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## Original article

# Can Google Trends analysis confirm the public's need for information about the rare association of facial nerve paralysis with COVID-19 or the COVID-19 vaccination?



R. Schubert<sup>b</sup>, M. Kaatz<sup>a</sup>, R. Schubert<sup>a</sup>, S. Springer<sup>a</sup>, M. Zieger<sup>a,\*</sup>

<sup>a</sup> SRH Wald-Klinikum Gera GmbH, Gera, Germany

<sup>b</sup> University of Louisiana Monroe, Monroe, USA

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## ABSTRACT

Facial nerve paralysis or Bell's palsy have been suggested as possible consequences of SARS-CoV-2 infections, as well as possible side effects of COVID-19 vaccinations. Google Trends data have been used to evaluate worldwide levels of public awareness for these topics for pre- and post-pandemic years. The results demonstrate a relatively low public interest in facial nerve paralysis in comparison to other more common COVID-19 related topics. Some peaks of interest in Bell's palsy can most likely be explained as triggered by the media. Therefore, Google Trends has shown public's relatively low awareness of this rare neurological phenomenon during the pandemic.

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## 1. Introduction

Since severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spread worldwide during the coronavirus pandemic, millions of people have contracted or died from coronavirus disease 2019 (COVID-19) or are affected by possible long-term impairments, e.g., long COVID [1]. Accordingly, from early on, great efforts were made worldwide to counteract the

pandemic with suitable measures such as hygiene, social distancing, lockdowns, and other restrictions. An important factor in the fight against the pandemic was also the development of effective vaccines [2]. COVID-19 vaccines have been developed using various, partially novel principles including mRNA, adenovirus vectors, protein subunits and inactivated SARS-CoV-2 [2]. Various COVID-19 symptoms have been described during the course of the pandemic (e.g., [1]),

\* Corresponding author.

E-mail address: [Michael.Zieger@srh.de](mailto:Michael.Zieger@srh.de) (M. Zieger).

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including initial reports of possible reactivations of herpes viruses in COVID-19 patients [3]. After the development of the first COVID-19 vaccines, these early reports were soon followed by reports of suspected reactivations of persistent viruses related to COVID-19 vaccinations, similar to those already described for other vaccines [4,5]. Varicella zoster (VZV) and herpes simplex viruses (HSV) can persist after the primary infection, e.g., chickenpox, and reactivations can occur. Risk factors for this include age, stress, HIV infection, cancer, or other causes that lead to immunosuppression [4,5]. VZV reactivation can be largely asymptomatic or cause shingles with possible attendant symptoms such as transient or persistent facial nerve paralysis. Serious complications of herpes virus reactivations can be meningitis and encephalitis.

Facial nerve paralysis can have very heterogeneous causes, such as viral or bacterial infections, ischemia, trauma, or tumour diseases. However, the most common form (ca. 60–75%) of facial nerve palsy is Bell's palsy, the causes of which are not yet fully understood [6]. For Bell's palsy, the idiopathic facial paralysis whose exact aetiology is still unclear, reactivation of HSV, for example, is also discussed as a cause [6]. Moreover, Bell's palsy is also discussed in direct connection with a SARS-CoV-2 infection [7] or COVID-19 vaccinations [7]. These possible connections are also mentioned in the current guideline of the German Society for Neurology [Deutsche Gesellschaft für Neurologie (DGN) e. V.] [6].

In the context of millions of cases of COVID-19 infections and vaccine doses administered worldwide in connection with the pandemic, the question arises as to whether possible rare neurological complications of COVID-19 infections or vaccinations such as facial nerve paralysis are not only scientifically published, but also whether the public is aware of them. The present study is therefore intended to address the question of whether the search interest for this possible complication can be proven in the search interest data of a large search engine during the course of the pandemic. Investigations using Google Trends analyses are already established for such investigations [1]. We hypothesize that the risk of virus reactivation, e.g., expression as herpes zoster ophthalmicus (Ramsay–Hunt syndrome type 2), and resulting facial nerve paralysis is not focused on by the public and does not generate a sustained interest, leading to the phenomenon being neglected in public interest. Accordingly, the aim of this study is to evaluate the worldwide representation and awareness of the topics facial nerve paralysis, Bell's palsy, shingles, and Ramsay–Hunt syndrome (type 2) through the search interest, as shown through the analysis of available Google Trends search data about public interest or the need for information. This study considered the terms that are serious, specific, and obvious to the layperson, such as facial nerve paralysis and Bell's palsy.

## 2. Data & methodology

Google Trends data have been widely used for tracking the COVID-19 pandemic or COVID-19 related symptoms. Google Trends data are anonymous and Google Trends provides comparisons of up to five search terms or topics. In this study, data were collected with the following settings in Google Trends

(<https://trends.google.com/trends>): the period was set the “Past five years”, the region was selected as “Worldwide” and “All categories” and “Web search” were set. In this study, search topics were used instead of search terms for better coverage as described [1]. Google Trends data were accessed in April 2022 and the following search topics were used: “Coronavirus disease 2019”, “COVID-19 vaccine”, “Long COVID”, “Clouding of consciousness”, “Chickenpox”, “Shingles”, “Herpes simplex”, “Bell's palsy”, “Ramsay–Hunt syndrome type 2”, and “Facial nerve paralysis”.

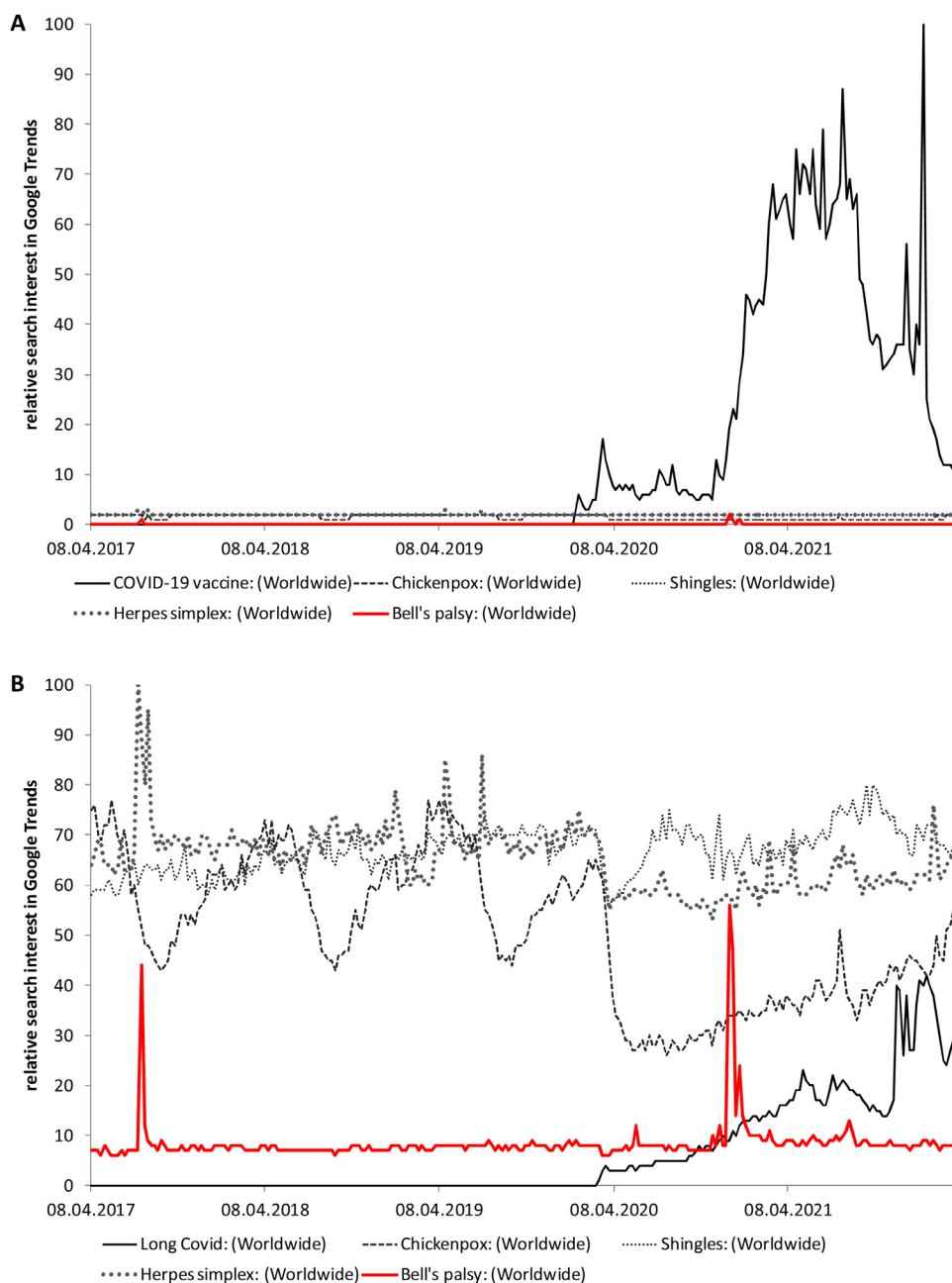
## 3. Observations

The relative search interest for the topic of COVID-19 clearly dominated compared to all other topics in this study (data not shown) as already shown for other common disease topics [1]. The relative search interest for the topic COVID-19 vaccine was far lower than for COVID-19 (data not shown), but still significantly higher than the interest for all the other topics in this study, as shown for some examples in Fig. 1A. Interest in a COVID-19 vaccine emerged early in the pandemic. A further increase occurred with the advances in COVID-19 vaccine candidates and when vaccinations became available worldwide [2]. As shown in Fig. 1B with a different reference topic, more details were visible. Thus, the seasonality for the search topic of chickenpox in the pre-pandemic years could be shown. Due to the pandemic, there was a significant drop in relative search interest for chickenpox at the beginning of 2020. There was a similar decrease in topics herpes simplex and shingles. The interest in chickenpox increased slightly over the course of the pandemic. Likewise, the relative interest in searching for shingles also increased again after the drop, sometimes even exceeding the level of the last pre-pandemic years (Fig. 1B). In contrast, a search interest for long COVID only arose with the pandemic, as already described elsewhere [1]. The interest in Bell's palsy, on the other hand, showed little changes over the period of the study, apart from two significant peaks in July 2017 and in December 2020 (Fig. 1B).

In Fig. 2, the relative interests in Bell's palsy, facial nerve paralysis, and Ramsay–Hunt syndrome (type 2), hereinafter referred to as Ramsay–Hunt syndrome for short, were shown. The well-known “Long COVID” and an associated symptom with a known relative low search interest, “Clouding of consciousness” [1] were shown as a comparison (Fig. 2). While an interest in “Long COVID” and “Clouding of consciousness” had developed during the pandemic, Bell's palsy, facial nerve paralysis and Ramsay–Hunt syndrome showed no noticeable changes as a result of the pandemic, apart from slight peaks in facial nerve paralysis and Bell's palsy (Fig. 2).

## 4. Discussion

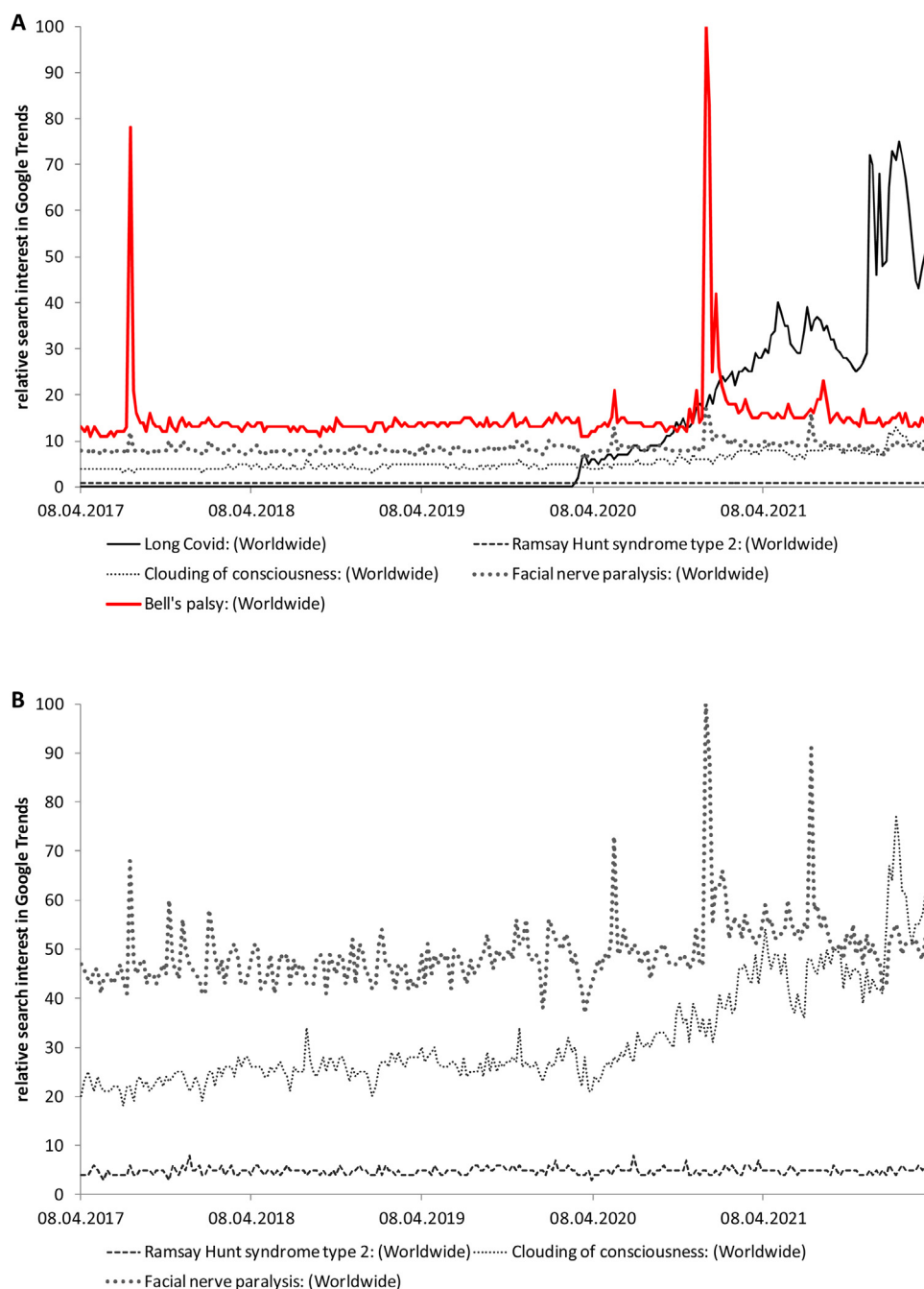
The results of Google Trends analysis demonstrate the public interests, documented by corresponding search volumes [1]. The interest in COVID-19 associated topics like COVID-19 vaccine or long COVID was reconfirmed in this study. This study has some limitations, such as the different popularity of the Google search engine around the world. Since Google Trends operates with relative search volumes, it is not possible



**Fig. 1 – Relative search interest in different search topics as indicated according to Google Trends data with topic COVID-19 vaccine (A) or topic herpes simplex (B) as reference.**

to make an exact statement about the absolute number of searches. Furthermore, only search terms, for which topics were available at Google Trends, were examined [1]. The infections with other communicable diseases, e.g., seasonal influenza and chickenpox, were reduced during the coronavirus pandemic. The reduced frequency of infection and illness is most likely to have benefited from the measures taken in the context of the pandemic [8]. Google Trends data also confirm a drop in interest in chickenpox during the pandemic. On the other hand, the relative search interest for shingles has largely recovered after a brief dip in early 2020, sometimes even exceeding the pre-pandemic level. The scientific discussion about the possible connection between

COVID-19 or the associated vaccinations may have contributed to the interest here [3,9]. However, the relative interest of Internet and especially Google users in the topics of other possible serious complications such as Ramsay–Hunt syndrome, facial nerve or Bell's palsy is low. Compared to the millions of COVID-19 cases and the millions of vaccine doses administered, the number of Ramsay–Hunt syndrome, facial nerve or Bell's palsy cases is comparatively very small. Due to the severity of the resulting limitations and dangers for the patients, a need for information and education is nevertheless necessary. Despite the relatively small number of cases, Bell's palsy, for example, is listed as a possible side effect of vaccination [10]. Facial paralysis as a result of vaccination is



**Fig. 2 – Relative search interest in different search topics as indicated according to Google Trends data with topic Bell's palsy (A) or topic facial nerve paralysis (B) as reference.**

also discussed as a non-specific inflammatory reaction [5]. However, its severity is hardly reflected in the search volume, which is probably due to the relative low number of cases. In addition to the neurological and functional aspects of a paresis, however, the psychological impact on the affected patients must also be considered.

Nonetheless, there have been two interest peaks for Bell's palsy in the past five years. The first of the two significant peaks for Bell's palsy can probably be traced back to reports about the American actress Angelina Jolie in July 2017, in which she revealed her Bell's palsy diagnosis [11]. While the

second peak in December 2020 was likely triggered by public media releases bringing public attention to possible relationship between Bell's palsy cases and mRNA vaccines (e.g., [12]). In terms of search volume, however, facial nerve paralysis or Bell's palsy remain of secondary importance.

## 5. Conclusions

Despite some limitations of this study, our analysis of the available data shows a trend that, apart from a few brief

spikes, facial nerve paralysis and Bell's palsy mostly show no appreciable increased public interest or information needs due to the pandemic compared to more common topics such as COVID-19 vaccine or long COVID. Although there are clear indications of the risk of facial nerve paralysis as part of a vaccination side effect, we agree with critical remarks by Volk et al. [5] on the outweighing of the benefits of vaccination against COVID-19 but also emphasize the need to inform those who have been vaccinated. Especially since episodes of facial nerve palsy can also be expected in connection with SARS-CoV-2 infections [5].

Google Trends data provide a useful tool to show the relative search interest and therefore the representation or awareness of topics within the population. Furthermore, analyses of search engine data may help to improve information materials for the public.

### Disclosure of interest

The authors declare that they have no competing interest.

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