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## COVID-19 vaccine hesitation and brand choice uncertainty

Paula Rodrigues

*Lusfada University and Research Centre in Organizations, Markets and Industrial Management (COMEGI), Porto, Portugal*

Ana Pinto Borges

*ISAG-European Business School, Porto, Portugal; Research Center in Business Sciences and Tourism (CICET-FCVC), Porto, Portugal and Research Centre in Organizations, Markets and Industrial Management (COMEGI), Porto, Portugal*

Ana Brochado

*Centro de Estudos sobre a Mudança Socioeconómica e o Território (DINÂMIA – CET), Instituto Universitário de Lisboa (ISCTE-IUL), Lisboa, Portugal, and*

Ana Sousa

*Research Centre in Organizations, Markets and Industrial Management (COMEGI), Porto, Portugal*

### Abstract

**Purpose** – This study aims to examine individual behaviours regarding coronavirus disease-2019 vaccine brands.

**Design/methodology/approach** – Firstly, qualitative research identified the reasons for vaccine hesitancy in relation to specific brands using data gathered from 36 semi-structured interviews and processed with Leximancer software. Secondly, a new conceptual model was developed with data from 917 questionnaires and analysed using partial least squares-structural equation modelling. The model integrates health treatment effectiveness, vaccines' immediate health benefits and individuals' hope as antecedents of perceived vaccine brand reliability and company reputation and their relationships with choice uncertainty.

**Findings** – The results reveal that vaccine hesitancy can be linked with individual, group and contextual and vaccine brand influences and that brand reliability and company reputation antecedents have variable but statistically significant effects on choice uncertainty.

**Practical implications** – This research's contribution lies in its analyses of vaccine acceptance and uncertainty from a vaccine brand perspective. The results can guide brand management policies implemented by public and private organisations.

**Originality/value** – This study contributes to academic literature by filling in two gaps. The first was that no prior studies have directly addressed vaccine brands' impact, whereas the second gap was the need for brand management policies that public (e.g. governments and public health agencies) and private organisations (e.g. pharmaceutical laboratories) can apply.

**Keywords** Coronavirus disease-19 (COVID-19), Vaccine, Individual knowledge, Brand reliability, Corporate reputation, Choice uncertainty

**Paper type** Research paper

## 1. Introduction

The coronavirus disease-2019 (COVID-19) pandemic's spread prompted a wide range of responses from governments worldwide, which had severe consequences at a social and economic level (Donthu and Gustafsson, 2020). Common measures included travel restrictions, no public gatherings, school closings, emergency investment in health-care facilities, lockdowns and other interventions to contain the virus and manage the restrictions' economic impacts. These measures have been described as contingency plans because COVID-19 is expected to be contained by pharmaceutical solutions such as vaccines.

The pandemic has stimulated related research in the fields of consumer behaviour and marketing. Various studies have analysed COVID-19's impact on online purchase behaviours and the pandemic's influence on how businesses create long-term brand equity and deal with rapid change and competitiveness within digital channels (Borges *et al.*, 2023; Dubbelink *et al.*, 2021). Sheth (2020), for instance, analysed the effect of COVID-19 restrictions on consumer habits, whereas Kirk and Rifkin (2020) focused on consumers' coping strategies during the pandemic. Williams *et al.* (2021), in turn, examined the relationship between consumers' vaccine confidence and trust.

Previous studies have thus focused primarily on consumers' behaviour towards the pandemic and its ramifications. In contrast, the present research concentrated on individuals' uncertainty about which vaccine brand to choose when they have limited knowledge about the manufacturers (Fajar *et al.*, 2022; Razai *et al.*, 2021). Many consumers worldwide have expressed ambiguous feelings about getting vaccinated as a social duty. COVID-19 vaccinations have been promoted as a way to overcome the pandemic crisis more quickly (Kieslich, 2018), but individuals are concerned about the consequences of being administered new vaccines produced in record time (Chaney and Lee, 2022).

The current study sought to contribute to the existing literature in two areas. Firstly, the analyses conducted identified the main themes associated with both hesitance about and acceptance of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) vaccines. Secondly, the research included examining consumers' behaviours towards specific vaccine brands. The proposed model considers the simultaneous impacts of the vaccinations' perceived treatment effectiveness and health benefits and individuals' hopes (i.e. their expectation that, if they get vaccinated, the pandemic will end sooner and normality will return) on consumers' choice uncertainty. These effects are mediated by the vaccines' brand reliability and company reputation.

Various vaccines against the SARS-CoV-2 were developed to protect populations against COVID-19 and approved by the vaccine sector's regulators in less than 12 months, after which these products were immediately distributed in dozens of countries (Shrotri *et al.*, 2021). The vaccines went through a rigorous series of studies and tests, but questions have been raised about the inoculations' safety and effectiveness (Neumann-Böhme *et al.*, 2020). Diverse initiatives have facilitated international co-operation between pharmaceutical laboratories, regulators, policymakers, funders, public health agencies and governments to ensure the vaccines are safe and effective. However, around 10% of the general population still considers vaccines risky and unnecessary, so these individuals have refused to get vaccinated.

Hesitancy regarding COVID-19 inoculation can be defined as a refusal, delay or acceptance based on doubts about the vaccines' usefulness and safety once they became available (Verger and Dub,e, 2020). A significant number of subpopulations and groups around the globe continue to be reluctant to get vaccinated – even in the future – despite the general public's widespread perception of the pandemic as generating significant risks (Verger and Dub,e, 2020). As a result, vaccine hesitancy has been listed by the World Health Organization (WHO) as one of the ten most significant threats to public health worldwide given that the vaccine is widely seen as the “most promising solution for the virus” (Akel *et al.*, 2021).

COVID-19 vaccine hesitancy can arise from multiple factors that generate fear, anxiety and

anger, including attempts to affect individuals' emotions through vaccine-related misinformation. Other factors are the speed with which various vaccine brands have been made available, the disease's novelty, questions about safety and effectiveness, the unknown and/or short duration of immunity and vaccines' country of origin (Chou and Budenz, 2020; Jungmann and Witthöft, 2020; Lin *et al.*, 2021; Lwin *et al.*, 2020; Reiter *et al.*, 2020). Humans can manage these kinds of uncertainty better when they pool their knowledge about an uncertain future as opposed to focusing entirely on unpredictable outcomes. Understanding individuals' vaccine hesitancy more fully could thus be important rather than simply making COVID-19 vaccines more easily available (Neumann-Böhme *et al.*, 2020).

Most people have expressed a deep hope that the vaccine is the best solution for the pandemic crisis, but few studies have assessed this expectation's influence on consumer behaviour. Some recent investigations have explored how hope in the context of the COVID-19 pandemic was linked to protection motivation, behavioural intention (Kim *et al.*, 2022), anxiety, stress and well-being (Gallagher *et al.*, 2021; Taylor and Asmundson, 2021). Hope has also been examined as a potential resilience factor that can reduce emotional distress (Braun-Lewensohn *et al.*, 2021; Taylor and Asmundson, 2021).

However, a review of the literature conducted for the present study revealed that no researchers have analysed hope's effect on vaccine brand reliability and company reputation's role in reducing choice uncertainty. This research thus sought to contribute to the existing literature by analysing the reasons for individuals' uncertainty or hesitancy about getting vaccinated due to the variety of brands on offer. The literature review also confirmed that uncertainty regarding which vaccine brand to choose has not previously been addressed from this perspective.

More specifically, this study's novelty consists of a new conceptual model of the relationships between COVID-19 vaccine-related dimensions. The variables incorporated include individual and social group influences on individuals' hopefulness and evaluations of the vaccines' treatment effectiveness and health benefits. Other factors considered are vaccine brand issues (i.e. brand reliability and company reputation) and contexts' influence on consumers' choice uncertainty.

The main goal was to strengthen the academic literature by filling in gaps in the research on choice uncertainty's effect on COVID-19 vaccine-related behaviour. Therefore, this study addressed two research questions:

- RQ1. What are the main themes associated with COVID-19 vaccine acceptance and hesitancy?
- RQ2. What are the main variables that affect choice uncertainty's influence on vaccine behaviours?

To this end, two complementary studies were conducted using qualitative and quantitative methods, respectively, to achieve the proposed objective. Study one identified the underlying reasons for individuals' acceptance and hesitancy regarding different COVID-19 vaccine brands by applying qualitative methods. Study two developed and tested a new conceptual model that explains choice uncertainty linked to vaccine brands via treatment effectiveness, immediate benefits and individuals' hope as antecedents of brand reliability and company

reputation. The second study explored the variables previously identified in the qualitative study as associated with the participants who exhibited brand acceptance.

The proposed model can help vaccine brand managers analyse and improve their products' reliability and reputation. In addition, the results show that, in pandemic situations (e.g. influenza pandemics), public health policies must consider not only individual and social group influences and vaccine issues but also vaccine brand variables.

## **2. Theoretical background and hypotheses**

### ***2.1 Individuals' vaccine acceptance and hesitancy***

Ever since the outbreak of COVID-19, hopes of controlling it have primarily been placed on vaccines as the most promising way to control the pandemic (Akel *et al.*, 2021). From a public health perspective, vaccination has long been considered an effective approach to preventing outbreaks of infectious diseases (Wong *et al.*, 2020). However, COVID-19's spread evidently can only be fully controlled through vaccination if the majority of people get the vaccine (Yan *et al.*, 2021). Medium-to-high confidence in vaccines has been shown to be the norm, but vaccine hesitancy could undermine immunisation programmes' long-term success (Larson *et al.*, 2015).

Vaccine hesitancy is influenced by three main factors: confidence, convenience and complacency (Larson *et al.*, 2015). Confidence is mainly associated with trust based on the perception that vaccines are safe and efficient. Convenience is related to populations' ease of access to vaccines. Complacency is understood as the perception that immunisation and the relevant disease's risks are of minor importance. The SAGE Working Group Model (WHO, 2014) classifies vaccine hesitancy determinants into three categories: vaccine brands, individual and group influences and contextual influences.

One of the most widely applied theories of health and illness behaviours is the health belief model (HBM) (Champion and Skinner, 2008). This model includes variables related to cues to action and perceived benefits, barriers and threats (i.e. perceived susceptibility to and severity of diseases). The latter factor joins together beliefs about changes in disease susceptibility and severity and diseases' seriousness.

Perceived benefits are defined as individuals' positive beliefs about being vaccinated. Perceived barriers are described as the conviction that inoculations' benefits are restricted by physical, psychological or financial factors, among others. Finally, cues to action comprise information, people and events that guide individuals towards being vaccinated (Champion and Skinner, 2008).

### ***2.2 Individual and social group influences on vaccine brands and issues***

According to Bettman and Park (1980), product knowledge consists, in this research context, of individuals' vaccine knowledge, expertise in performing vaccine-related tasks and familiarity with vaccinations (Yan *et al.*, 2021). Vaccine knowledge can be understood as information about the health treatment's effectiveness and immediate health benefits. This knowledge is based on the careful development of safe and effective vaccines, which normally involves multiple years of evaluations during the pre-clinical and clinical stages. Vaccines also need to follow strict rules to gain regulatory authorities' approval before these products can be manufactured and distributed in bulk amounts (Mellet and Pepper, 2021).

Given the uncertainty about COVID-19's actual impacts and its high rate of transmission and incidence led the authorities to allow vaccine development and testing to be accelerated by various pharmaceutical laboratories internationally. The overall goal was to produce and disseminate a successful COVID-19 vaccine worldwide (Motta *et al.*, 2021). The high-level of attrition (i.e. low probability of success) during the vaccine's development meant that

simultaneous testing of multiple candidates would increase the chances of finding effective vaccines (Mellet and Pepper, 2021). In the end, multiple COVID-19 vaccines were developed and approved by the competent authorities in less than 12 months and immediately administered in dozens of countries (Shrotri *et al.*, 2021).

This significant achievement took place in such a short period that many people have expressed concerns about the vaccines' safety and efficacy (Cohen, 2020; Hastline, 2020). This hesitancy could jeopardise the attainment of the vaccination rates needed to reach the expected herd immunity and thus end the pandemic (Motta *et al.*, 2021). Doubts about the vaccines' risks and value have been generated by a widespread lack of sufficient information among the general population (Agle and Xiao, 2021). In response, the relevant organisations (e.g. the WHO, European Union and governments) have taken measures and defined strategies to provide the public with more plentiful information.

Public health problems on a global scale put pressures on governments to present effective treatments. The COVID-19 vaccines and their associated brands appeared in response to the pandemic, offering a solution that government officials considered effective. The latter's endorsement has contributed to vaccine brands' perceived reliability and pharmaceutical companies' reputation.

Garbarino and Johnson (1999) define perceived brand reliability as the expectation that the brand will fulfil perceived obligations. Munuera-Aleman *et al.* (2003) report that a two-dimensional idea of brand trust – reliability and intention – has become the most popular approach among management and marketing researchers. However, the present study opted to focus solely on brand reliability because it can take into account vaccines' technical or competence-based nature based on manufacturers' ability and willingness to keep promises and satisfy individuals' needs (Delgado-Ballester and Luis Munuera-Aleman, 2005).

In turn, company reputation can be understood as people's expectations about companies' ability to address their stakeholders' interests (Perez-Cornejo *et al.*, 2019). Firms' good reputation enhance its products and services' value. During the COVID-19 pandemic, individuals received plentiful information about certain vaccine brands' efficacy (e.g. Pfizer- BioNTech, Moderna, AstraZeneca and Janssen), so these brands and their companies' perceived reliability and reputation improved.

The difference between vaccine brands' reliability and their manufacturer's established reputation can be explained by the technology associated with this type of vaccine, namely, messenger ribonucleic acid (mRNA) versus adenovirus, as well as each laboratory's prior standing. These companies had to develop the COVID-19 vaccines rapidly but still sought to ensure the safety of the people vaccinated and maintain their trust in the vaccines and expectations associated with the manufacturers' reputation and reliability (Alvarez-Zuzek *et al.*, 2022; Killgore *et al.*, 2021; Rodriguez *et al.*, 2022). The current research's first set of hypotheses was thus formulated as follows:

H1a. Health treatments' effectiveness has a positive effect on brand reliability.

H1b. Health treatments' effectiveness has a positive effect on company reputation.

Successful disclosure of products' benefits requires an understanding of communication tools' temporal dimension (i.e. immediate or long-term devices) because they have different consequences for brand recognition and motivation (Spassova and Lee, 2013). Spassova and Lee (2013) highlight that, when products fulfil more immediate goals, these items become more enticing. The previously discussed factors combined with the urgency of finding a solution for the COVID-19 pandemic to motivate individuals to perceive specific vaccines as

safe, which contributed significantly to strengthening the relevant companies' reputation and brand reliability.

Access was provided to information about the technology underlying vaccine development (e.g. mRNA and adenovirus), which led consumers to perceive and discuss the vaccines' immediate benefits differently. The resulting effect on brand trustworthiness and company reputation revealed that consumers' perceived distinctiveness as each vaccine product's immediate effects on their health. The second hypothesis formulated for the present study was thus as follows:

*H2a.* Products' immediate health benefits have a positive effect on brand reliability.

*H2b.* Products' immediate health benefits have a positive influence on company reputation.

Both consumer behaviour researchers and practitioners seek to understand why individuals participate in particular prosocial consumption behaviours (Batson *et al.*, 2008). Factors that increase these choices include, among others, personality, motivation and context, and marketing managers often tap into positive emotions (e.g. love, hope, pride and compassion) to foster these behaviours (Cavanaugh *et al.*, 2015). The latter cited authors analysed how specific positive emotions influence consumers' desire to share their resources and found that customers' hope encourages behaviours that benefit others close to them. Lazarus (2006, p. 16) defines hope as "fearing the worst but yearning for better and believing the wished-for improvement is possible", which provides motivations to pursue positive goals and achieve them (Lazarus, 1991).

Hope affects the economic sustainability of varied sectors such as the beauty industry. For example, Charles Revson, the founder of Revlon, famously said, "in the factory we make cosmetics; in the store we sell hope" (Revlon, n.d.). MacInnis and de Mello (2005) explored the construct of hope in consumer behaviour, marketing and public policy contexts. Based on appraisal theory, MacInnis and de Mello (2005), in turn, define hope as a "positively valenced emotion evoked in response to an uncertain but possible goal-congruent outcome" (p. 2), thereby keeping hope conceptually separate from constructs such as expectation or involvement.

Hope is an emotion associated with situations described as harmonising with goals, and feelings of hope are usually grounded in possibilities instead of probabilities. MacInnis and de Mello (2005) further suggest that consumers' information processing concentrates less on products' actual advantages and more on these items' promise of making established goals possible. In the present study, hope was understood as individuals' belief in the vaccines' power to eradicate the SARS-CoV-2 virus and in a better future. Consumers' hope focused on the vaccine brand and vaccination process, whereas brand trust and company reputation were essential in reducing their choice uncertainty.

The current research conceptualised the COVID-19 vaccination process as not only a way individuals seek to protect themselves against the virus but also a prosocial behaviour because the majority also perceive vaccination as protecting the public's health through herd immunity (Waugh and Fredrickson, 2006). In addition, a particularly interesting aspect of the present research context is how the COVID-19 vaccines' medium- to long-term effects are still unknown. Individuals are more willing to assume possible risks if their hope for a positive outcome is strong. Thus, the third hypothesis was worded as follows:

*H3a.* Hope has a positive effect on brand reliability.

*H3a.* Hope has a positive effect on company reputation.

### 2.3 Choice uncertainty

The mental state of uncertainty is thought to reflect any incongruity between individuals' cognitive structures and perceptions, which results in a degree of psychological discomfort and stimulates a desire to resolve the uncertainty (Laurin *et al.*, 2008). A significant number of people remain uncertain about making decisions based on the available information about the vaccines. A fuller understanding of vaccine-related choice uncertainty could clarify which mechanisms create these gaps between attitudes and behaviours (Hassan *et al.*, 2013). Urbany *et al.* (1989) identify two general types of uncertainty: knowledge and choice.

Choice uncertainty causes individuals to conduct more extensive searches for knowledge, but only a weak negative association has been found between knowledge uncertainty and search behaviours. Knowledge uncertainty denotes the possession of information about other possibilities (Hassan *et al.*, 2013). Shiu *et al.* (2011) further defined another type of uncertainty – evaluation uncertainty – which is individuals' inadequate understanding of how to use the knowledge they have collected.

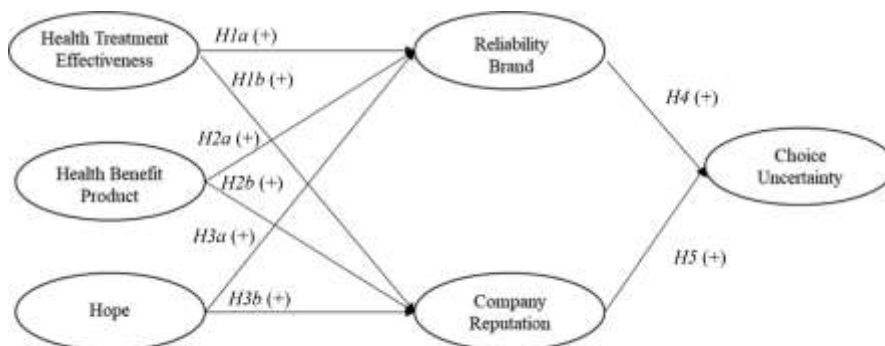
Based on a review of the literature, Jacoby *et al.* (1994) differentiate between two main antecedents of uncertainty: credibility and ambiguity. Uncertainty is the result of factors that have a strong impact on individuals' acquisition and analysis of information and that are important to understanding the mental state of uncertainty. Perceived credibility can thus be assumed to be influenced by brand reliability, which can help reduce uncertainty for individuals needing to make a choice.

According to Perez-Cornejo *et al.* (2019), corporate reputation is a trustworthy indicator of stakeholders' attitudes because, if firms do not behave in ways that match their corporate reputation, these companies will lose the capital stored in this asset. Whenever this problem occurs, stakeholders may understand these inconsistent behaviours as transmitting ambiguous information or perceive the inconsistencies as introducing ambiguity into company reputation, thereby increasing individuals' choice uncertainty. In contrast, if firms maintain a good reputation, individuals' perceived ambiguity will be minimal, and choice uncertainty will also have less of an impact. Given the above findings, two final hypotheses were defined for the current research:

H4. Brand reliability has a positive effect on choice uncertainty by decreasing uncertainty.

H5. Company reputation has a positive effect on choice uncertainty by decreasing uncertainty.

The conceptual model is presented in Figure 1.



Source: Authors' own work



### 3. Methodology

#### 3.1 Study one

To address the first research question, data were gathered using qualitative methods, namely, semi-structured interviews conducted in Portugal during February 2021. Saturation was obtained with 36 interviews. The interview participants were between 18 and 81 years old, with an average age of 40 (standard deviation  $\frac{1}{4}$  19). Nine out the 36 participants were students, 5 were retired, and 22 were employed, including 5 health-care workers.

The interview guide had three main sections. The first included the introduction of the interview topic, the informed consent form and questions regarding interviewees' age, occupation and previous COVID-19 infections. The second section assessed COVID-19 awareness and perceived threat (i.e. susceptibility and severity). Three main questions were asked:

- Q1. Are you knowledgeable about COVID-19 infection and prevention?
- Q2. Are you aware of the current number of people infected with COVID-19?
- Q3. Do you expect the pandemic to be controlled? Why or why not?

The last section focused on vaccines and vaccination-related issues, that is, perceived barriers and benefits. The first two questions were as follows:

- Q1. How do you feel about the COVID-19 vaccination programme?
- Q2. Do you perceive a need for the vaccine?

This section also included questions about cues for action:

- Q1. Do you know all the vaccines on offer?
- Q2. Do you perceive all vaccines as similar in terms of safety and efficacy? Why or why not?

The last set of questions assessed behavioural intention: Have you already been vaccinated? If not, would you like to get vaccinated? Why or why not?

The interviews were transcribed, and the narratives analysed using Leximancer software (Moshin *et al.*, 2020). Leximancer uses Bayesian statistics, non-linear dynamics and machine learning algorithms (Wu *et al.*, 2014) to perform unsupervised quantitative content analyses of natural language texts with minimal manual intervention needed from researchers. This software follows a two-step procedure that combines conceptual analysis (i.e. concepts' frequency) and relational analysis (i.e. co-occurrence between concepts). Leximancer's main graphical output is concept maps that present the main ideas (i.e. nodes) and group them into themes (i.e. larger shared circles). Concepts that appear together in interview transcripts are placed near one another on the concept maps.

As suggested by Moshin *et al.* (2020), each theme was further clarified using additional narrative analysis to identify key segments of interview text. The interviewees were subsequently classified into two groups: vaccine acceptance (number  $\frac{1}{4}$  30) and vaccine hesitancy (number  $\frac{1}{4}$  6). These categories were defined as tags in Leximancer (Moshin *et al.*, 2020).

The vaccine acceptance group included either individuals who had already been vaccinated or who intended to get the vaccine. The vaccine hesitancy group comprised two participants who planned to refuse the vaccine (e.g. "I mistrust the vaccine. I can say that I will give my vaccine to others" [category  $\frac{1}{4}$  vaccine hesitancy, age  $\frac{1}{4}$  56, occupational status  $\frac{1}{4}$  worker]). Another member intended to delay vaccination (e.g. "I want to take it, but only in the last

phase” [vaccine hesitancy, 54, worker]. Two other participants would only consider getting vaccinated if it became mandatory (e.g. “I do not intend to get the vaccine unless it’s mandatory” [vaccine hesitancy, 20, student]). The remaining member expressed doubts (e.g. “I don’t want to be vaccinated although I have to be vaccinated” [vaccine hesitancy, 80, retired]).

### 3.2 Study two

The second set of data was collected in February 2021 from a convenience sample of 1,057 individuals. Respondents who did not wish to be vaccinated (number ¼ 135) were excluded, as well as those who selected two vaccine brands that were not being supplied in Portugal, namely, Sanofi-GSK (number ¼ 8) and CureVac (number ¼ 2). The final sample comprised 917 participants.

The questionnaire was designed and self-administered using Google Forms, which helped ensure anonymity. The respondents’ profile is shown in Table 1. A pre-test was conducted with a sample of university students and academic professionals (i.e. 128 completed questionnaires) to assess the questions and scales’ content validity. This procedure ensured that the questionnaire’s content, design and structure were clear.

The questionnaire was divided into three parts.

| Sociodemographic characteristics                    | %    |
|---|------|
| <i>Age (years)</i>                                  |      |
| <15   | 1.2  |
| 16–25   | 46.7 |
| 26–40   | 34.5 |
| 41–55   | 13.3 |
| >55   | 4.4  |
| <i>Gender</i>                                       |      |
| Male  | 39.3 |
| Female  | 59.1 |
| Preferred not to answer                             | 1.6  |
| <i>Education</i>                                    |      |
| Basic   | 8.4  |
| Secondary   | 26.0 |
| Higher  | 65.6 |
| <i>Monthly household income (euros after taxes)</i> |      |
| <€1,000   | 26.7 |
| €1,001–€2,000                                       | 44.5 |
| €2,001–€3,000                                       | 19.1 |
| > €3,000  | 9.7  |

The first part dealt with issues involving the participants' sociodemographic characteristics. The second part focused on assessing whether the respondents had ever been infected with COVID-19 and whether anyone close (i.e. family or friend) had died from the virus. Items also measured how confident each participant was about four vaccine brands' reliability: Pfizer-BioNtech, AstraZeneca, Moderna and Janssen (i.e. vaccine brands approved for Portugal). The last part of the questionnaire asked respondents to think about a hypothetical scenario in which they would be administered the chosen vaccine or, if they had already been vaccinated, would respond to a set of statements about the theoretical model's constructs. These variables were operationalised via measures adopted from the existing literature.

In the data collection phase, any common method bias (CMB) introduced into the self-reported data was reduced by assuring the respondents of their identity's confidentiality and randomising the items in the questionnaire (Podsakoff *et al.*, 2003). In the data analysis phase, the risk of CMB was evaluated by running Harman's single-factor test (Harman, 1976). The results reveal that the total variance extracted by one factor is 25.70%, which is less than the recommended threshold of 50%. The model was thus considered to be free of CMB.

The scale measuring health treatment effectiveness contained five items adapted from Cheng *et al.*'s (2017) research. The three-item scale assessing the product's immediate health benefits was taken from Spassova and Lee's (2013) work, whereas the seven items that evaluated individuals' hope were adopted from Cavanaugh *et al.*'s (2015) scale. Brand reliability (three items) and company reputation (five items) scales were adapted from Folse *et al.* (2012) and Rapp *et al.* (2013), respectively. Finally, choice uncertainty was measured with the three-item scale developed by May (2017). All the questionnaire items were evaluated on a five-point Likert scale (i.e. 1 ¼ "Strongly disagree"; 5 ¼ "Strongly agree").

## 4. Results

### 4.1 Study one

The content analysis of the interview transcripts using Leximancer revealed 11 main themes that describe vaccine decision-making: vaccine (100%), effective(ness) (50%), control (45%), time (43%), brand (41%), cases (40%), hope (39%), effort (35%), trust (30%), fear (17%) and behaviour (15%). These themes were further grouped in three categories based on the SAGE Working Group Model of vaccine hesitancy determinants (WHO, 2014). The vaccine brand and specific vaccination issues category includes four themes (i.e. brand, time, effort and effective[ness]). The television category represents contextual factors (i.e. cases). The remaining six themes are individual and social group influences (i.e. control, vaccine, hope, trust, fear and behaviour).

#### 4.1.1 Vaccine brand and specific vaccination issues.

The theme of brand comprises the concepts of brand, market, new (vaccine), multiple (vaccines), confidence and Pfizer. This theme describes the participants' awareness of the many vaccines available. One interviewee stated, "there are now multiple vaccines on the market, such as Pfizer, AstraZeneca and Moderna" (vaccine acceptance, 53, worker).

The theme of time covers the concepts of time, short (time), side and effects. Most participants commented on the brief period in which the vaccines were developed. The interviewees are concerned about rapid development of COVID-19 inoculations, which left insufficient time to detect all side effects. One participant maintained that "the short time spent on developing the vaccine does not inspire trust" (vaccine hesitancy, 19, student). Another individual shared, "the time factor is crucial to ascertaining whether there are long-term side effects or not" (vaccine acceptance, 53, worker). Other participants are not afraid about the time needed to develop safe vaccines. For instance, an interviewee said, "we have been vaccinated several times, and we have never questioned the development time" (vaccine acceptance, 21, student).

Most participants perceive the vaccine brands as different (i.e. formulation, administration, efficacy and side effects) even though all have been approved by regulatory

agencies as safe and effective. A respondent wrote:

The vaccines are different in the way they are administered, preserved [and] formulated, but they have the same goal [...]. The vaccines offered in Portugal were approved by the competent authorities, so the [general] population should feel confident about them. (vaccine acceptance, 25, health worker)

The theme of effort includes the concepts of effort, scientists and countries. Those who accept the vaccine emphasise multiple scientists' role and different countries' efforts to develop multiple vaccines in a short period of time. For example, one participant asserted that:

When COVID appeared, people asked where they could find a vaccine quickly. Now that not one or two, but several vaccines have appeared, they [individuals] are now afraid that it [the vaccine's development] was too fast. The vaccines are reliable as they were developed by the combined efforts of several countries, [and] several scientists who had never been high profile before. (vaccine acceptance, 22, health worker)

*4.1.2 Contextual factors.* The theme of television joins the concepts of television, cases and know(ledge). This theme focuses on communication and media environments that provide information about COVID-19 to the general population. An interviewee stated, "I am informed about COVID and the number of cases. I follow the news on the television daily" (vaccine acceptance, 52, worker).

*4.1.3 Individual and social group influences.* The theme of vaccine includes the concepts of vaccine, COVID, people and get (vaccinated). This central theme represents all the adults who plan to get inoculated. A typical statement is "I want to get vaccinated as soon as possible" (vaccine acceptance, 22, student).

The theme of control encompasses the concepts of control, year, population, follow(er), severe (cases), virus, disease, professionals, immunity, pandemic, expense, group and health. This theme highlights immunisation's role as a social norm. An interviewee reported that:

I think the vaccines are a step forward towards helping to control the pandemic. I think it is a virus that is here to stay and that it will be necessary to get vaccinated every year. The situation must be controlled by achieving herd immunity. It will probably only be one year from now that things will be well under control. (vaccine acceptance, 21, student)

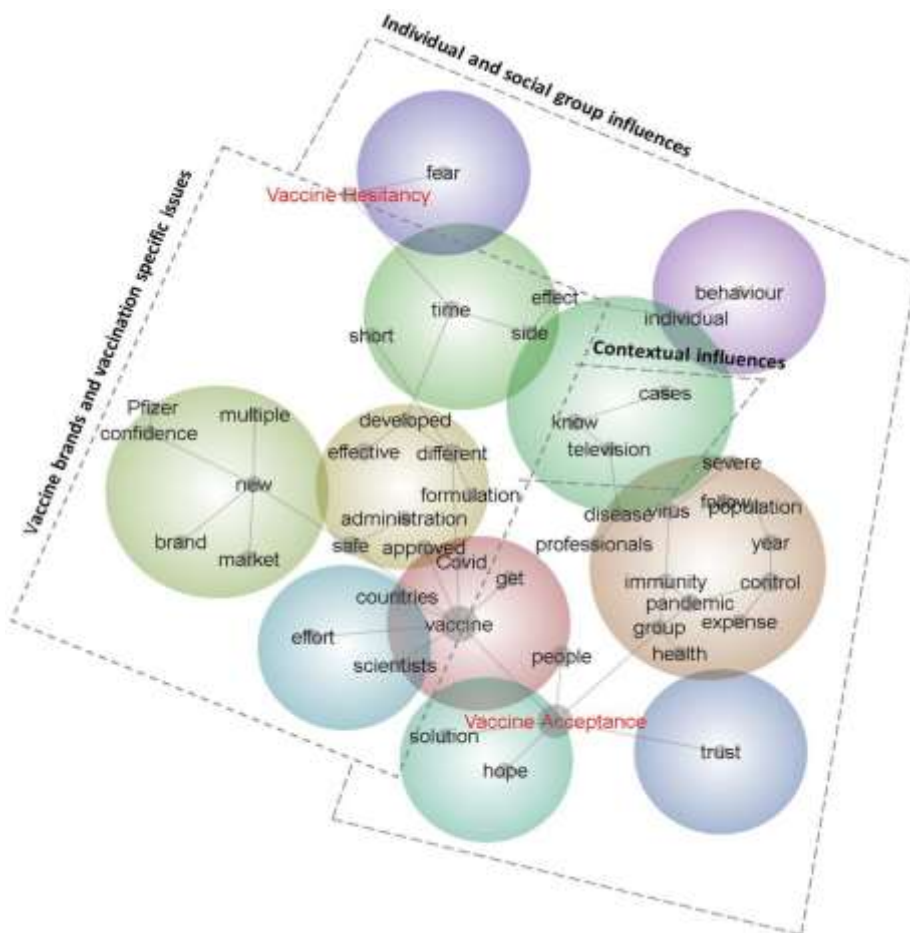
The theme of hope includes the concepts of hope and solution. One participant stated, "I want to be vaccinated because I want to be part of the solution" (vaccine acceptance, 34, retired). Another respondent said, "I have hope in the vaccine, and I'm looking forward to getting vaccinated" (vaccine acceptance, 72, retired).

The theme and concept of trust is associated with a positive attitude towards the vaccine. An interviewee asserted, "I want to get vaccinated. I trust the vaccine because it's the only thing we have so far to prevent new infections" (vaccine acceptance, 25, health worker). In contrast, the theme and concept of fear is mainly linked with vaccine hesitancy. One individual shared, "I feel fear, and no desire to get vaccinated" (vaccine hesitancy, 80, retired). The theme of behaviour combines the concepts of behaviour and individual. This theme involves the population's role in controlling COVID-19's spread. An older respondent said, "the pandemic will be controlled thanks to each person's individual behaviour" (vaccine hesitancy, 80, retired).

The themes that are more likely to be mentioned by the vaccine hesitancy group are fear, time, behaviour and television (see Figure 2). These participants are afraid of the vaccine and concerned about not only the short time in which the vaccines were developed but also the impossibility of assessing long-term effects in that time. This segment also believes that the pandemic will be controlled based on individual behaviour.

The themes that are most often referred to by the vaccine acceptance group are vaccine,

hope, trust, effort, control, effective(ness) and brand. These participants feel hope in the vaccine process and its perceived health benefits (e.g. controlling the pandemic), as well as believing in the vaccines' effectiveness. These individuals are aware of the multiple vaccine brands and trust vaccines and vaccine brands.



Source: Authors' own work

#### 4.2 Study two

The research model (see Figure 1) was tested using SmartPLS 3 software (Ringle *et al.*, 2015) to conduct structural equation modelling (SEM) based on the partial least squares (PLS) method, which facilitates statistical analyses of models containing reflective constructs (Henseler *et al.*, 2016). PLS-SEM estimates partial model structures by combining principal component analysis with ordinary least squares regression (Hair *et al.*, 2019).

As suggested by Hair *et al.* (2019), the first step of the present measurement model assessment was to examine the indicators' loadings on their respective constructs. The loadings should be greater than 0.708 (Hair *et al.*, 2019). In this case, all the loadings exceeded the threshold value except for the construct of hope (i.e. H7), but the value was only slightly below the cut-off point so this variable was retained in the model. The loadings were estimated using bootstrap resampling (i.e. 5,000 subsamples of

the original sample) to obtain the *t*-statistic's values (Hair *et al.*, 2017b). The current results confirm that all the indicators are significant with a confidence level of 99.9%.

The degree of multicollinearity among the model's variables was checked using the variance inflation factor. Values vary from 1.067 to 1.444, which is well below the standard threshold of 5 (Hair *et al.*, 2017a). The measurement model was also found to conform to all the reliability and validity criteria required by PLS model assessments. The values were as follows: Cronbach's  $\alpha > 0.7$ ; Dijkstra–Henseler's  $\rho$  ( $r_A$ )  $> 0.7$  (Dijkstra and Henseler, 2015); composite reliability  $> 0.7$  (Nunnally and Bernstein, 1994); and average variance extracted  $> 0.5$  (Fornell and Larcker, 1981). More detailed results are presented in Table 2.

The discriminant validity analysis was based on the Fornell–Larcker criterion, which confirmed a satisfactory level of discriminant validity for all the constructs. Discriminant validity was also assessed via the heterotrait–monotrait ratio (HTMT) of correlations, as recommended by Henseler *et al.* (2015). Table 3 shows that discriminant validity is present because all the HTMT criteria are below the standard 0.9 threshold (Henseler *et al.*, 2015).

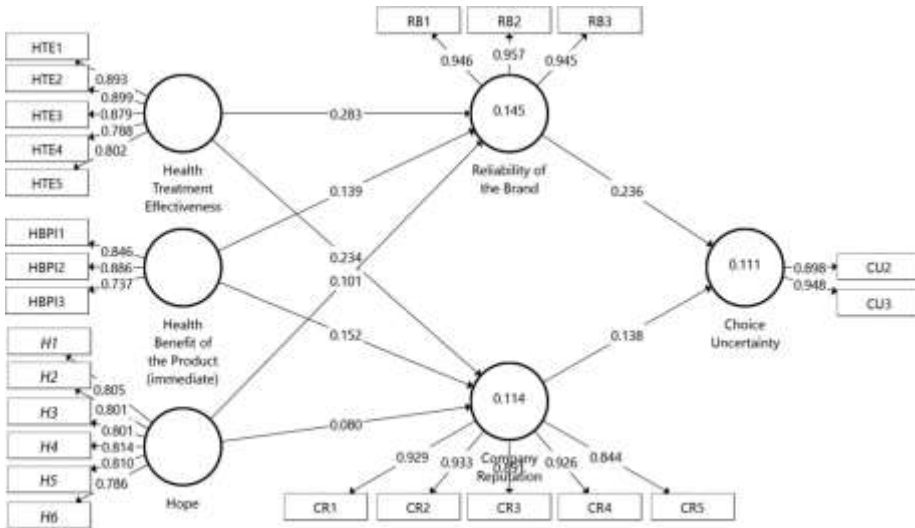
The hypotheses were tested using 5,000 bootstrap resamples (see Table 4). The structural model's explanatory power was evaluated using the coefficient of determination ( $R^2$ ) value, which reflects the dependent constructs' explained variance (Hair *et al.*, 2019). The results indicate that all paths are statistically significant, with the structural model explaining 14.5% of the variance in brand reliability, 11.4% of company reputation and 11.1% of choice uncertainty (see Figure 3).

The above findings provide support for all the hypotheses. More specifically, *H1a*, *H2a* and *H3a* state that health treatment effectiveness, the product's immediate health benefits and hope have a positive effect on brand reliability. The results verify these hypotheses based on the significant direct positive impact of health treatment effectiveness (path coefficient  $\frac{1}{4}$  0.283;  $p < 0.001$ ), the product's immediate health benefits (path coefficient  $\frac{1}{4}$  0.139;  $p < 0.01$ ) and hope (path coefficient  $\frac{1}{4}$  0.101;  $p < 0.05$ ) on brand reliability.

*H1b*, *H2b* and *H3b*, in turn, posit that health treatment effectiveness, the product's immediate health benefits and hope have a positive effect on company reputation. The findings also provide support for these hypotheses because a significant direct positive impact on company reputation was confirmed for health treatment effectiveness (path coefficient  $\frac{1}{4}$  0.234;  $p < 0.001$ ), the product's immediate health benefits (path coefficient  $\frac{1}{4}$  0.152;  $p < 0.001$ ) and hope (path coefficient  $\frac{1}{4}$  0.080;  $p < 0.05$ ). Support was also found for *H4* and *H5* given the significant positive relationship between brand reliability and choice uncertainty (path coefficient  $\frac{1}{4}$  0.236;  $p < 0.001$ ) and between company reputation and choice uncertainty (path coefficient  $\frac{1}{4}$  0.138;  $p < 0.01$ ) (see Table 4).

## 5. Conclusions

This research analysed the underlying reasons for vaccine acceptance and hesitancy in study one and choice uncertainty and brand reliability in study two, with regard to COVID-19 vaccine brands. The first study's results reveal that vaccine hesitancy can be associated with specific vaccine brand and vaccination issues, as well as individual and group influences and contextual factors. These findings are in agreement with the SAGE Working Group Model (Larson *et al.*, 2015; WHO, 2014). The participants who exhibit vaccine hesitancy do not believe in herd immunity and report low levels of complacency (Larson *et al.*, 2015). They also have little confidence in the vaccines (Larson *et al.*, 2015) as these individuals are concerned about both the short time in which the vaccines were developed and the impossibility of assessing potential long-term effects during that brief period. Conversely, the respondents whose answers indicate vaccine acceptance trust the vaccine brands available on the market, and they have hope that the vaccines will be effective, as well as confidence in the benefits of mass immunisation.



Source: Authors' own work

The results answer the first research question, revealing that the main themes associated with vaccine acceptance and hesitancy are awareness of different brands in the market, the short time in which the vaccines were developed and thus the need to assess side effects, media information and individual behaviours. The findings facilitated the segmentation of the participants into two groups: those that intend to be vaccinated and those who are hesitant about the vaccine. More specifically, the themes associated with the first group are hope, solution, social and individual behaviours' influence on immunisation and confidence in the COVID-19 vaccines.

The conceptual model's results in study two provide empirical support for the first study's findings. The vaccines' health treatment effectiveness and immediate health benefits have a strong impact on brand reliability and company reputation. Hope has a stronger effect on brand reliability than on company reputation. One possible reason for this variation is that individuals may be more concerned about the vaccines' effectiveness and immediate benefits. In addition, more information is available about vaccine brands than about the companies themselves (MacInnis and de Mello, 2005).

Brand reliability can be considered to be one dimension of brand trust (Munuera-Aleman *et al.*, 2003). The present results confirm that brand reliability has a positive effect on individuals' choice uncertainty, that is, decreasing their uncertainty about getting vaccinated against COVID-19. This impact occurs because people experience no uncertainty regarding the vaccines and feel quite secure about their results (Folse *et al.*, 2012). Company reputation also has a positive effect on individuals' choice uncertainty. This uncertainty decreases when pharmaceutical companies backing vaccine brands maintain a good reputation, remain trustworthy and make honest claims (Perez-Cornejo *et al.*, 2019; Rapp *et al.*, 2013).

The results also answer the second research question. Brand reliability and company reputation are the main variables that influence vaccination behaviour in the presence of choice uncertainty. However, brands only achieve these two characteristics if the

brands are perceived as offering effective treatment and immediate benefits and as providing the hope of controlling the COVID-19 pandemic.

### *5.1 Theoretical contributions*

The current findings have significant theoretical implications. Study one's results extend the SAGE Working Group Model for the COVID-19 context, in which the vaccines had to be successfully developed in a short time. In addition, the market segmentation approach adopted contributes to the existing literature by identifying two groups of individuals based on two main themes: vaccine hesitancy and vaccine acceptance. The first study's findings also provide evidence of COVID-19 vaccine brand awareness and brands' role in vaccine acceptance.

Study two's originality arises from its results for individual consumer behaviours towards vaccines and the main variables that influence vaccine behaviour when choice uncertainty is a factor. This study's findings specifically contribute to the extant literature by clarifying the positive role of brand-related variables in decreasing vaccine brand uncertainty, namely, trust in brand reliability and companies and/or pharmaceutical products' reputation.

### *5.2 Managerial contributions*

The results also have managerial implications. The first study revealed that vaccine hesitancy is associated with a lack of confidence in all COVID-19 vaccine brands due to the accelerated development and approval process and fear of the long-term side effects that could thus not be assessed. Vaccine hesitancy is further increased by a lack of complacency



about mass immunisations as a way to end the pandemic. Thus, any public agency's communication strategies targeting this group need to ensure greater transparency about the uncertainties associated with vaccines. Agencies additionally should update the list of potential risks as more individuals are vaccinated and promote informed consent to manage expectations appropriately. The latter strategies can sometimes be difficult to implement, so, in parallel, organisations need to reinforce communication about COVID-19 vaccinations' benefits with examples of successes in combating the pandemic in varied countries.

The second study underlined that vaccine communication strategies must not only reinforce confidence in health treatment effectiveness and vaccines' benefits but also address specific brand-related issues, such as brand reliability and the corresponding pharmaceutical companies' reputation. More concretely, the findings can help public organisations (e.g. governments and public health agencies) strengthen vaccine acceptance and private entities' (e.g. pharmaceutical laboratories) ability to increase brand reliability and company reputation.

As the pandemic is a public health problem, public organisations must promote free vaccinations to the general population, define strategies to spread more accurate information and diminish uncertainty about the vaccines' benefits. Governments' communication plan should primarily seek to communicate the COVID-19 inoculation's benefits more effectively so that even more people will get vaccinated. The results reveal that individuals evaluate health treatment effectiveness by considering three aspects – efficiency, effectiveness and usefulness – so people prefer a fast solution offering a high probability of a cure.

Communications' contents thus need to integrate these three features and emphasise that getting vaccinated can provide the maximum benefits (i.e. a quick cure and herd immunity) that will have an immediate effect on individuals' health. This strategy can best be operationalised by involving medical experts (e.g. health professionals) and public policymakers. In addition to highlighting all the relevant factors, officials must foster a stronger, more positive emotional investment in COVID-19 vaccination as a solution that can provide the most hope that the pandemic will be brought under control. The present results also indicate that agencies need to broadcast information on the vaccine brands to decrease consumers' choice uncertainty.

These findings are equally important for pharmaceutical companies as they currently supply multiple vaccines. These firms can focus on making their brand reliability and company reputation stronger in the present unusual environment. Brands that quickly prove to be highly efficacious and offer benefits can make more customers believe that the solution for COVID-19 can be found, which will have a strong impact on future sales indicators and financial results.

### *5.3 Limitations and suggested future research*

Despite these valuable contributions, this study was also subject to some limitations. Firstly, the data were collected during the vaccination campaign's initial phases. Future research could adopt a longitudinal design to test brand choice uncertainty determinants' stability, for instance, in Portugal, where around 85% of the population have been vaccinated thus far. Secondly, the quantitative study's sample is relatively large, but this investigation focused on a single country (i.e. Portugal). Further studies are needed to collect data in other countries where other vaccine brands have been approved by health-care regulators, thereby facilitating cross-cultural comparisons.

Another limitation is the lack of analyses focused on reliability brand and company reputation's mediating effects on the relationship between input variables and choice

uncertainty. Future studies should assess the strength of these two mediators' impacts, as well as company reputation's influence on brand reliability. Interesting results may also be generated by considering age's moderating effects on the relationships between brand reliability, company reputation and choice uncertainty.

## References

- Agley, J. and Xiao, Y. (2021), "Misinformation about COVID-19: evidence for differential latent profiles and a strong association with trust in science", *BMC Public Health*, Vol. 21 No. 1, p. 89, doi: 10.1186/s12889-020-10103-x.
- Akel, S., Bleibel, F., Hale, G. and Khanfar, N.M. (2021), "Destigmatizing public health concerns and supply of COVID-19 vaccines", *Health Marketing Quarterly*, Vol. 38 Nos 2/3, pp. 1-7, doi: 10.1080/ 07359683.2021.1968099.
- Alvarez-Zuzek, L.G., Zipfel, C.M. and Bansal, S. (2022), "Spatial clustering in vaccination hesitancy: the role of social influence and social selection", *PLOS Computational Biology*, Vol. 18 No. 10, p. e1010437.
- Batson, C.D., Ahmad, N., Powell, A.A., Stocks, E.L., Shah, J. and Gardner, W.L. (2008), "Prosocial motivation", in Gardner, J.Y.S.a.W.L. (Ed.), *Handbook of Motivation Science*, Guilford Press, New York, NY, pp. 135-149.
- Bettman, J.R. and Park, C.W. (1980), "Effects of prior knowledge and experience and phase of the choice process on consumer decision processes: a protocol analysis", *Journal of Consumer Research*, Vol. 7 No. 3, pp. 234-248, doi: 10.1086/208812.
- Borges, A.P., Vieira, E., Rodrigues, P. and Sousa, A. (2023), "Influence of COVID-19 on online shopping behaviour, leisure and socialization", *Management Research, The Journal of the Iberoamerican Academy of Management*, Vol. 21 No. 2, pp. 122-144.
- Braun-Lewensohn, O., Abu-Kaf, S. and Kalagy, T. (2021), "Hope and resilience during a pandemic among three cultural groups in Israel: the second wave of Covid-19", *Frontiers in Psychology*, Vol. 12, doi: 10.3389/fpsyg.2021.637349.
- Cavanaugh, L., Bettman, J. and Luce, M. (2015), "Feeling love and doing more for distant others: specific positive emotions differentially affect prosocial consumption", *Journal of Marketing Research*, Vol. 52 No. 5, pp. 657-673, doi: 10.1509/jmr.10.0219.
- Chaney, D. and Lee, M.S. (2022), "COVID-19 vaccines and anti-consumption: understanding anti-vaxxers hesitancy", *Psychology and Marketing*, Vol. 39 No. 4, pp. 741-754, doi: 10.1002/mar.21617.
- Cheng, Y., Mukhopadhyay, A. and Schrift, R.Y. (2017), "Do costly options lead to better outcomes? How the protestant work ethic influences the cost-benefit heuristic in goal pursuit", *Journal of Marketing Research*, Vol. 54 No. 4, pp. 636-649, doi: 10.1509/jmr.15.0105.
- Chou, W.-Y.S. and Budenz, A. (2020), "Considering emotion in COVID-19 vaccine communication: addressing vaccine hesitancy and fostering vaccine confidence", *Health Communication*, Vol. 35 No. 14, pp. 1718-1722, doi: 10.1080/10410236.2020.1838096.
- Cohen, E. (2020), "Fauci says Covid-19 vaccine may not get US to herd immunity if too many people refuse to get it", available at: [www.cnn.com/2020/06/28/health/fauci-coronavirus-vaccine-contact-tracing-aspen/index.html](http://www.cnn.com/2020/06/28/health/fauci-coronavirus-vaccine-contact-tracing-aspen/index.html) (accessed 29 August 2021).
- Delgado-Ballester, E. and Luis Munuera-Alem, J. (2005), "Does brand trust matter to brand equity?", *Journal of Product and Brand Management*, Vol. 14 No. 3, pp. 187-196, doi: 10.1108/ 10610420510601058.
- Dijkstra, T. and Henseler, J. (2015), "Consistent partial least squares path modeling", *MIS*

*Quarterly*, Vol. 39 No. 2, pp. 297-316, doi: 10.25300/MISQ/2015/39.2.02.

- Donthu, N. and Gustafsson, A. (2020), "Effects of COVID-19 on business and research", *Journal of Business Research*, Vol. 117, pp. 284-289, doi: 10.1016/j.jbusres.2020.06.008.
- Dubbelink, S.I., Herrando, C. and Constantinides, E. (2021), "Social media marketing as a branding strategy in extraordinary times: lessons from the COVID-19 pandemic", *Sustainability*, Vol. 13 No. 18, p. 10310.
- Fajar, J.K., Sallam, M., Soegiarto, G., Sugiri, Y.J., Anshory, M., Wulandari, L., Kosasih, S.A.P., Ilmawan, M., Kusnaeni, K., Fikri, M. and Fikri, M. (2022), "Global prevalence and potential influencing factors of COVID-19 vaccination hesitancy: a meta-analysis", *Vaccines*, Vol. 10 No. 8, p. 1356.
- Folse, J.A.G., Netemeyer, R.G. and Burton, S. (2012), "SPOKESCHARACTERS: how the personality traits of sincerity, excitement, and competence help to build equity", *Journal of Advertising*, Vol. 41 No. 1, pp. 17-32, available at: [www.jstor.org/stable/23208318](http://www.jstor.org/stable/23208318)
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research (JMR)*, Vol. 18 No. 1, pp. 39-50, available at: <http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=5015357&site=ehost-live&scope=site>
- Gallagher, M.W., Smith, L.J., Richardson, A.L., D'Souza, J.M. and Long, L.J. (2021), "Examining the longitudinal effects and potential mechanisms of hope on COVID-19 stress, anxiety, and well-being", *Cognitive Behaviour Therapy*, Vol. 50 No. 3, pp. 234-245, doi: 10.1080/16506073.2021.1877341.
- Garbarino, E. and Johnson, M.S. (1999), "The different roles of satisfaction, trust, and commitment in customer relationships", *Journal of Marketing*, Vol. 63 No. 2, pp. 70-87, doi: 10.1177/002224299906300205.
- Champion, V.L. and Skinner, C.S. (2008), "The health belief model", In Glanz, K., Rimer, B.K. and Viswanath, K. (Eds), *Health Behavior and Health Education: theory, Research, and Practice*, John Wiley and Sons, San Francisco, CA.
- Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2017a), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage, Thousand Oaks, CA.
- Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019), "When to use and how to report the results of PLS-SEM", *European Business Review*, Vol. 31 No. 1, pp. 2-24, doi: 10.1108/EBR-11-2018-0203.
- Hair, J.F., Sarstedt, M., Ringle, C.M. and Gudergan, S.P. (2017b), *Advanced Issues in Partial Least Squares Structural Equation Modeling*, SAGE Publications, Thousand Oaks, CA.
- Harman, H.H. (1976), *Modern Factor Analysis*, 3rd ed., The University of Chicago Press, Chicago, IL.
- Hassan, L., Shaw, D., Shiu, E., Walsh, G. and Parry, S. (2013), "Uncertainty in ethical consumer choice: a conceptual model", *Journal of Consumer Behaviour*, Vol. 12 No. 3, pp. 182-193, doi: 10.1002/cb.1409.
- Hastline, W. (2020), "The risks of rushing a COVID-19 vaccine", available at: [www.scientificamerican.com/article/the-risks-of-rushing-a-covid-19-vaccine/](http://www.scientificamerican.com/article/the-risks-of-rushing-a-covid-19-vaccine/) (accessed 29 August).
- Henseler, J., Hubona, G. and Ray, P.A. (2016), "Using PLS path modeling in new technology research: updated guidelines", *Industrial Management and Data Systems*, Vol. 116 No. 1, pp. 2-20.

- Henseler, J., Ringle, C.M. and Sarstedt, M. (2015), "A new criterion for assessing discriminant validity in variance-based structural equation modeling", *Journal of the Academy of Marketing Science*, Vol. 43 No. 1, pp. 115-135, doi: 10.1007/s11747-014-0403-8.
- Jacoby, J., Jaccard, J.J., Currim, I., Kuss, A., Ansari, A. and Troutman, T. (1994), "Tracing the impact of item-by-item information accessing on uncertainty reduction", *Journal of Consumer Research*, Vol. 21 No. 2, pp. 291-303, doi: 10.1086/209398.
- Jungmann, S.M. and Witthöft, M. (2020), "Health anxiety, cyberchondria, and coping in the current COVID-19 pandemic: which factors are related to coronavirus anxiety?", *Journal of Anxiety Disorders*, Vol. 73, p. 102239, doi: 10.1016/j.janxdis.2020.102239.
- Kieslich, K. (2018), "Addressing vaccination hesitancy in Europe: a case study in state–society relations", *European Journal of Public Health*, Vol. 28 No. suppl\_3, pp. 30-33.
- Killgore, W.D.S., Cloonan, S.A., Taylor, E.C. and Dailey, N.S. (2021), "The COVID-19 vaccine is here- now who is willing to get it?", *Vaccines (Basel)*, Vol. 9 No. 4, doi: 10.3390/vaccines9040339.
- Kim, J., Yang, K., Min, J. and White, B. (2022), "Hope, fear, and consumer behavioral change amid COVID-19: application of protection motivation theory", *International Journal of Consumer Studies*, Vol. 46 No. 2, pp. 558-574, doi: 10.1111/ijcs.12700.
- Kirk, C.P. and Rifkin, L.S. (2020), "I'll trade you diamonds for toilet paper: consumer reacting, coping and adapting behaviors in the COVID-19 pandemic", *Journal of Business Research*, Vol. 117, pp. 124-131, doi: 10.1016/j.jbusres.2020.05.028.
- Larson, H.J., Schulz, W.S., Tucker, J.D. and Smith, D.M. (2015), "Measuring vaccine confidence: introducing a global vaccine confidence index", *PLoS Currents*, Vol. 7, doi: 10.1371/currents.outbreaks.ce0f6177bc97332602a8e3fe7d7f7cc4.
- Laurin, K., Kay, A.C. and Moscovitch, D.A. (2008), "On the belief in god: towards an understanding of the emotional substrates of compensatory control", *Journal of Experimental Social Psychology*, Vol. 44 No. 6, pp. 1559-1562, doi: 10.1016/j.jesp.2008.07.007.
- Lazarus, R.S. (1991), *Emotion and Adaptation*, Oxford University Press on Demand.
- Lazarus, R.S. (2006), "Emotions and interpersonal relationships: toward a person-centered conceptualization of emotions and coping", *Journal of Personality*, Vol. 74 No. 1, pp. 9-46, doi: 10.1111/j.1467- 6494.2005.00368.x.
- Lin, C., Tu, P. and Beitsch, L.M. (2021), "Confidence and receptivity for COVID-19 vaccines: a rapid systematic review", *Vaccines*, Vol. 9 No. 1, p. 16, available at: [www.mdpi.com/2076-393X/9/1/16](http://www.mdpi.com/2076-393X/9/1/16)
- Lwin, M.O., Lu, J., Sheldenkar, A., Schulz, P.J., Shin, W., Gupta, R. and Yang, Y. (2020), "Global sentiments surrounding the COVID-19 pandemic on twitter: analysis of twitter trends", *JMIR Public Health and Surveillance*, Vol. 6 No. 2, p. e19447, doi: 10.2196/19447.
- MacInnis, D.J. and de Mello, G.E. (2005), "The concept of hope and its relevance to product evaluation and choice", *Journal of Marketing*, Vol. 69 No. 1, pp. 1-14, doi: 10.1509/jmkg.69.1.1.55513.
- May, F. (2017), "The effect of future event markers on intertemporal choice is moderated by the reliance on emotions versus reason to make decisions", *Journal of Consumer Research*, Vol. 44 No. 2, pp. 313-331, doi: 10.1093/jcr/ucw081.
- Mellet, J. and Pepper, M.S. (2021), "A COVID-19 vaccine: big strides come with big challenges",

*Vaccines*, Vol. 9 No. 1, p. 39, doi: 10.3390/vaccines9010039.

- Moshin, A., Brochado, A. and Rodrigues, H. (2020), "Halal tourism is traveling fast: community perceptions and implications", *Journal of Destination Marketing and Management*, Vol. 18, p. 100503, doi: 10.1016/j.jdmm.2020.100503.
- Motta, M., Callaghan, T., Sylvester, S. and Lunz-Trujillo, K. (2003), "Identifying the prevalence, correlates, and policy consequences of anti-vaccine social identity", *Politics, Groups, and Identities*, doi: 10.1080/21565503.2021.1932528.
- Munuera-Aleman, J.L., Delgado-Ballester, E. and Yague-Guillen, M.J. (2003), "Development and validation of a brand trust scale", *International Journal of Market Research*, Vol. 45 No. 1, pp. 1-18, doi: 10.1177/147078530304500103.
- Neumann-Böhme, S., Varghese, N.E., Sabat, I., Barros, P.P., Brouwer, W., van Exel, J., Schreyögg, J. and Stargardt, T. (2020), "Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19", *The European Journal of Health Economics*, Vol. 21 No. 7, pp. 977-982, doi: 10.1007/s10198-020-01208-6.
- Nunnally, J. and Bernstein, I. (1994), *Psychometric Theory*, McGraw-Hill, New York, NY.
- Perez-Cornejo, C., de Quevedo-Puente, E. and Delgado-García, J.B. (2019), "How to manage corporate reputation? The effect of enterprise risk management systems and audit committees on corporate reputation", *European Management Journal*, Vol. 37 No. 4, pp. 505-515, doi: 10.1016/j.emj.2019.01.005.
- Podsakoff, P.M., MacKenzie, S.B., Jeong-Yeon, L. and Podsakoff, N.P. (2003), "Common method biases in behavioral research: a critical review of the literature and recommended remedies", *Journal of Applied Psychology*, Vol. 88 No. 5, p. 879, available at: <http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=10986397&site=ehost-live&scope=site>
- Rapp, A., Beitelspacher, L.S., Grewal, D. and Hughes, D.E. (2013), "Understanding social media effects across seller, retailer, and consumer interactions", *Journal of the Academy of Marketing Science*, Vol. 41 No. 5, pp. 547-566, doi: 10.1007/s11747-013-0326-9.
- Razai, M.S., Chaudhry, U.A., Doerholt, K., Bauld, L. and Majeed, A. (2021), "Covid-19 vaccination hesitancy", *BMJ*, p. 373.
- Reiter, P.L., Pennell, M.L. and Katz, M.L. (2020), "Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated?", *Vaccine*, Vol. 38 No. 42, pp. 6500-6507, doi: 10.1016/j.vaccine.2020.08.043.
- Ringle, C.M., Wende, S. and Becker, J.-M. (2015), *SmartPLS 3*, SmartPLS, Bönningstedt.
- Rodriguez, V.J., Alcaide, M.L., Salazar, A.S., Montgomerie, E.K., Maddalon, M.J. and Jones, D.L. (2022), "Psychometric properties of a vaccine hesitancy scale adapted for COVID-19 vaccination among people with HIV", *AIDS and Behavior*, Vol. 26 No. 1, pp. 96-101, doi: 10.1007/s10461-021-03350-5.
- Sheth, J. (2020), "Impact of covid-19 on consumer behavior: will the old habits return or die?", *Journal of Business Research*, Vol. 117, pp. 280-283, doi: 10.1016/j.jbusres.2020.05.059.
- Shiu, E.M.K., Walsh, G., Hassan, L.M. and Shaw, D. (2011), "Consumer uncertainty, revisited", *Psychology and Marketing*, Vol. 28 No. 6, pp. 584-607, doi: 10.1002/mar.20402.
- Shrotri, M., Swinnen, T., Kampmann, B. and Parker, E.P.K. (2021), "An interactive website tracking COVID-19 vaccine development", *The Lancet Global Health*, Vol. 9 No. 5, pp.

e590-e592, doi: 10.1016/S2214-109X(21)00043-7.

- Spassova, G. and Lee, A.Y. (2013), "Looking into the future: a match between self-view and temporal distance", *Journal of Consumer Research*, Vol. 40 No. 1, pp. 159-171, doi: 10.1086/669145.
- Taylor, S. and Asmundson, G.J. (2021), "Immunization stress-related responses: implications for vaccination hesitancy and vaccination processes during the COVID-19 pandemic", *Journal of Anxiety Disorders*, Vol. 84, p. 102489.
- Urbany, J.E., Dickson, P.R. and Wilkie, W.L. (1989), "Buyer uncertainty and information search", *Journal of Consumer Research*, Vol. 16 No. 2, pp. 208-215, doi: 10.1086/209209.
- Verger, P. and Dubé, E. (2020), "Restoring confidence in vaccines in the COVID-19 era", *Expert Review of Vaccines*, Vol. 19 No. 11, pp. 991-993, doi: 10.1080/14760584.2020.1825945.
- Waugh, C.E. and Fredrickson, B.L. (2006), "Nice to know you: positive emotions, self–other overlap, and complex understanding in the formation of a new relationship", *The Journal of Positive Psychology*, Vol. 1 No. 2, pp. 93-106.
- WHO (2014), "Report of the SAGE working group on vaccine hesitancy, 2014", available at: [www.who.int/immunization/sage/meetings/2014/october/1\\_Report\\_WORKING\\_GROUP\\_vaccine\\_hesitancy\\_final.pdf](http://www.who.int/immunization/sage/meetings/2014/october/1_Report_WORKING_GROUP_vaccine_hesitancy_final.pdf)
- Williams, N.L., Nguyen, T.H.H., Del Chiappa, G., Fedeli, G. and Wassler, P. (2021), "COVID-19 vaccine confidence and tourism at the early stage of a voluntary mass vaccination campaign: a PMT segmentation analysis", *Current Issues in Tourism*, Vol. 25 No. 3, pp. 1-15, doi: 10.1080/13683500.2021.1963216.
- Wong, L.P., Alias, H., Wong, P.-F., Lee, H.Y. and AbuBakar, S. (2020), "The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay", *Human Vaccines and Immunotherapeutics*, Vol. 16 No. 9, pp. 2204-2214, doi: 10.1080/21645515.2020.1790279.
- Wu, M.-Y., Wall, G. and Pearce, P.L. (2014), "Shopping experiences: international tourists in Beijing's silk market", *Tourism Management*, Vol. 41, pp. 96-106.
- Yan, J., Ouyang, Z., Vinnikova, A. and Chen, M. (2021), "Avoidance of the threats of defective vaccines: how a vaccine scandal influences parents' protective behavioral response", *Health Communication*, Vol. 36 No. 8, pp. 962-971, doi: 10.1080/10410236.2020.1724638.