Google Trends Search for Sex Reveals Change in Relationship Preferences in Post-Quarantine Periods in Chile

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ABSTRACT

The study investigated seasonal variations in mating behavior by analyzing the search for sex during the COVID-19 quarantine in Google trends. Causal impact analyses were used to examine the trends of Google keyword searches during the period in which the quarantine and post-quarantine period lasted in Chile, for topics related to mate preferences. Results indicated a consistent difference during the post-quarantine peaks of Google trends related to short-term and long-term mating behaviors. Such results complement research about the change in mating strategies from an evolutionary approach which predicted decreased a long-term investment during periods of uncertainty caused by the pandemic. We discuss the implications of this method to advance the comprehension the effects of pandemic on mating preferences.

1. Introduction

Life history theory states that all organisms, including humans, must make concessions in the allocation of resources based on ecological conditions of resource availability (Charnov, 1993; Roff, 2003; Stearns,1992). An evolutionary perspective predicts that these compensations trigger different short- or long-term mating strategies in humans, allowing for increased reproductive success in certain ecological niches (Buss, 2019). Economic recessions influence psychology and behavior (Ermer, Cosmides, & Tooby, 2008; Hill et al., 2012a ; Hill et al., 2012b; Van Vugt, De Cremer, & Janssen, 2008). In general, research shows that individuals who live in harsh environments marked by scarcity of ecological resources or economic recession have a decreased choice of a long-term mating strategy, due to the crucial role resources play in facilitating human offspring and investing in a fast reproductive endeavors (Chisholm, 1993; Roff, 2003; Stearns, 1992; Belsky, Schlomer & Ellis, 2012; Simpson et al, 2012). Research of previous economic recessions in which sex-specific income/capitalization

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strategies have been studied, showed that during crisis women increase their consumption of products that enhance their attractiveness to the opposite sex ("lipstick effect") compared to other types of products (Hill et al, 2012). This empirical evidence supports the evolutionary prediction that women will put more effort into ensuring a financially secure partner in an environment where long-term partners are scarce (Hill et al, 2012; Jennions & Petrie, 1997). In addition, marriage rates have been reported to plummet while people postpone reproduction during crises (Sobotka et al., 2011). For example, data show that in the pandemic peak of 1918 there was an immediate decline in fertility that was sustained by economic recession, unemployment, and uncertainty (Balbo et al, 2013; Wagner et al, 2020).

Consequently, mating strategies suffer a great impact when resources are scarce. Following this perspective, the COVID-19 pandemic is influencing these mating strategies and will have a profound impact on divorce and birth rates (Seitz et al.,2020). The coronavirus crisis triggered an economic recession in which budget constraints and resource consumption priorities (quotes) change (Seitz et al.,2020). In addition, it must be taken into account that social constraints limited by a virus, cause the distribution of resources to change strongly, so the resource budget that previously allowed for increased time and energy for social activities could be reduced considerably. These limitations, such as the fear of contracting the disease or public policy restrictions, may increase the cost of a short-term strategy, but this factor will not change the psychological motivations produced by the abrupt change in the amount of resources and a future period of uncertainty during a crisis. This is because the characteristics of COVID- 19 are not consistent with the presence of signs that generate negative emotions such as disgust (Seitz et al.,2020). Even if this was the case, Hatz and colleagues (2020) have studied sexual decisions with sexually transmitted diseases (ETS) and found that young people make rational decisions that minimize the possibility of infection and maximize physical attractiveness, and that these decisions are rational.

For this reason, we expected that people will prioritize short-term decisions related to sexuality over long-term relationships, which will recover when people may go out without restrictions again. To test this hypothesis, we first evaluated self-reporting of the words commonly used for short-and long-term motivations in online searches, and then assessed how these words change in periods of quarantine and post quarantine looking at Google keyword searching trends. In general, Google trends are useful for understanding certain behaviors that change over a period of time and predict different searching activities. This research includes political (Jun et al, 2016; Mavragani et al, 2016), disease tracking (Ginsberg et al., 2009; Nindrea et al, 2020; Yang, Huang, Peng, and Tsai, 2010), and seasonal preferences, where people often use the Internet as a means for finding potential partners and even to obtain sexual gratification (e.g., to find pornography, engage in prostitution, obtain romantic partners, etc.; Markey and Markey, 2013).

2. Materials and Methods

2.1. Participants

2.1.1. Sociodemographic Information

Participants answered sociodemographic questions including sex, age, relationship status, socioeconomic level, and sexual orientation, time you have been with your partner, number of relationships they have had in their lives and number of children.

2.1.2. Self-Reports

A total of 285 subjects participated in the study. All the participants resided in Chile. The mean age of participants was 26.274 (SD = 12.597) years. 23 were in a causal relationship 94 committed and 116 were singles. Everyone answered this question in their version for a committed relationship and for a causal relationship:

> *"Imagine an alien, who has never visited Earth, comes to your house and asks you how could you search for a committed relationship/causal relationship on Google? Write just one word that will present you with good search results."*

2.1.3. Google Trends

Participants for this study were any individuals residing in Chile who entered select keywords into the Google trends engine between January 2018 and November 2020.

2.2. Measurement of Google Trends for a Causal Impact Analysis

Causal impact analysis estimates the impact of an intervention on an objective time series, using untreated control series to construct a counterfactual condition, and to estimate the causal effect as the difference between observed values after intervention and control values (Brodersen et al., 2015). Specifically, the model allows the choice between candidate keywords, which are selected without reference to external characteristics and purely on the basis of how well they explain short- and long-term behavioral preferences before the quarantine and post-quarantine periods. Furthermore, the model was based on the Bayesian structural time series, adopting synthetic controls of words that do not participate in the incidence of time variations.

2.2.1. Short-Term and Long-Term Behavior Keywords

The results of the self-report show that 8.9% of the subject's associate love with a committed relationship and 15.1% relate the word sex to a causal relationship. The other percentages belong to words that do not match and empty spaces. Consequently, we analyze these two words in Google trends. Long term preferences refer to love and short term for sex respectively. It is worth mentioning that the word Tinder was repeated in both questions 20% and 47.1% respectively (The percentages were calculated with validly answered responses). These words were used in the causal impact analysis for evaluated to assess their change in the quarantine and post-quarantine periods.

2.2.2. Control Keywords

We follow the strategy of to Brodersen (2015) for construct a counterfactual based on available information. specifically, we use time series of words that do not reflect changes in the interventions we want to study, so we generate a set of candidate predictor variables with a keyword category. In general, we tried to choose word sets that have both self-reporting preferences such as "tinder" and word sets that do not have clear seasonal incidence (e.g., "wild", "specimen", "grade", "recording", "air"," hacker").

2.3. Causal Impact Analysis

We conducted three exploratory studies to evaluate the period of the quarantine on the search for the words sex and love in Google trends. In the first study we evaluated the effect of quarantine, and on the other two studies the effect of post quarantine periods. In general, we used data based on web searches, provided by Google Trends (s.f.) The words we searched for

were the reported choices by Chileans as short-term preferences for sex and long-term preferences for love. The treatment variable consisted of observations of the word sex and love in Google trends for the weeks from January 2018 to November 2020. The quarantine in Chile became effective on April 5 and the post-quarantine period became effective with the Chilean government's "step-by-step" plan, where there was a quarantine release and fewer restrictions to move around the country, on September 13th (Chilean information and restrictions due to COVID-19, s.f.). The causal impact model allows for choosing among candidate controls, which are selected without reference to external characteristics and based purely in terms of how well they explain the behavior of sex and love preferences prior to quarantine and post-quarantine periods. The model employs a synthetic control that is based on a combination of dates prior to the intervention, while an independent time series was also used with the word tinder, since the subjects in their self-report said that it represented both preferences. In addition, we compared these to the words that shouldn't be affected by the intervention as a control. In general, the model builds on the synthetic controls (control keywords, see 2.2.2) we used for the first two studies. For the third study we wanted to add a variable to the synthetic control that was correlated with our variables in study, such as it is the word tinder (love and sex with the word tinder present a Pearson correlation coefficient of 0.47 and 0.46, respectively)

We carried out tree causal impact analyses to estimate the influence of the quarantine and post-quarantine periods caused by covid-19, on the aggregate number of Google trends for sex and love in our area of interest. In our case, we consider two interventions for the analysis, respectively:

The week corresponding to April 5, 2020 is taken as the starting date for quarantine.

The week corresponding to September 13, 2020 is established as the change of phase or post-quarantine

The analysis of the causal impact was done with the statistical package "CausalImpact". The reproducible software codes. This package using a structural time-series models to estimate forecast without intervention and then it repeatedly generated data, as described above, under different true effect sizes. We then computed the posterior predictive distribution over the counterfactuals and recorded whether or not we would have concluded a causal effect, or in the other words, posterior probabilities of causal effect.

2.3.1. Quarantine Causal Impact Analysis

For visualizing the effect of the quarantine, we used the Google trends for sex and love from January 2018 to the week before the beginning of the quarantine April 5, 2020 as a control condition. The Google trends for sex and love did not decrease over time from January 2018 to April 2020, but only showed predictable seasonal patterns. Therefore, we estimated the causal impact of the quarantines (beginning as of April 5th) by comparing the counterfactual values represented by the Google trends of the control.

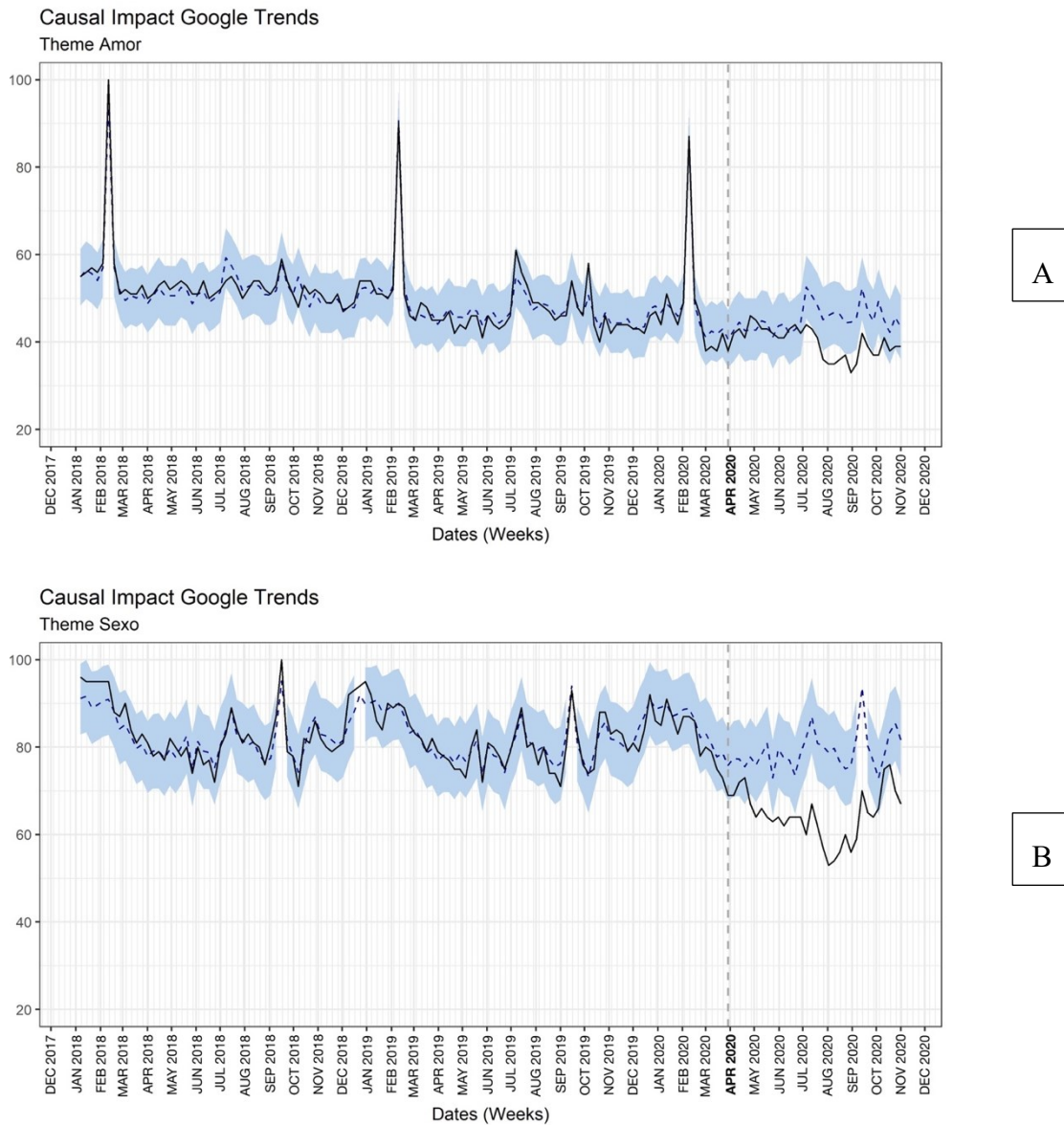### 2.3.2. Post-Quarantine Causal Impact Analysis

For estimating the effect of the post-quarantine period, we used the Google trends for sex and love from April 5, 2020 to the week before the start of the "phase change" or end of strict quarantine on September 13, 2020 as a control. The Google trends decreased over time from April 2020 to September 2020 (quarantine time). Therefore, we estimated the causal impact of the post-quarantine period (from September 13, 2020), comparing the counterfactual values represented by the Google trends of the control.

2.3.3. Post-Quarantine Causal Impact Analysis with Tinder

To see the effect of the post-quarantine period, we use Google trends for sex and love from April 5, 2020 to the week before the beginning of the "phase change" or the end of the strict quarantine on September 13, 2020 as a control. In addition, we added a time series of the word "tinder" as a control to the model. Google's trends decreased over time from April 2020 to September 2020 (quarantine time). Therefore, we estimated the causal impact of the post-quarantine period (from September 13, 2020) by comparing the counterfactual values represented by the quarantine Google trends.

3. Results

We found that the quarantine led to a reduction of the trend for the word love and sex in Google. Comparing the period after quarantine (April 2020) with the period before quarantine, the estimated reduction in searches for the word love are maintained in post-quarantine periods (during the confinement), and the word sex has an increase in searches, compared with the period after quarantine (September 2020). In relative terms, response values showed a decrease of the words love and sex in Google searches of 11% and 19% respectively in quarantine periods (Figure 1). In the case of post quarantine periods there was a difference in searches for love and sex. Specifically, love follows the trend present in quarantine with no significant changes ($p = 0.225$) in the post- quarantine causal analysis. In contrast, sex shows an increase in Google searches from the quarantine period to the post-quarantine period of 8.8% ($p = 0.005$). The 95% confidence interval of this percentage was [2%, 15%], which means that the increased effect observed during the post-quarantine period was statistically significant and it is unlikely to be due to random fluctuations. To corroborate this outcome, we conducted the third causal analysis study with the post-quarantine period by adding a counterfactual series with the word tinder. The results show the same positive effect exclusive of sex with a relative effect increase of 11% (see Table 1, column 3 "Post-quarantine tinder").

Figure 1: Causal impact analysis for the google trends for love (Fig 1a) and sex (Fig 1b) in quarantine
The shaded region surrounding the dotted trend line represents the confidence interval for counterfactual prediction. The vertical dotted line denotes the quarantine initiation, after which, the actual behavior (solid line) clearly moves outside the confidence interval.
Source: Authors with Causal Impact R Package

Table 1.
Causal impact results

Google trends		Quarantine		Post-quarantine		Post-quarantine tinder	
		Average	*Cumulative*	*Average*	*Cumulative*	*Average*	*Cumulative*
Love	Actual	41	1274	40	319	40	319
	Prediction (SD)	46 (1.2)	1434 (38.1)	41 (1.8)	330 (14.6)	41 (1.9)	324 (15.2)
	95% CI	[44, 49]	[1360, 1507]	[38, 45]	[301, 359]	[37, 44]	[294, 354]
	Absolute effect (SD)	-5.2 (1.2)	-160.1 (38.1)	-1.4 (1.8)	-11 (14.6)	-0.66 (1.9)	-5.26 (15.2)
	95% CI	[-7.5, -2.8]	[-232.5, -85.9]	[-5, 2.2]	[-40, 17.8]	[-4.9, 1.8]	[-34.8, 24.7]
	Relative effect (SD)	-11% (2.7%)	-11% (2.7%)	-3.3% (4.4%)	-3.3% (4.4%)	-1.6% (4.7%)	-1.6% (4.7%)
	95%CI	[-16%, -6%]	[-16%, -6%]	[-12%, 5.4%]	[-12%, 5.4%]	[-11%, 7.6%]	[-11%, 7.6%]
	Posterior tail-area probability	0.0002		0.22446		0.37106	
	Posterior prob. of a causal effect	99.97982%		78%		63%	
Sex	Actual	63	1996	68	541	68	541
	Prediction (SD)	78 (1)	2427 (33)	62 (2.1)	497 (17)	61 (2.2)	488 (17.7)
	95% CI	[77, 81]	[2364, 2492]	[58, 66]	[464, 531]	[57, 65]	[453,522]
	Absolute effect (SD)	-15 (1)	-461 (33)	5.5 (2.1)	43.7(17.0)	6.6 (2.2)	53.0 (17.7)
	95% CI	[-17, -13]	[-526, -398]	[1.7, 11]	[9.8, 77]	[2.4, 11]	[18.9,88]
	Relative effect (SD)	-19% (1.3%)	-19% (1.3%)	8.8% (3.4%)	8.8% (3.4%)	11% (3.6%)	11% (3.6%)
	95%CI	[-22%, -16%]	[-22%, -16%]	[2%, 15%]	[2%, 15%]	[3.9%, 18%]	[3.9%, 18%]
	Posterior tail-area probability	0.0001		0.00552		0.0012	
	Posterior prob. of a causal effect	99.98998%		99.44797%		99.87983%	

The "Average" column represents the average value of the Google trends after quarantine, post-quarantine, respectively. The "Absolute Effect" is determined as the difference between the predicted and actual value. The third column represents the value of the google trends after post-quarantine by adding tinder as a control series.

In general, we can say that the mating preferences assessed with the Google trends words changed during quarantine and post-quarantine periods. Our causal impact analysis reveals that in a quarantine period there is a negative impact on the metrics we collected, and that this impact is not maintained for sex in the post-quarantine period. To better illustrate these results, we can see that the word sex has a significant increase compared to the search for the word love in post-quarantine periods, even when adding a counterfactual search directly related to these two words such as tinder (Figure 2). The post-quarantine period, when mobility restrictions were dropped in the country, had a differential impact on Google search preferences for the word sex and love, and these preferences coincided with what people in Chile related to short- or long-term preferences. Consequently, the results of this study bring us closer to indirectly measuring the change in short and long-term preferences in a novel way.

These results offer a measured view of the consequences that the Covid-19 crisis may have on people's mating preferences and the impact it may have in the future. In the case of the analysis

of post-quarantine results, our current causal analysis cannot account for the possible subsequent impacts on birth rates and marriages, but it can be said that such interventions could plausibly contribute to the causal impact of the change in people's preferences that is not random.
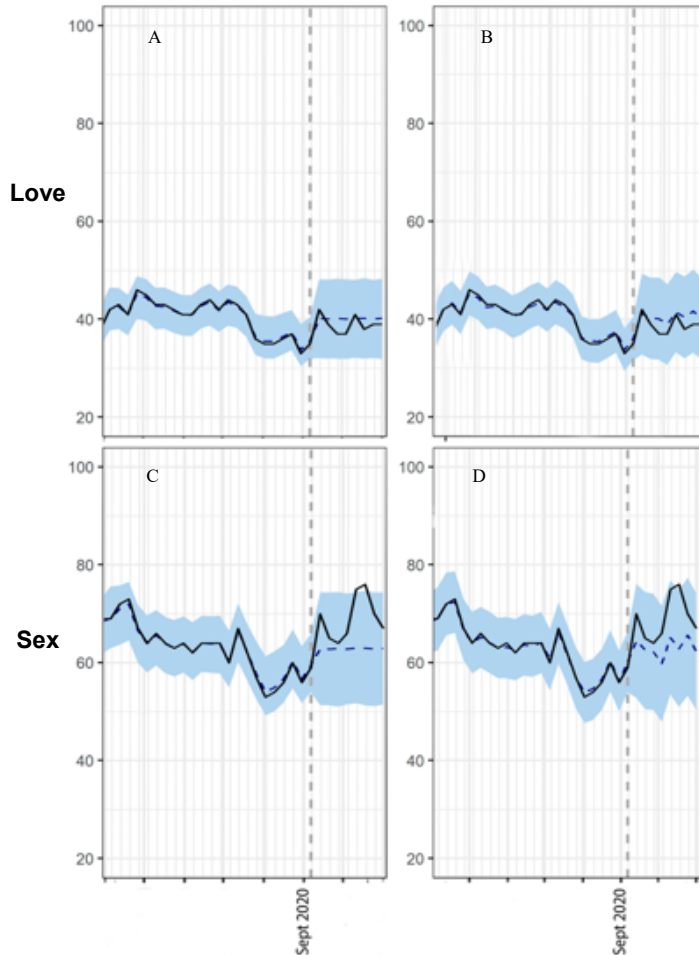

Figure 2: Causal impact analysis for the Google trends for love (Fig 1a and Fig 1b) and sex (Fig 1c and Fig 1d) in post-quarantine
Fig 1b and Fig. 1d represents the same post-quarantine analysis, but adding tinder as a control series. The shaded region surrounding the dotted trend line represents the confidence interval for counterfactual prediction. The vertical dotted line denotes the post-quarantine initiation, after which, the actual behaviour (solid line) clearly sex moves differently to the counterfactual.
Source: Authors Causal Impact Analysis in R Package.

4. Discussion

This report analyzes the impact of quarantine and post-quarantine during the last months of 2020 on the search for the words love and sex. The results obtained for the quarantine coincide with the literature suggesting a decrease on the search for sex in periods of confinement (Lehmiller et al., 2020, Li et al., 2020). The findings obtained for the post-quarantine period indicate that, according to the existing literature on the effects of economic instability and future uncertainty, this lead to short-term mating strategies, where casual sex could be an evolutionarily stable preference for achieving reproductive success in this type of environment. Undoubtedly, the social distance and stay-at-home orders stemming from the COVID-19 pandemic are affecting people's sex lives and choice for long-term relationships. It is

challenging to assess whether these changes will have a future impact on marriages, divorces, and births. This impact may be relevant to public policy measures related to sexuality precautions if sex is an increasing preference after quarantine. Our analysis of causal impact only tells us that there is evidence that the post-quarantine period has had a differential impact on the measures we collect. Nonetheless, it is not possible to identify unsearched external properties, which may also have played a role in causing the observed impact, such as marriage rates, birth rates, or other restrictive policies that may provide little motivation to search for these words. For this reason, this study is an initial step into analyzing what will happen after the pandemic with data from dating applications, rates of sexually transmitted infections, and self-reports, among others, to understand changes in mating behaviors when there are quarantine and post-quarantine periods.

In general, we can say that the mating preferences assessed with the Google trends words changed during quarantine and post-quarantine periods. Our causal impact analysis reveals that in a quarantine period there is a negative impact on the metrics we collected (love: p-value = 0.0002, sex: p-value = 0.0001), and that this impact is not maintained for sex in the post-quarantine period (increase 5.5 points with p-value = 0.00552). To better illustrate these results, we can see that the word sex has a significant increase compared to the search for the word love in post-quarantine periods and it is even more, when adding a counterfactual search directly related to these two words such as tinder (increase 6.6 points with p-value = 0.00552) (Figure 2). The post-quarantine period, when mobility restrictions were dropped in the country, had a differential impact on Google search preferences for the word sex and love (in post-quarantine, love did not have a significant icrease with p-value = 0.22446), and these preferences coincided with what people in Chile related to short- or long-term preferences. Consequently, the results of this study bring us closer to indirectly measuring the change in short and long-term preferences in a novel way.

These results offer a measured view of the consequences that the Covid-19 crisis may have on people's mating preferences and the impact it may have in the future. In the case of the analysis of post-quarantine results, our current causal analysis cannot account for the possible subsequent impacts on birth rates and marriages, but it can be said that such interventions could plausibly contribute to the causal impact of the change in people's preferences that is not random.

Likewise, the present research has several limitations. Causal impact analysis builds synthetic controls and is recommended to add a series of controls that are related to the variables to be studied (Brodersen et al., 2015). As controls, we used the word "tinder". This choice was based on two arguments: (i) The word tinder is related to the two mating preferences found in the initial self-reports (relating to casual sex as well as love, respectively) (ii) the word tinder has positive correlations found with both, the word sex and love, which led to conclude that tinder was a good control. This assumption may be controversial. It is more plausible for many people to relate sex with tinder, more so than to relate love with tinder. Consequently, the word tinder does not represent both words equally. For this reason, we believe that in the future we should take more controls related to both words to further analyze causal impact.

In addition, we know that the words we selected may represent more than one preference for people. In the case of the word sex, one might think that this represents preferences for pornography, sex toys, and erotic publications searches, but this type of searched increased in the quarantine period and users of pornography and sex toys tend to search for specific sites in Google (Smothers, 2020; Pornhub Insights, 2020, s.f. ; Zanttoni, 2020 ; Zane, 2020). For this reason, our study corroborates that the word sex does not represent a preference for pornography and sex toys, since it diminishes during the quarantine. But if we believe that the

word sex is a good representation approach to a certain preference for human mating it could explain why it increases post -quarantine.The motivations for post-quarantine sex searches can be discussed and cannot be justified by a broad theoretical generalization of these findings, as self-reporting may not be representative of actual behavior, but they are an important and novel contribution to the literature and to our collective understanding of the influence of the COVID-19 pandemic on human mating. Conversely, there may be more than one preference for these words in the searches for love and sex, but their search is not random and may represent different mating strategies for the Chilean population. For this reason, it is recommended to replicate this study in cross-culturally to see if there is variance in language and Google searches related to different preferences.

On the other hand, disgust and fear are helpful and motivate us to avoid people who show clear signs of illness, such as blood, pale skin, lesions, yellow eyes or runny nose (Tybur et al., 2013; Lieberman et al., 2018). But with COVID-19 infections, this is not what most people see, as there is a percentage of asymptomatic people (Furukawa et al., 2020; Seitz et al.,2020). In this context, the prediction of the behavioral immune system theory (Schaller et al, 2011; Makhanova et al, 2020) could not affect the shift towards a short-term matching interest, since without valid indications of infection, the function of preventing contact, or the repugnance, remains inactive. Therefore, disgust may be important, but less powerful than empathy in achieving social distancing in the case of this virus (Pfattheicher et al., 2020).

To our knowledge, this is the first study to apply this promising new Bayesian modeling approach to estimate the effects of partial and total confinement on mating preferences. Our conclusions are clear: partial bans (post-quarantine) increase sex searches in Google trends. However, we know that this is an indirect measure of short-term mating preferences, as this study must be complemented by experimental evidence to measure short-term preferences in periods of pandemic caused by COVID-19.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

All authors contributed to the article and approved the submitted version.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

References

Balbo, N., Billari, F., & Mills, M. (2013). Fertility in Advanced Societies: A Review of Research. *European Journal Of Population / Revue Européenne De Démographie*, *29*(1), 1-38. https://doi.org/10.1007/s10680-012-9277-y

Bavel, J., Baicker, K., Boggio, P., Capraro, V., Cichocka, A., & Cikara, M. et al. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, *4*(5), 460-471. https://doi.org/10.1038/s41562-020-0884-z

Belsky, J., Schlomer, G., & Ellis, B. (2012). Beyond cumulative risk: Distinguishing harshness and unpredictability as determinants of parenting and early life history strategy. *Developmental Psychology*, *48*(3), 662-673. https://doi.org/10.1037/a0024454

Brodersen, K., Gallusser, F., Koehler, J., Remy, N., & Scott, S. (2015). Inferring causal impact using Bayesian structural time-series models. *The Annals Of Applied Statistics*, *9*(1), 247-274. https://doi.org/10.1214/14-aoas788

Buss, D., & Schmitt, D. (2019). Mate Preferences and Their Behavioral Manifestations. *Annual Review Of Psychology*, *70*(1), 77-110. https://doi.org/10.1146/annurev-psych-010418-103408

Charnov, E. (1993). *Life history invariants*. Oxford University Press.

Chilean information and restrictions due to COVID-19. Wikipedia. https://es.wikipedia.org/wiki/Pandemia_de_COVID-19

Chisholm, J., Ellison, P., Evans, J., Lee, P., Lieberman, L., & Pavlik, Z. et al. (1993). Death, Hope, and Sex: Life-History Theory and the Development of Reproductive Strategies [and Comments and Reply]. *Current Anthropology*, *34*(1), 1-24. https://doi.org/10.1086/204131

Coronavirus Update in Pornhub Insights. (3rd April 2020) Purnhub Inisghts. https://www.pornhub.com/insights/coronavirus-update-april-2

Ermer, E., Cosmides, L., & Tooby, J. (2008). Relative status regulates risky decision making about resources in men: evidence for the co-evolution of motivation and cognition. *Evolution And Human Behavior*, *29*(2), 106-118. https://doi.org/10.1016/j.evolhumbehav.2007.11.002

Furukawa, N., Brooks, J., & Sobel, J. (2020). Evidence Supporting Transmission of Severe Acute Respiratory Syndrome Coronavirus 2 While Presymptomatic or Asymptomatic. *Emerging Infectious Diseases*, *26*(7). https://doi.org/10.3201/eid2607.201595

Ginsberg, J., Mohebbi, M., Patel, R., Brammer, L., Smolinski, M., & Brilliant, L. (2009). Detecting influenza epidemics using search engine query data. *Nature*, *457*(7232), 1012-1014. https://doi.org/10.1038/nature07634

Google Trends. (s.f.). https://trends.google.cl

Griskevicius, V., Cialdini, R., & Kenrick, D. (2006). Peacocks, Picasso, and parental investment: The effects of romantic motives on creativity. *Journal Of Personality And Social Psychology*, *91*(1), 63-76. https://doi.org/10.1037/0022-3514.91.1.63

Hatz, L., Park, S., McCarty, K., McCarthy, D., & Davis-Stober, C. (2020). Young Adults Make Rational Sexual Decisions. *Psychological Science*, *31*(8), 944-956. https://doi.org/10.1177/0956797620925036

Hill, S. E., Rodeheffer, C. D., DelPriore, D., & Butterfield, M. E. (2012b). A life history perspective on women's calorie regulation psychology: Food, fat, and fertility suppression. [Manuscript submitted for publication].

Hill, S., Rodeheffer, C., Griskevicius, V., Durante, K., & White, A. (2012). Boosting beauty in an economic decline: Mating, spending, and the lipstick effect. *Journal Of Personality And Social Psychology*, *103*(2), 275-291. https://doi.org/10.1037/a0028657

Jennions, M.,& Petrie, M. (1997). Variation in mate choice and mating preferences: a review of causes and consequences. *Biological Reviews Of The Cambridge Philosophical Society*, *72*(2), 283-327. https://doi.org/10.1017/s0006323196005014

Jun, S., Yoo, H., & Kim, J. (2016). A study on the effects of the CAFE standard on consumers. *Energy Policy*, *91*, 148-160. https://doi.org/10.1016/j.enpol.2016.01.004

Lehmiller, J., Garcia, J., Gesselman, A., & Mark, K. (2020). Less Sex, but More Sexual Diversity: Changes in Sexual Behavior during the COVID-19 Coronavirus Pandemic. *Leisure Sciences*, 1-10. https://doi.org/10.1080/01490400.2020.1774016

Li, W., Li, G., Xin, C., Wang, Y., & Yang, S. (2020). Challenges in the Practice of Sexual Medicine in the Time of COVID-19 in China. *The Journal Of Sexual Medicine*, *17*(7), 1225-1228. https://doi.org/10.1016/j.jsxm.2020.04.380

Lieberman, D., & Patrick, C. (2018). *Objection: Disgust, Morality, and the Law*. Oxford University Press.

Makhanova, A., & Shepherd, M. (2020). Behavioral immune system linked to responses to the threat of COVID-19. *Personality And Individual Differences*, *167*, 110221. https://doi.org/10.1016/j.paid.2020.110221

Markey, P., & Markey, C. (2013). Seasonal Variation in Internet Keyword Searches: A Proxy Assessment of Sex Mating Behaviors. *Archives Of Sexual Behavior*, *42*(4), 515-521. https://doi.org/10.1007/s10508-012-9996-5

Mavragani, A., Sypsa, K., Sampri, A., & Tsagarakis, K. (2016). Quantifying the UK Online Interest in Substances of the EU Watchlist for Water Monitoring: Diclofenac, Estradiol, and the Macrolide Antibiotics. *Water*, *8*(11), 542. https://doi.org/10.3390/w8110542

Nindrea, R., Sari, N., Lazuardi, L., & Aryandono, T. (2020). Validation: The Use of Google Trends as an Alternative Data Source for COVID-19 Surveillance in Indonesia. *Asia Pacific Journal Of Public Health*, *32*(6-7), 368-369. https://doi.org/10.1177/1010539520940896

Pfattheicher, S., Nockur, L., Böhm, R., Sassenrath, C., & Petersen, M. (2020). The Emotional Path to Action: Empathy Promotes Physical Distancing and Wearing of Face Masks During the COVID-19 Pandemic. *Psychological Science*, *31*(11), 1363-1373. https://doi.org/10.1177/0956797620964422

Roff, D. (2003). *Life history evolution*. Sinauer Associates.

Schaller, M., & Park, J. (2011). The Behavioral Immune System (and Why It Matters). *Current Directions In Psychological Science*, *20*(2), 99-103. https://doi.org/10.1177/0963721411402596

Seitz, B., Aktipis, A., Buss, D., Alcock, J., Bloom, P., & Gelfand, M. et al. (2020). The pandemic exposes human nature: 10 evolutionary insights. *Proceedings Of The National Academy Of Sciences*, *117*(45), 27767-27776. https://doi.org/10.1073/pnas.2009787117

Simpson, J., Griskevicius, V., Kuo, S., Sung, S., & Collins, W. (2012). Evolution, stress, and sensitive periods: The influence of unpredictability in early versus late childhood on sex and

risky behavior. *Developmental Psychology*, *48*(3), 674-686. https://doi.org/10.1037/a0027293

Smothers, H. (2020). *Sex Toy Sales Are Skyrocketing During the Coronoavirus Pandemic*. Vice. Retrieved 28 October 2020, from https://www.vice.com/en/article/y3m9bw/sex-toy-sales-up-during-coronavirus-covid-19-pandemic

Sobotka, T., Skirbekk, V., & Philipov, D. (2011). Economic Recession and Fertility in the Developed World. *Population And Development Review*, *37*(2), 267-306. https://doi.org/10.1111/j.1728-4457.2011.00411.x

Stearns, S. (1992). *The evolution of life histories*. Oxford University Press.

Tybur, J., Lieberman, D., Kurzban, R., & DeScioli, P. (2013). Disgust: Evolved function and structure. *Psychological Review*, *120*(1), 65-84. https://doi.org/10.1037/a0030778

Vugt, M., Cremer, D., & Janssen, D. (2008). Gender Differences in Cooperation and Competition. *Psychological Science*, *18*(1), 19-23. https://doi.org/10.1111/j.1467-9280.2007.01842.x

Wagner, S., Tropf, F., Cavalli, N., & Mills, M. (2020). Pandemics, Public Health Interventions and Fertility: Evidence from the 1918 Influenza. https://doi.org/10.31235/osf.io/f3hv8

Yang, A., Huang, N., Peng, C., & Tsai, S. (2010). Do Seasons Have an Influence on the Incidence of Depression? The Use of an Internet Search Engine Query Data as a Proxy of Human Affect. *Plos ONE*, *5*(10), e13728. https://doi.org/10.1371/journal.pone.0013728

Zane, Z. (2020). The psychological reasons you're horny as hell during the coronavirus quarantine. *Men's Health*. Retrieved 28 October 2020, from https://www.menshealth.com/sex-women/a31897503/horny-quarantine-coronavirus-covid-19/

Zattoni, F., Gül, M., Soligo, M., Morlacco, A., Motterle, G., & Collavino, J. et al. (2020). The impact of COVID-19 pandemic on pornography habits: a global analysis of Google Trends. *International Journal Of Impotence Research*. https://doi.org/10.1038/s41443-020-00380-w