before the pandemic starts from July 1, 2018 and the period during the pandemic ends on December 31, 2021, which corresponds to the start of data collection. However, it is important to clarify that the initial drastic restrictions were revised as of June 1, 2020, both for the quota of persons and for the other prevention measures, according to a weekly endemic traffic light (DOF, 2020b).

Based on a 21-month split for each of the two compared periods, we proceeded with the collection of reviews generated before the pandemic (July 1, 2018 to March 31, 2020) and during the pandemic (July 1, 2018 to March 31, 2020) and during the pandemic (July 1, 2020 to March 31, 2020).

April 2020 to December 31, 2021), which yielded 4,508 and 1,538 records, respectively. For each of the selected records, in addition to the title and textual content of the review, other contextual, personal and productivity variables of the author were collected (see Table 2). Table 2 contextualizes, according to their availability in the original reviews, the geodemographic, gender and productivity characteristics of the data involved in the study.

Table 2. Statistics of the reviews involved in the study.

Genre	%	Residence	%
Men	14.56	Baja California, Mexico	33.51
Women	7.12	Rest of Mexico	21.70
Not specified	78.32	California, USA.	3.98
Age classes		Rest of U.S.	2.67
13-17	0.02	Others	0.20
18-24	0.69	Not specified	37.94
25-34	3.29	Contribution level	
35-49	6.80	1	6.87
50-64	2.67	2	9.66
65 and over	0.82	3	17.82
Not specified	85.71	4	12.41
TripAdvisor Membership		5	10.31
Before 2010	9.71	6	14.68
Between 2011-2018	63.25	Not specified	28.25
As of 2019	27.04	Number of reviews considered	6,046

Textual processing of reviews

The data involved in this study were collected by means of an R *script* using the "rvest" library (Wickham, 2021). First, the authors' urls were collected from the TripAdvisor pages of the selected restaurants, and then the information inherent to each of the authors was collected. The collected data were organized in a relational database and the textual information from the title and content of the reviews was subjected to a combination of cleaning and preparation treatments. The textual information was subjected to the removal of unconventional spaces and punctuation, to the structuring of the

paragraphs and removal of *emojis* that are difficult to detect by the sensitivity of text mining in general and sentiment analysis in particular (Aggarwal & Zhai; 2012; Surikov & Egorova, 2020). This was followed by the removal of commonly used words ("the", "a", "and"), grammatical tagging (identification of words as verbs, adjectives and adverbs) and reversion from uppercase to lowercase. The resulting textual corpus was then subjected to a lexicon creation procedure consisting of transforming the text into a list of words characterized by number of characters, count and frequency (Garnier & Guérin-Pace, 2010). A semi-supervised lemmatization process was applied to the list of words obtained, which made it possible to achieve groupings of word segments (such as grouping, under the root of "recommend", the words "recommend", "recommend", "recommend") (Lebart et al., 1997; Tellez et al., 2017). Then, we proceeded to the thematic and cognitive construction of repetitive segments of words identified by their frequency of association and their semantic context. The obtained segments were manually relocated into 5 constructs of 10 dimensions: food quality (quality of food content, food experience, menu variety, food value), service quality and hospitality (quality of ambience, quality of service), satisfaction (restaurant satisfaction, destination satisfaction) and future intentions (loyalty and recommendation). Each of these constructs and their respective dimensions were characterized by their frequency in the textual corpus and related individually to their respective reviews. Similarly, a relational link was established between the constructs and their dimensions with nominal variables in the database, such as the star rating on TripAdvisor.

Sentiment analysis and scoring

In order to ascertain the impact of the constructs and their dimensions on the textual sentiment analysis score before and during the pandemic, we initially proceeded with the generation of this indicator, retaking the textual corpus preprocessed in the previous stages. Thus, the textual corpus obtained in the previous stage was subjected to sentiment analysis using semantic tools from *Lexalytics*, an efficient application for dealing with long content that combines natural language processing (NLP) and machine learning techniques (Lexalytics, 2018; Pezenka and Weismayer, 2020). The procedure consists of four phases: the reduction of the textual corpus into its constituent parts, the location of the parts that link sentiments, the assignment of a score between -1 (very negative) and 1 (very positive) to each of these parts, and finally, the combination of the scores obtained when the

analyzed textual unit admits several expressed sentiments (Lak & Turetken, 2017; Yu, Rita, Moro & Oliveira, 2021). In general terms, this assignment is based on sentiment libraries and rules that allow examining texts in native Mexican Spanish, granting a numerical score qualitatively interpreted in three modalities: negative, neutral and positive.

The validation of the sentiment polarity obtained with Semantria was performed, as suggested in Lak and Turetken (2014) and Pezenka and Weismayer (2020), through cross-checking with the overall TripAdvisor star rating given by the author. In this sense, the harmonization between a five-category Likert scale of the TripAdvisor rating with the three of the Semantria sentiment polarity was carried out following the proposal of Pezenka and Weismayer (2020), which consists of adding the two lowest (10 and 20) and highest (40 and 50) ratings of the rating to match the negative and positive polarity respectively, naturally keeping the level 30 rating equivalent to a neutral polarity. Supported by a strong proportion of the high rating (84.43%) that tends to show a strong correlation with machine-determined sentiment polarity, the crossover exhibited a well-rated rate of 91.77%, a high efficiency compared to the 61.17% found by Pezenka and Weismayer (2020) (see Table 3).

Table 3. The crossover between star rating and sentiment polarity.

Polarity of feelings	Tripadvisor star rating (%)					Total
	10	20	30	40	50	
Negative (+1)	2.47	1.90	1.51	0.64	0.84	7.37
Neutral (0)	1.63	1.31	2.97	5.26	10.06	21.23
Positive (-1)	0.40	0.54	2.84	13.57	54.05	71.40
Total	4.50	3.76	7.32	19.48	64.95	100

Differences and impacts before and after the pandemic

Due to the lack of normality in the distribution of the data analyzed, the nonparametric Mann-Whitney U test at a significance level of $p < 0.05$ was used to verify whether or not the monthly means of the number of referrals are equal for the two independent groups, before and during the pandemic (see Table 4).

From another perspective, the impact of the constructs and their dimensions on the machine-determined sentiment polarity score was estimated using a multiple regression with independent variables coded as *dummy* variables. First, reviews were separated into positive and negative according to the TripAdvisor star rating, reclassified on a Likert scale of three (negative, neutral and positive).

This was achieved by assigning a value of 1 to a positive review and 0 to the others (negative and neutral) to characterize the positive effect block. Using the same logic, the negative effect block was defined by assigning a value of 1 to the negative review and 0 to the others (positive and neutral). Regression processing was performed by dividing the two blocks of data previously determined into positive before and after the pandemic and negative before and after the pandemic (see Figures 1 and 2).

Results

The restaurants selected for the study are mostly located in Tijuana and Ensenada, which dominate the gastronomic offerings, accounting for nearly 84% of the establishments selected. The vast majority of the restaurants selected are of the *pop* casual type (73.3%), followed at a distance by family style (9.95%), fast food (8.96%), *premium* casual (5.95%) and, finally, buffet style (1.99%) (see Table 1). The average TripAdvisor star rating by municipality yields close figures and seems to be subject to a dynamic in which a higher participation corresponds slightly to a lower *rating*. The same indicator by type of restaurant suggests a higher valuation of the *premium* casual offer, followed successively by pop casual, fast food, family style and, finally, the buffet type.

Considering that the capture of authors' personal information on TripAdvisor is not systematic, the statistics in Table 2 are indicative. In the universe of authors who captured their information, men are twice as numerous in publishing, and the age ranges of 25-64 years are the most prolific. For the most part, the authors involved in the study are registered with TripAdvisor between 2011 and 2018 and, overall, have a contribution level equal to or greater than three. Just over half of the authors are Mexican and less than half are residents of the state of Baja California itself, with the neighboring state of California contributing about 4% (7% with all other U.S. states).

The variation in the volume of reviews during the pandemic was almost -49.12% with respect to the pre-pandemic period, while negative reviews of the pandemic were -49.12% higher than in the pre-pandemic period.

TripAdvisor star ratings grew by 43.87%, neutrals decreased by -1.96% and positives did the same with -6.01%. In relative terms, the balance before and during the pandemic exhibits a drastic reduction in the publication of reviews accompanied by a degradation in diner appreciation.

Star rating of constructs and dimensions

The variation of the TripAdvisor star rating of the constructs and their dimensions before and during the pandemic clearly shows, in Table 3, a bipolar behavior, opposing the negative ratings (10 and 20) to the other polarities. Indeed, as far as the negative *rating* (10 and 20) is concerned, except for the satisfaction construct and its dimension of satisfaction with the restaurant, which exhibit significant differences before and during the pandemic ($p < 0.05$), for all other constructs and their dimensions, the compared periods are quite similar. For the neutral and positive polarities, all the constructs and their dimensions analyzed showed significant differences for the period before and during the pandemic. From another perspective, regardless of the polarity of the *rating* recorded, everything seems to indicate that the period before the pandemic had a greater incidence on the constructs and their dimensions, although this effect was generally not significant for the negative polarities.

Table 4. Mann-Whitney U test for constructs and dimensions

TripAdvisor star rating	10	20	30	40	50
Constructs					
Food Quality (FQ)	22.08/18.93 NS	22/14.13 S	28.64/9.92 S	30/10 S	32/10 S
Quality of service and hospitality (SHQ)	23.45/17.55 NS	19.90/16.75 NS	26.31/12.64 S	29.69/10.34 S	32/11 S
Satisfaction (SAT)	24.23/16.77 S	22.55/13.44 S	27.71/11 S	30/10 S	32/11 S
Future intentions (INT)	22.90/18.10 NS	20.68/15.78 NS	26.95/11.89 S	29.55/10.50 S	31.83/11.17 S
Total	24.48/18.52 NS	27.21/1579 S	31.52/11.48 S	32/11 S	32/11 S
Dimensions of Food Quality (FQ)					
Quality of content food (FCQ)	18.88/22.13 NS	20.75/15.69 NS	27.40/11.36 S	30/10 S	32/11 S

Food experience (FE)	22.45/18.55 NS	20.13/16.45 NS	27.93/10.75 S	29.40/10.66 S	32/11 S
Menu Variety (MS)	21.50/19.50 NS	18.80/18.13 NS	22.14/17.50 S	26.50/13.87 S	30.02/12.98 S
Food value (FV)	21.83/19.18 NS	19.77/16.91 NS	25.38/13.72 S	29.07/11.03 S	31.69/11.31 S
Service quality and hospitality (SHQ)					
Environmental Quality (EQ)	20.50/20.50 NS	117.20/20.13 NS	24.26/15.03 S	29.02/11.08 S	31.11/11.05 S
Service Quality (SQ)	23.50/17.50 NS	20.73/15.72 NS	25.67/13.39 S	29.26/10.82 S	39.90/11.10 S
Satisfaction dimensions (SAT)					
Satisfaction with the restaurant (SATR)	24.23/16.77 S	22.78/13.16 S	27.76/10.94 S	30/10 S	32/11 S
Destination Satisfaction (SATD)	20/21 NS	18.38/18.66 NS	22.50/17.08 S	25.02/15.50 S	27.14/15.86 S
Dimensions of future intentions (INT)					
Loyalty (LOYAL)	23.13/17.88 NS	20.02/16.59 NS	26.26/12.69 S	27.98/12.24 S	30.60/12.40 S
Recommendation (RECO)	21.65/19.35 NS	20.08/16.53 NS	25.19/13.94 S	29.50/10.55 S	31.40/11.60 S

Mean rating before/mean rating during. S: Significant at $p < 0.05$. NS: Not significant at $p < 0.05$.

Impact of quality and intentions on star ratings

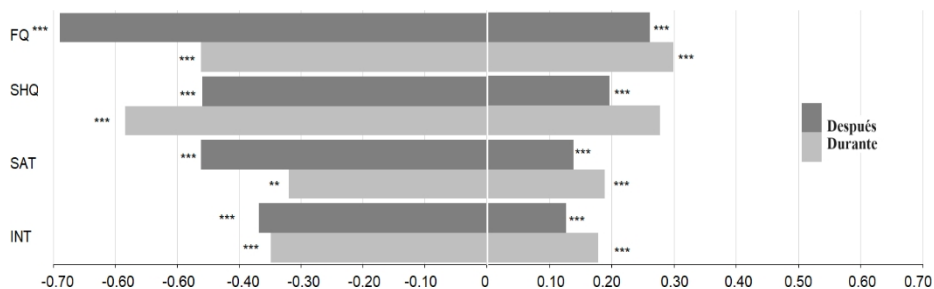
The impact of the constructs and their dimensions on the machine-determined sentiment score was found to be significant in all cases ($P < 0.01$) for both periods analyzed. Positive reviews during the pandemic had a slightly higher impact compared to the previous period for all the constructs analyzed. Overall, the diachronic evolution seems to exhibit a greater impact on service and hospitality quality (SHQ) in favor of the period during the pandemic. Comparatively, the food quality construct (FQ) had a greater impact before and during the pandemic, followed by service quality and hospitality (SHQ) and, finally, satisfaction (SAT) and future intentions (INT) with almost identical behavior.

From the perspective of negative reviews, except in the case of service quality and hospitality (SHQ) which exhibited the greatest impact on the sentiment score during the pandemic, the other constructs had incidences

high during the pre-pandemic period. The difference in impact between the two periods compared is greater for food quality (FQ) and satisfaction in favor of the pre-pandemic period and for service quality and hospitality (SHQ) during the pandemic. Comparatively, it is food quality (FQ) that has the highest impact on the negative sentiment score, followed successively by service quality and hospitality (SHQ), satisfaction (SAT) and future intentions (INT).

Taking into account the impact on the polarities, the highest incidence on the sentiment score is registered, as Figure 2 indicates, in the negative reviews. The difference is a little more than twice in favor of the construct that has the greatest impact on negative reviews (food quality) compared to the equivalent construct in positive reviews (food quality).

Figure 1. Impact of constructs on the sentiment score.



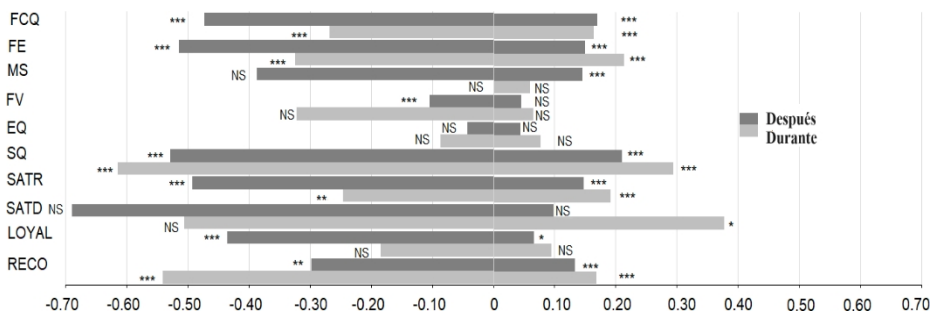
*** Significant at $P < 0.001$. ** Significant at $P < 0.01$.

The incidence of some dimensions analyzed, as in the case of environmental quality (EQ), was non-significant before and during the pandemic for both positive and negative reviews (see Figure 2). Examples of other dimensions that were non-significant in the block of positive reviews before and during the pandemic include food value (FV), for before, satisfaction with the destination (SATD) and, for during, loyalty (loyal). For the same block, the other dimensions were significant before and during the pandemic. In the field of negative reviews, only the menu variety dimension (ms) was not significant for both periods analyzed.

The dimensions that were non-significant only before the pandemic were satisfaction with destination (SATD), while food value (FV) and loyalty were non-significant during the pandemic. For the positive block, the strongest incidence in the sentiment score was in the positive block. coughing occurs during the pandemic with the satisfaction with destination (SATD) dimension.

followed successively by service quality (SQ), menu variety (ms) and the others. For negative reviews, the most important significant occurrences were before the pandemic successively with service quality (SQ), food experience (FE), food content quality (FCQ) and others, while during the pandemic they were service quality (SQ), recommendation (reco), menu variety (ms), food experience (FE) and others.

Figure 2. The impact of the dimensions on the sentiment score.



*** Significant at $P < 0.001$. ** Significant at $P < 0.01$. * Significant at $P < 0.05$. NS Not significant.

Discussion of results

Compared to the same period before the pandemic, the number of published reviews plummeted by about 50%, suggesting an increase in negative scores to the detriment of positive and neutral scores. In general terms, these findings are consistent with those found in the city of Shanghai, China, by Jia (2021), who noted, during the pandemic, a decrease in restaurant patronage, a predisposition to give low ratings and to spend less. However, Luo and Xu (2021) found that, between January and June 2020, the *rating* of five U.S. cities leaned strongly toward higher ratings, even though it coincided with the decline in the number of reviews. Indeed, if the fall in the number of reviews can rationally be attributed to the social constraints of the pandemic, the contradictory dynamics of the *rating* call for other behavioral explanations. For Jia (2021), the downward trend in the *rating* is due to social uncertainty and risk perception, while the observed rises may be the product of inherent differences in each national and regional context, as mentioned in Nakayama and Wan, 2019. With regard to these differences, it is perhaps important to remember that the weight of quarantine and

the socioeconomic effects of the pandemic were not the same for the cities studied so far. However, in order to reposition the discussion in its proper measure, it is useful to take into account the neutralization effect between negatives and positives, especially when the published volume is largely dominated by positive reviews (Pezenka and Weismayer, 2020).

From the perspective of the constructs and their dimensions involved in the analyzed reviews, the distribution of the *rating* hints at a dual dynamic before and during the pandemic. In full or partial agreement with previous works by Gan et al. (2017), Kim et al. (2016), Kostromitina et al. (2021), Pezenka and Weismayer (2020) and Zhang et al. (2014), the constructs and dimensions seem related to a different *rating*, supported by topics of decreasing reference according to the following order: food quality, service quality and hospitality, satisfaction and, finally, future intentions. Thus, a review that begins with the narration of food quality does not necessarily follow with the author's dining experience and future intentions. From this perspective, the re-signs do not seem to conform a causal marketing model, exhibiting rather implicit referents replete with insinuations and allusions intended to influence the readers' decision. Next to the reviews, the dominant star rating, with both neutral and positive aspects, expresses the explicit side of the diner, which generally tends to agree with the meaning of the published text.

In addition to conforming to the comments above, the neutral ratings (30) and positive (40 and 50) of the analyzed constructs and their dimensions appear predictable through a significant difference before and during the spread of COVID-19. The tendency to give a more positive rating for the period prior to the pandemic reflects the typically expected behavior in the face of the constraints and deficiencies that impacted the supplier-commensal relationship during the epidemic. In contrast, the negative rating situation was similar for both periods on the very negative (10) side, while on the negative (20) side, only food quality, satisfaction and its dimension of satisfaction with the restaurant were rated differently between the two periods. For these latter items, the authors seem more inclined to rate them more negatively during the pre-pandemic period. In this sense, if there was an increase in ratings during the pandemic, as described by Luo and Xu (2021), this possibility would not extend to all of the items analyzed, as in the case of service quality and hospitality, even though, according to Byrd et al.(2021), it was one of the factors most disturbed by the pandemic.

From another perspective, the incidence of the negative sentiment block is more important in the absolute value than in the positive one, with a decreasing distribution by constructs in conformity, as far as the coincident themes are concerned, Gan et al.

(2021) and Pezenka & Weismayer (2020) (see Figure 1). Comparatively, the constructs analyzed during the pandemic had a slightly greater impact on the positive polarity, while in the star rating, the authors rated the pre-epidemic period more positively. For the negative block, agreement is particularly confirmed for the constructs of food quality and satisfaction, which had a greater impact before the pandemic in both rating systems. In summary, these small discrepancies between star rating and sentiment rating that were observed, among others, in Barbierato et al. (2021), Gan et al., (2017) and Luo and Xu (2021), were attributed to human, technical or contextual factors that may also be influencing the case of this study.

Breaking down the significant incidence of the constructs in the sentiment score to their constituent dimensions, food content quality, food experience, service quality, satisfaction with the restaurant, loyalty (during the pandemic), and recommendation emerge as the most impactful in both polarity blocks.

To these dimensions, we add menu variety (pre-pandemic), destination satisfaction (during pandemic) for the positive block of the sentiment score, and food value (pre-pandemic) for the negative block. Some of these dimensions, such as destination satisfaction, loyalty, and recommendations, are topics that may come to complement the picture, as evidenced in previous studies, including Gan et al. (2017) and Pezenka & Weismayer (2020).

The intensity of the significant impact on the sentiment score is another finding of interest. In the positive block, satisfaction with the destination has the highest incidence, followed by service quality and food experience during the pandemic. For the negative block, it is service quality that leads this incidence during the pandemic, followed by the same dimension before the pandemic, and the third place is occupied by food experience. From this perspective, satisfaction with the destination, which seems to stand out with a higher positive incidence during the pandemic, can be explained by the exit of the quarantine and the return to a certain normality in circulation and social interaction, in a context of a high proportion of non-resident visitors to the state.

Theoretical implications

The approach that consists of converting the analyzed textual corpus into words and segments certainly presents virtues, but it is based on implicit referents of constructs and dimensions related to *marketing* and management

of hospitality. Indeed, a narrative segment such as "very tasty food," which refers to an explicit perception of quality, is assimilated to satisfaction and even an implicit manifestation of e-wom. In these types of analysis contexts, reducing semantic dispersion by adopting constructs and their dimensions is perhaps an important step toward reflection and action (Cassar et al., 2020; Gottschalk & Mafael, 2017; King et al., 2014).

In this study, the constructs and their dimensions highlight the relevance of a two-pronged approach to visualize the perception dynamics of authors during a crisis period. A temporal approach of before and during the pandemic, which is complemented by a logic of polarities of star rating and sentiment to examine online reviews, is rarely addressed as in Pezenka and Weismayer (2020). This undertaking quickly clarified that a textual corpus with topics of varying frequency is not comparable to a casual *marketing* model and, therefore, further reflection is needed to combine the analysis of online reviews with field surveys.

Beyond the differences resulting from the use of the star and sentiment scores, everything seems to indicate that the incidence of the constructs and their dimensions incorporates the neutralization between polarities, as was also evidenced for some similar topics by Luo and Xu (2021) and Pezenka and Weismayer (2020). This made it possible to evidence, in this study, that the constructs and their analyzed dimensions present some identical incidences and others dual, and different in the negative and positive blocks. Added to this aspect is the finding of constructs and their dimensions that are more positive or negative depending on the context in the blocks of polarities and temporal location (before or during the pandemic). In this sense, the behavior of the authors does not seem to be temporally static or predictable, alternating during the pandemic a critical side in the positive block and a more tolerant side in the other block. Within these dynamics, the dimensions of satisfaction with the destination, loyalty and recommendations stand out, among others, which are highlighted for the first time for their incidence in the polarities of the sentiment score, perhaps due to the border and touristic features of the study region, as indicated in Toudert & Bringas (2019, 2021). Furthermore, it is important to note that these findings open new lines of investigation and raise questions about how these constructs and dimensions may evolve in the future, especially in the context of an ever-changing pandemic. The interaction between authors and online reviews may be influenced by a number of factors, including public health policies, market trends, and technological innovations. Therefore, it is crucial to maintain a flexible and adaptive approach to understanding and responding to these dynamics. Of course, all these new findings will need to be validated in future research.

Practical implications

Considering the border location of the study region (Toudert & Bringas, 2019, 2021), the practical implications of this research acquire a scope that integrates actors and strategies from the tourism and hospitality sectors. This approach allows for a broader and more holistic view, recognizing the interconnection between these sectors and the importance of a coordinated strategy.

The predominance of positive *ratings* continually drives the need to strengthen traditional management and develop skills that facilitate effective interaction with social media, especially reviews. In this context, it is crucial not only to respond to reviews, but also to learn from them and use them as a tool for continuous improvement. These tasks, common to all food providers, can be coordinated between the destination promotion organization and the restaurant industry, mainly in terms of training and social media analysis services (Mirzaalian & Halpenny, 2021). This collaboration can result in greater cohesion and efficiency in responding to reviews, and improving service quality.

There are several topics of interest for training, such as the development of strategies and skills for the creation of online content and, in particular, the acquisition of skills to respond, in a personalized way, to reviewers, an essential activity, according to Pantelidis (2010), for the survival of the business. In addition, it is important to emphasize that continuous training and adaptability are key in today's constantly changing environment. Another aspect of training interest is the creation of staff training opportunities to improve the perception of food and service quality during the pandemic, two issues of great impact on both positive and negative reviews. In this regard, it is crucial to focus not only on improving quality, but also on effectively communicating these improvements to customers. Complementing training actions with the delivery of thematic and contextual analysis reports of reviews can promote the planning and design of collective strategies. These reports can provide valuable insight into emerging trends and areas for potential improvement. However, none of the above actions can substitute for owners and managers in the investigation of reviews and their authors, incorporating gender, age and geographic location with their respective contextual differences into feedback strategies. This inclusive and diverse perspective can help to ensure that feedback strategies are effective and resonate with a wide range of customers.

The interaction between lodging and tourism activities in the study region is reflected in the authors' satisfaction and future intentions as evidenced by the star rating and sentiment polarities reflected in the content. This valuable *feedback* can be used to inform and guide future strategies and decisions. The relative relaxation of pandemic protection measures appears to favor the linking of culinary offerings with destination-focused tourism products such as scenery, recreational activities and urban tours. This change in consumer behavior presents an opportunity for food providers and tour operators to collaborate and create integrated and memorable experiences for visitors. In this context, it is advisable to act on the factors influencing e-wom, which appears to be strongly affected in the negative block during the pandemic. This proactive approach can help mitigate the negative impact and take advantage of opportunities for improvement and growth. From this perspective, in addition to driving improvements primarily in service, food content and quality of experience, it is perhaps a good time to reward loyalty and incentivize recommendation with tangible rewards. These rewards can take many forms, from discounts and special offers to recognition and exclusive privileges. Strategies can include the use of coupons and vouchers, access to VIP areas and offers to enhance the dining experience at the visited establishment. These strategies can help foster customer loyalty, increase satisfaction and enhance positive e-wom.

Limitations and future prospects

It is possible that some of the results of this study are a product of the border tourism context that specifically defines the study region. This geographic and cultural particularity may influence the perceptions and experiences of visitors, which, in turn, is reflected in the reviews they leave. Therefore, its extrapolation to other contexts should be validated through future research. This implies the need for comparative studies in different regions and contexts to better understand the universality or specificity of these findings.

To a large extent, the impact that the destination appears to have on the positive sentiment score segment during the pandemic is an area that could be further explored. This could involve a more detailed analysis of how specific destination characteristics, such as its response to the pandemic or its tourist attractions, may influence visitor reviews. In addition, it could be useful to analyze reviews in English, a language commonly used by a significant flow of U.S. tourists and day-trippers. This analysis

could provide a more complete picture of the perceptions of this important group of visitors.

Despite the progress made in natural language processing and machine learning techniques, we believe that there is still a long way to go to achieve an efficient connection between the constructs and their dimensions with the word segments derived from text mining. This implies the need to further refine and improve these techniques to more accurately and completely capture the richness and complexity of online reviews. Furthermore, it suggests the importance of combining these computational approaches with a deep understanding of the contexts and human processes underlying these reviews.

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