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Research Article

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COVID-19 in Mass Media: Manufacturing Mass Perceptions of the Virus among Older Adults

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Abstract: According to the latest The Global Risks Report (2022) of World Economic Forum, the large-scale coronavirus disease 2019 (COVID-19) threat creates various tensions that might lead to unexpected cascading impacts in various domains. Nevertheless, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus, about 120 nm in diameter, remains invisible to people whose cognition, emotions, and health-related behaviors are driven primarily by the subjective perception of the virus. Mass media communicating information, symbols, beliefs, and codes of conduct to the population contribute widely to the socially constructed representations of the new SARS-CoV-2 virus. Thus, the aim of the current research is to investigate the impacts of the common COVID-19 mass media image of the “ball with spikes” representing the SARS-CoV-2 virus on older adults particularly vulnerable to the COVID-19 coronavirus disease and fake news dissemination. This research is based on an innovative mixed-methods research design that combines questionnaires ($N = 144$), semi-structured research interviews, and pictographic measures ($N = 26$). The primary results demonstrate that individuals’ perceptions of and emotional reactions to the invisible SARS-CoV-2 virus are shaped by mass media exposure, as the “ball with spikes” became a familiar symbol of the COVID-19 virus, marked by the symbolism of dangerousness and mystery with a divisive aesthetic. The current research that aims to highlight the role of mass media as the vector of an icon image of the new SARS-CoV-2 virus provides additional elements that may contribute to improved crisis management effectiveness of future pandemic outbreaks.

Keywords: COVID-19, SARS-CoV-2 virus, mass media, images, perceptions

The coronavirus disease 2019 (COVID-19) coronavirus pandemic that overwhelmed the world in 2020 represents one of the major large-scale crises of the twenty-first century. Indeed, the International

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Health Regulations Emergency Committee of the World Health Organization declared on January 30, 2020 that the COVID-19 outbreak of a new type of coronavirus in China was becoming a public health emergency of international concern, primarily due to extensive human-to-human transmission, while calling for solidarity and cooperation of the global community (World Health Organization, January 30, 2020). During the global COVID-19 pandemic, researchers rapidly pointed out related COVID-19 infodemics and their impacts on individuals' health and general well-being (Brennen, Simon, Howard, & Nielsen, 2020; Gao *et al.*, 2020; Pennycook, McPhetres, Zhang, Lu, & Rand, 2020). In particular, negative mass media news has impacted individuals' emotions and overall psychological resilience during the COVID-19 pandemic (Giri & Maurya, 2021).

1 Construction of Collectively Shared Representations of the New COVID-19 Virus

Regardless of the nature of crises, whether natural or man-made, extreme situations are inherent to the human condition. These low-probability and high-impact situations, whatever their origin or their consequences, refer to a temporal breakdown in the course of individuals' existence (Pelletier, McLaughlin, Duteil-Mougel, Boespflug, & Lefort, 2021). These extreme situations are commonly followed by a transformative pivot of the reconstruction of the situational meaning and reshuffling of existence that allows individuals to overcome the collective trauma (Pelletier & Drozda-Senkowska, 2019a; Pelletier, 2021; Schippers, 2020). Large-scale crises, such as the COVID-19 pandemic, oblige people and societies to deploy adaptive coping mechanisms (Silver, 2020). Thus, during the COVID-19 crisis, the population has tried to cope with this extraordinary situation by reconstructing its meaning (de Jong, Ziegler, & Schippers, 2020), allowing people to cope with and overcome the destabilizing circumstances of the sanitary crisis (Eisenbeck, Carreno, & Pérez-Escobar, 2021).

In facing the new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus characterized above all by its invisibility, the representations of populations fall within the register of subjectivity underpinned by complex factors of the social construction of reality (Berger & Luckmann, 1966). Thus, various representations, projections, and imaginations built by emotional, cognitive, and social processes contribute to the elaboration of a collectively shared representation of the new virus and the meaning of the COVID-19 crisis. In particular, the mass media has an important role in the social construction of reality during extreme societal situations. The seminal research of Moscovici (1961/1976) pointed out that mass media diffusion refers to a particular communication system transmitting a message that represents common knowledge intended to be shared. Thus, the mass media constitutes a fundamental mediator between new and external objects, such as the new SARS-CoV-2 virus and the general public, consequently determining laypeople's emotions, cognition, and health-related behaviors during the COVID-19 pandemic.

In line with the postulation of Herman and Chomsky (1988/2010), the mass media serves as a system for communicating information, various symbols, consensual beliefs, and codes of conduct to the population. Indeed, the mass media remains one of the most important vectors of the social construction of reality and, therefore, the construction of meaning that people have of actual societal threats, together with political, institutional, and interpersonal communications (Orfali, 2005; Pelletier & Drozda-Senkowska, 2019b). Mass media information diffusion, which is above all factual, contributes to the construction of an "imaginary social world" (Rouquette, 1998, p. 93) and, therefore, cannot be apprehended without its relationship to ideology. By extension, mass media communication cannot be understood without its relationship to political power (Wandhoefer, Thamm, & Joshi, 2011) because it irrevocably carries political and institutional influences and interests. Thus, the mainstream mass media is a powerful instrument that spreads societal interests, efficiently amplified by the Internet and various social media platforms. In particular, Lim, Lu, Chen, and Kan (2015) found that online users use social networks for personal and professional reasons.

Furthermore, they observed that YouTube and Instagram act as source networks where users post to a sink network commonly found to be Twitter.

2 Mass Media as a Tool for Manufacturing Collectively Shared Representations

In particular, the mass media-generated images of the world in laypeople's cognition allow for constructing representations of major societal issues marked by uncertainty and novelty. These mass media images are of remarkable ingenuity primarily due to the invisibility of social construction processes (Gamson, Croteau, Hoynes, & Sasson, 1992). These images can take various forms, such as visual imagery, language, and sounds, and contain layers of meaning. Indeed, the mass media image of the invisible virus SARS-CoV-2 diffused by the mass media worldwide depicted as a "ball with spikes" offers clear visual information to the population. In particular, this generic mass media image of the "ball with spikes" offers a visual icon that embodies the very idea of a virus and therefore represents a common, intelligible, and familiar symbol of COVID-19 (Pelletier et al., 2022).

Visuals in the form of images, pictures, photographs, and videos have been used in news and mass media for easy comprehension of and attraction to a news story or message. They are also used as powerful symbols that can develop or change people's interpretation of events and messages. Indeed, people understand, retain, and retrieve visuals more easily than text (Bucher & Schumacher, 2006) due to their vivid nature and greater occupancy of the mind than textual information. Hence, visuals impact a person's emotions, ideas, impressions, judgments, and even behaviors more than texts (Gibson & Zillmann, 2000). The mass media mainly used the picture of a "ball with spikes" since the start of the pandemic. Specifically, the Centers for Disease Control and Prevention (CDC) developed the famous red and gray "ball with spikes" image for the virus (Li, Molder, & Yang, 2022). This image became so popular that it could be regarded as one of the most important icons symbolizing the virus and the COVID-19 pandemic in general. Indeed, this inexact representation corresponds to a scientific reality of another type of virus: the capsid with proteins stuck inside, playing the role of a "key" to open the cells to be infected. In particular, this image has been revealed recently under an electron microscope on cryogenized slices (Ke et al., 2020). The scientific explanation behind the spikes was that they represented the virus' tools to attach to other cells, but these scientific explanations were missing in mass media platforms.

Furthermore, the meaning and context of the virus's actual existence and extremely contagious and harmful nature were lost due to the "beautiful and colorful" pictorial representation of the SARS-CoV-2 virus (Sonnevend, 2020). The "ball with spikes" image has appeared in varying sizes, colors, and patterns across different media outlets as the primary representation of how the COVID-19 virus looked, although it was not the case in reality. This image was disseminated by news media as well as other media platforms. The widespread circulation and presence of the image across all the media platforms, coupled with the misleading or lacking explanation of the scientific structure of the virus, misled people to believe and embed in their minds the "ball with spikes" image as the accurate representation of the SARS-CoV-2 virus. As a result, throughout the pandemic and even today, people think about the virus as the mass media depicted representation without knowing how it truly appears under microscopy (Pelletier et al., 2022).

3 Theory of Visual Framing in Mass Media

The theory of visual framing sheds light on how the media frames messages with the help of visuals. Framing is an important concept in the mass media to understand how a message is constructed, and meaning is derived through its context (Bock, 2020). Goffman (1974) first elaborated on the framing concept and argued that the construction and context of messages impact the subsequent thoughts and behaviors of

the audience about these messages. Similarly, visual framing uses visuals in the message construction that are considered powerful since they are less intrusive and require less cognitive load than text. Rodriguez and Dimitrova (2011) analyzed how visuals can be used as denotative systems, stylistic–semiotic systems, connotative systems, and ideological representations.

According to Wischmann (1987), visuals are good framing tools to haze over issues while overwhelming the truth or facts. In the context of the COVID-19 pandemic, almost all news or messages have been framed using the “ball with spikes” image. The image has most often been used to cover anything related to pathogens. Indeed, it might have been used to instill fear among the audience about the virus. Li *et al.* (2022) analyzed the impact of the representational images of SARS-CoV-2 on the emotions and risk perception of viewers and found that the images elicited different levels of fear and disgust. However, no association with risk perception was observed. Thus, these authors suggested being careful about using the representational images of the COVID-19 virus or other infectious pathogens as they can have potential cognitive and emotional impacts on the audience. Notably, the growth of predominantly visual social media platforms (e.g., YouTube, Instagram, and TikTok) has made online users more susceptible to visual information on such platforms (Marcella-Hood & Marcella, 2022).

Herman and Chomsky’s (1988/2010) theory of manufacturing consent explains the impact of mass media on society as an important means of disseminating information, symbols, beliefs, and norms to the public. The mass media is also responsible for giving meaning to these messages, constructing common symbols and beliefs for the public while propagating them widely so that a common consent or commonality is reached among the masses. In particular, Gamson *et al.* (1992) analyzed how media messages or images contribute to the social construction of reality by highlighting three main factors with a major role in its social construction: 1) hegemony, 2) framing, frame transformation, or manipulation by the media, and 3) the fragmentation effect. All these factors contribute to constructing a shared “reality” that is often distorted by society. Indeed, in the context of the COVID-19 pandemic, the common mass media image of the “ball with spikes” representing the SARS-CoV-2 virus tends to be perceived as clear visual information that is easily “targetable” by people and, therefore, less anxiety-eliciting compared to the scientific image of the virus (Pelletier *et al.*, 2022).

The aim of the current research is to investigate the impact of the mass media image of the “ball with spikes” on older adults’ perceptions. We constructed an innovative mixed-methods research design protocol combining questionnaires, semi-structured research interviews, and pictographic measures. Indeed, older adults have been commonly designated by the French and international health authorities as a particularly vulnerable group to the COVID-19 coronavirus disease since the beginning of the pandemic (République Française, 2022). Moreover, older adults are the most affected by social isolation and loneliness in the context of the COVID-19 outbreak, which predicts poor physical and mental health outcomes (Wu, 2020). While using social networks tends to reduce the negative impact of the COVID-19 pandemic on older adults’ global health (Rolandi *et al.*, 2020), the use of social networks during the COVID-19 lockdowns underpinned the COVID-19 infodemic characterized by broad dissemination of various fake news and misleading images (Kanozia, Kaur, & Arya, 2021; Rocha *et al.*, 2021). Recent research has demonstrated that older adults are particularly vulnerable to fake news dissemination in the context of the COVID-19 pandemic (Sun, Cheng, Zhang, & Yang, 2020), and older adults share fake news seven times more than young adults on social networks (Guess, Nagler, & Tucker, 2019).

4 Method

The current research protocol, based on a mixed-methods research design combining research questionnaires ($N = 144$), semi-structured research interviews, and pictographic measures ($N = 26$), aimed to investigate the specificities and societal impacts of the COVID-19 mass media image of the “ball with spikes.” Participants of this study were recruited by snowball sampling focused on an older adult recruitment pool living in the Nouvelle-Aquitaine region of France. Specifically, two sets of research protocols

comprised an online questionnaire administered to the participants during the strict COVID-19 pandemic lockdown in France due to the lack of other solutions between February and June 2021. Immediately after the COVID-19 lockdown, an additional investigation was conducted utilizing semi-structured research interviews in July 2021. These semi-structured research interviews with older participants aimed to thoroughly investigate the specificities and impacts of the COVID-19 mass media image of the “ball with spikes” on older adults’ perceptions.

4.1 Participants

The current mixed-methods research protocol participants were French adults 60 years and older. Indeed, older adults are particularly vulnerable to the COVID-19 coronavirus disease and fake news dissemination. All participants were recruited by random snowball sampling during the COVID-19 pandemic lockdown in France during the first half of 2021 in the French region of Nouvelle-Aquitaine. The participants that completed the online questionnaire were a sample of older adults ($N = 144$), aged from 60 to 84 years ($M = 70.22$, $SD = 5.63$), and the participants that were interviewed during research interviews were a sample of older adults ($N = 26$), aged from 63 to 86 years ($M = 74.05$, $SD = 6.41$), living the region of Nouvelle-Aquitaine in France.

4.2 Measures

4.2.1 Online Questionnaire

Mass media impacts on the lay population have been assessed by an online questionnaire during the COVID-19 pandemic lockdown in France, during the first half of 2021. An advertisement has been made on various internet platforms and university websites to invite older participants living in the region of Nouvelle-Aquitaine to complete the questionnaire. The online questionnaire aimed to assess primarily the mass media exposure of the participants. Participants were asked to report the frequency of use of social networks (e.g., Facebook, Twitter, and Instagram) since the beginning of the COVID-19 pandemic, the Likert scale of this item ranged from 1 (*I never use social networks*) to 5 (*I use social networks several times per day*). Also, participants were asked for what aim they use social networks: “Since the Coronavirus COVID-19 pandemic, what are you using social media for?” The Likert scale of this item ranged from 1 (*The most frequent*) to 4 (*The less frequent*). The participants were 50.00% males and 50.00% females, and their answers to these mass media-related questions were collected and analyzed by the statistical software IBM SPSS Statistics version 26.

4.2.2 Research Interviews

In order to investigate more thoroughly specificities and impacts on laypeople’s representations of the COVID-19 mass media image of the “ball with spikes,” semi-structured research interviews were conducted by three interviewers, experienced, and trained to conduct research interviews. First, the participants were invited to sign a consent to participate in the research interview and an agreement to record the audio of their interview. The totality of research interviews was based on an interview guide in order to standardize rigorously the research procedure. The research interviews aimed primarily to investigate how participants are spontaneously depicting the COVID-19 virus and what the target mass media image of the “ball with spikes” elicits to them on the basis of free association. All interviews took place individually, face-to-face with an interviewer in a calm individual office, specifically designed for research interviews. First, the

interviewer gave a white sheet of paper to the participant and asked the participant to spontaneously draw the COVID-19 virus as he or she think it looks like. Then, the participant was invited to describe thoroughly his or her spontaneously painted image of the COVID-19 virus. Second, the interviewer showed the participant the target mass media image of the “ball with spikes” (cf., Appendix) and asked the participant what representations the current target image spontaneously elicits to him or her? Then, the interviewer asked the participant, the following questions to further elaborate his or her discourse: What do you see? What do you think it is? What do you think about this image? What inspires you with this image? What are your feelings and emotions? What does that make you think of? The totality of interviews was recorded and thoroughly analyzed afterward by the method of semiotic analysis that allows deriving meaning of an object from participants’ narratives.

4.2.3 Sociodemographic Data

The final part of the questionnaire and research interviews requested participants to indicate their basic sociodemographic characteristics, namely their age, gender, family situation, postcode of residence, and their usual daily activities.

4.2.4 Power Analysis

The data that support these findings for reproducing statistical analyses are provided on Open Science Framework: <https://osf.io/bq2vn/>. We conducted a *post hoc* power analysis with the software *G*Power 3* (Faul, Erdfelder, Lang, & Buchner, 2007) to retrospectively estimate the statistical power of an observed effect, based on the sample size. A *post hoc* power analysis for the goodness of fit tests demonstrated that with power $(1 - \beta)$ set at 0.87, $\alpha = 0.05$ (two-tailed), and critical $\chi^2 = 7.82$, a sample size of 144 participants allows reaching an effect size of 0.30, which corresponds to a conventional medium size effect of the study results.

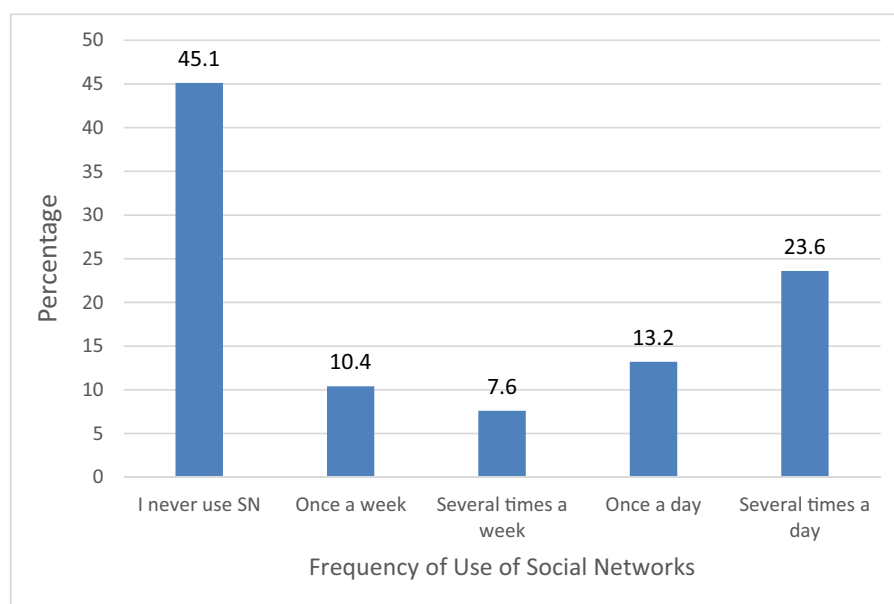


Figure 1: Frequency of use of social networks since the beginning of the COVID-19 pandemic.

5 Results

The results in percentages reported the mass media exposure of the older participants, such as the frequency of use of social networks by the participants since the beginning of the COVID-19 pandemic (Figure 1) and the primary aim of participants’ use of social networks since the beginning of the COVID-19 pandemic (Figure 2), examples of the most frequently spontaneously painted image by 59% of participants, representing the COVID-19 virus as a “ball with spikes” (Figure 3), and the most representative participants’ verbatims of the target mass media image representing the COVID-19 virus as a “ball with spikes.”

It can be observed in Figure 1 that the majority of the participants, 45.10%, never used any social media platforms. The older adults who used social media several times a day constituted 23.60% while 13.20% used it only once a day. Few participants, 10.40%, used social media only once a week, and the least number of older adults, 7.60%, used it several times a week.

Figure 2 shows that there are mainly four aims for the use of social media by older adults since the beginning of the pandemic. It can be observed that the majority of the participants used social media to play online games, followed by work. Comparatively, a smaller number of participants used social media more frequently to search for mass media and information or to discuss with others. Additionally, the Chi-square independence test has been conducted to assess whether the frequency of use of social networks since the beginning of the COVID-19 pandemic and the purpose of use of social networks by the participants were associated. The results demonstrated that the frequency of use and the use of social networks for mass media and information search, $\chi^2(12, N = 144) = 8.09, p = 0.778$, Cramer’s $V = 0.137$, and for work, $\chi^2(12, N = 144) = 19.62, p = 0.075$, and Cramer’s $V = 0.213$, were not associated. However, the results demonstrated that the frequency of use of social networks and the use of social networks to discuss with others, $\chi^2(12, N = 144) = 20.96, p < 0.05$, and Cramer’s $V = 0.220$, and to play online games, $\chi^2(12, N = 144) = 34.44, p < 0.001$, and Cramer’s $V = 0.282$, were associated.

In the second step of the research protocol, participants were asked to paint their depiction of the COVID-19 virus on a sheet of paper during the research interviews. The most of participants spontaneously depicted the image of the COVID-19 virus as a spike mine, a chestnut bug, as a sphere with prickly protruding contours, which can detach and disperse in the air to attack the humans’ respiratory tract.

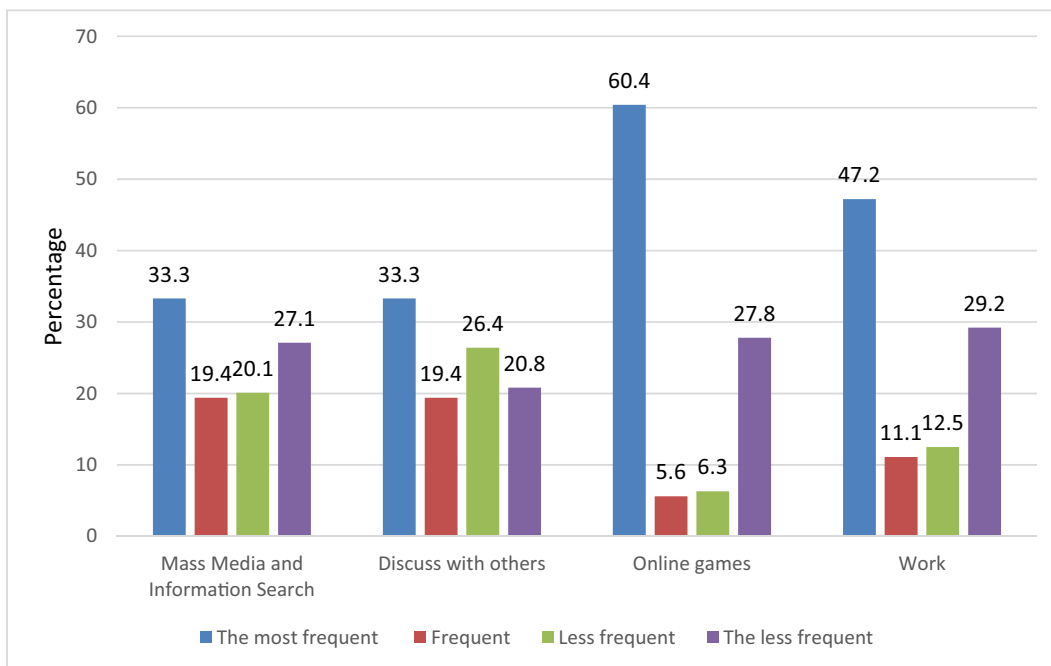
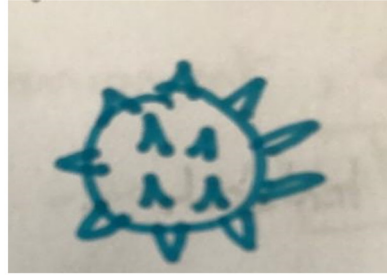
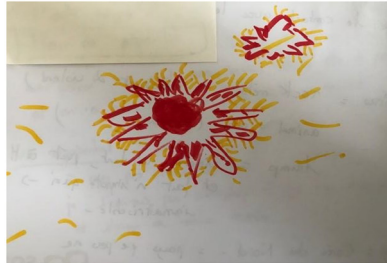


Figure 2: Primary aim of participants’ use of social networks since the beginning of the COVID-19 pandemic.



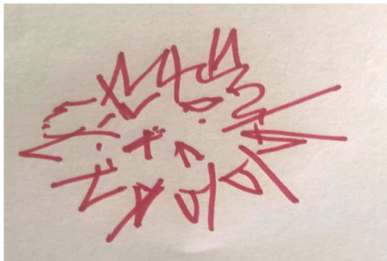
(Female, 72 years)



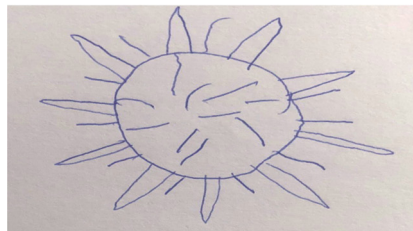
(Male, 71 years)



(Female, 67 years)



(Male, 78 years)



(Female, 67 years)

Figure 3: Examples of the most frequently spontaneously painted image of the COVID-19 virus by the participants.

The imagined COVID-19 virus is made up of a fairly mobile central core, which multiplies and increases its dangerousness. This most common representation of a “ball with spikes” for 59% of participants corresponds to the largely diffused mass media image of the COVID-19 virus that highlights the unequivocal dangerousness of the new virus. The examples of the most frequently spontaneously painted image of the COVID-19 virus by the participants are reported in Figure 3.

The research protocol was followed by the step where the interviewers showed the participants the target mass media image of the “ball with spikes” (cf., Appendix) and asked participants what they think about the image, as described in Section 4. The target mass media image allows constructing a generic narrative of the virus. It is a well-recognized and familiar image that is rather consistent with spontaneous spherical representations diffused by mass media news channels. However, the target mass media image does not necessarily represent the real shape of the COVID-19 virus, because this inexact representation corresponds to a scientific reality of another type of virus: the capsid with proteins stuck inside, playing the role of a “key” to open the cells to be infected (Ke et al., 2020).

The most representative participants’ narratives of the target mass media image of the “ball with spikes,” a symbol of the COVID-19 virus, demonstrated that the mass media image corresponds to the participants’ general representation of the virus, because the mass media mainly used the picture of a “ball with spikes” since the start of the pandemic:

- *“I must have seen it on TV, it’s the representation I had of the virus”* (Female, 76 years)
- *“It reminds me of TV health podcasts, we’ve seen it in certain diseases, like cancer”* (Male, 74 years)
- *“It’s what they show us in the TV, we see it every day. It is a big hedgehog, except that the hedgehog isn’t mean, and there we wouldn’t want to have him in his garden, it is a bit of a threat”* (Female, 75 years)
- *“It matches the picture science makes of it”* (Male, 78 years)
- *“It’s the virus I recognize it with its big red spikes”* (Female, 72 years)
- *“A small circle with small peaks like on TV”* (Female, 72 years)
- *“A red star with lots of thorns sticking out, like the dandelion flower. It’s volatile, we don’t catch it”* (Male, 71 years)
- *“It’s a virus that you see in the labs. A kind of virus, a bug, our bug”* (Female, 84 years)
- *“It is an international symbol, we know what we are talking about by seeing the image”* (Male, 73 years)

Participants’ narratives illustrate the fact that the mass media image of the “ball with spikes” elicits the very idea of the dangerousness of the virus due to its warrior symbolism and multidirectional spikes that are harmful to the body and, hence, elicit different emotions and reactions. The dialectic that is specific to pandemics is manifested in participants’ narratives by the “war metaphor,” and these narratives reflect also humans’ primordial primary fears and the symbolism of a war:

- *“It’s like a missile, it’s the bomb that’s going to explode, like in the 7th company. it’s scary”* (Female, 67 years)
- *“An underwater mine. When you touch it, it explodes”* (Male, 71 years)
- *“A sea urchin with its spines, I wouldn’t put my hand on it”* (Male, 78 years)
- *“The virus is a bit like a bomb with spikes. He doesn’t need guns to kill”* (Female, 63 years)
- *“It’s a soft bullet, much like a jellyfish, that can be deadly”* (Male, 65 years)
- *“It’s a picture of danger, it is sly”* (Female, 84 years)

However, the aesthetically “vivid and beautiful” representation of the virus as a red and blue “ball with spikes” that creates an “identity” for the COVID-19 virus remains tainted by a divisive aesthetic, ranging from appreciating its beauty to feeling fear, apprehension, or disgust, expressed by the following narratives:

- *“It’s pretty, I like it. it makes you think of a planet”* (Female, 78 years)
- *“It’s kinda pretty; the colors are nice, it’s nice to look at”* (Female, 72 years)
- *“The less I see of it, the better off I am, it saps my spirits.” These red dots are everywhere, it disgusts me. It’s colorful but it’s not beautiful”* (Male, 80 years)
- *“I see him aggressive because of the spikes, it’s scary”* (Female, 79 years)
- *“It is not handsome, it is mean and vicious, it is not an attractive image”* (Female, 63 years)

- “*Red is aggressive, midnight blue is the unknown. it disgusts me*” (Female, 84 years)

Furthermore, participants’ narratives express the search for meaning, that is recurrent in crisis situations, related in particular to the biological functioning of the COVID-19 virus, and the modes of action of the virus that remain a mystery for most of the participants:
- “*How does it act? How does it feed? It pumps oxygen...*” (Female, 78 years)
- “*It falls like a chestnut bug*” (Female, 71 years)
- “*I don’t know how it goes about attacking, it has to reach the lungs with the suction cups*” (Female, 72 years)
- “*It enters the body by contact, the spikes play a role in entering the cells*” (Male, 73 years)
- “*It enters through the mouth into the body*” (Female, 79 years)
- “*With its little spikes, it injects something to infect the cells where it multiplies*” (Female, 63 years)
- “*It floats in the air, it tries to enter the cells to spread inside and it can kill me*” (Male, 65 years)
- “*It’s a total mystery how it enters the cells*” (Female, 84 years)

6 Discussion

The current research investigated the impacts of the common COVID-19 mass media image of the “ball with spikes” representing the SARS-CoV-2 virus on older adults particularly vulnerable to COVID-19 disease and fake news dissemination. The primary results of the current research demonstrated that mass media images are a powerful vector of the social construction of reality. Indeed, 36.80% of older adults use social networks daily. In our study, most participants used social networks to play online games or for work, while fewer older adults used them to search for information or discuss with others. Furthermore, 59% of the older adults spontaneously depicted the representation of the new SARS-CoV-2 virus as the generic mass media image of the “ball with spikes.” Therefore, older adults’ imagery of the invisible SARS-CoV-2 virus has been shaped by mass media exposure: the “ball with spikes” that became a familiar symbol of the COVID-19 virus. Furthermore, the image elicited different emotions in older adults, marked by the symbolism of deadliness, mystery, and disgust, with a divisive aesthetic.

The main results of this research showed that 36.80% of the older participants used social media at least once daily for different reasons, mostly playing games and working. The COVID-19 pandemic was accompanied by several lockdowns and, consequently, work from home across countries. This situation might have resulted in increased usage of social networks for work. Inside their homes, people also had more free time to indulge in indoor activities like playing online games. Furthermore, people used social networks to access information related to the pandemic and discuss with others because the lockdowns forced them to remain indoors, so they used online means to acquire information and communicate. During the COVID-19 pandemic, people accessed information about the virus and the disease through several media platforms.

At the start of the pandemic, the CDC created the famous red and gray “ball with spikes” pictorial representation of the virus (Giaino, 2020) depicted by the mass media and popular science broadcasts, such as the broadcast about the origin of COVID-19 virus primarily diffused by the international TV channel TV5 Monde (2021, June 9). Major mass media outlets used this image along with many other similar images. Considering the first factor, hegemony (Gamson *et al.*, 1992), it could be understood that the powerful and big media houses have more resources, money, and power at their disposal to investigate the latest news or information. The first filter of the propaganda model within Herman and Chomsky’s (1988/2010) manufacturing of consent explains that due to this concentration of power and resources among a handful of big media organizations, smaller organizations have become dependent on them for the latest news, leading to a lack of news heterogeneity. This concentration led to all online media outlets and social media platforms, even those disseminating mis/disinformation about the pandemic, using the “ball with spikes” image as a representation of the COVID-19 virus. This constant representation since 2019 has made it one of the most identifiable icons defining the pandemic, leading to the cultivation of this mediated representation of the

virus in peoples' minds as posited by Gerbner's (1998) cultivation theory that found that messages or images transmitted by media heavily influence people's perceptions of the real world.

In this present research, most (59%) of the participants depicted the image of the COVID-19 virus as a bug or mine having protrusions that detach and disperse in mid-air, thereby multiplying to harm humans. The depicted image was similar to the representational image of the mass media for the virus. Hence, it is clear that the mass media profoundly impacted older adults' perception and depiction of the COVID-19 virus. The results of this present study showed that older adults perceived the "ball with spikes" image as a symbol of war, like an explosive mine, missile, or bomb, due to multidirectional spikes that are harmful to the body and, hence, elicit various emotions and reactions, such as fear, mystery, apprehension, and disgust. However, given its divisive aesthetic, some people liked the image for its aesthetic beauty, as Sonnevend (2020) argued. The aesthetically "vivid and beautiful" representation of the virus as a red and gray "ball with spikes" was designed by the CDC, where two medical illustrators were tasked to create an "identity" for the virus (Giaino, 2020). Thus, instead of instilling fear and wariness about the virus and disease among the public, this image possibly incited a different approach due to the seemingly harmless and attractive representation, thereby thwarting the application of public health policies and other health-related behaviors.

While we may not clearly define the boundary between threatening and reassuring responses concerning the "ball with spikes," we may conclude that the mass media images continuing to exist in laypeople's heads elicit specific emotions while thinking about the COVID-19 pandemic or similar future pandemics. The mass media images allow laypeople to be continuously aware of the current developments of the crisis while the mass media warns of possible consequences for their health. Weldon (2001), in her study on the media representation of the Ebola virus as an urban legend, observed that media representations of any disease can impact the quality of reporting and the diagnosis and treatment of the disease. The misrepresentation of the virus can also lead to poor adherence to appropriate health behaviors among health workers and the public. Therefore, the targeted mass media image is saturated with feelings of pessimism, uncertainty, fear, anxiety, and threat. Indeed, these negative emotions may have a detrimental effect on people's mental health and well-being, contributing to lowering an individual's resilience during the COVID-19 crisis. Hence, people must be shown real images of the virus to relate to the crisis more and understand the seriousness of the situation during the pandemic when many might not have followed the rules and guidelines for COVID-19 appropriate health-related behaviors. Although the image of the virus in the mass media presents a synthesis of scientific reality, it is not an image resulting from an accurate scientific recording because, at present, there is no scientific tool capable of providing this level of detail to the image, whatever the method.

For further consideration, the role of the scientific image of these free viral particles named "virions" on the population's trust in the scientific community, including scientists and medical doctors, should be tested. Therefore, a specific experimental protocol of nonlinear optics with multiphoton microscopy assisted numerically should be established through the mathematical estimation of the instrumental response function (Lefort et al., 2021). The images resulting from such an innovative protocol must then be confronted with images delivered with the electron microscope. Moreover, conducting research in pandemic contexts that constitute a risk of human-to-human transmission remains complex. In particular, an online questionnaire appears as a hardly reachable research tool for older adults which caused the relatively small sample size. Also, future qualitative investigations of older adults' social network use should be conducted to avoid bias related to self-reported measures. However, the mixed methods research design of the current study, and research interviews in particular, allows increasing the ecological validity of applied research (Flick, 1992, 2018), conducted in complex societal contexts, such as the COVID-19 pandemic lockdowns. Additionally, future research should strive for replication and extension of the current study with other age groups, and large-scale cross-country research projects should be conducted.

7 Implications

Future research should investigate why the mass media did not provide a real explanation of the “ball with spikes” image, as the image was circulated even by public health authorities without a scientific explanation. Perhaps, miscommunication, a lack of communication between the media, health authorities, and scientists, or negligence by mass media actors and public health officials were reasons behind the public’s misleading belief about the virus’s accurate representation.

Additionally, future research should deepen the understanding of the precise nature of the individual and collective processes contributing to the social construction of reality during critical collective upheavals, such as the COVID-19 global pandemic. The current interdisciplinary and multimethodological analysis, which aims to shed light on the different aspects of mass media influences during the COVID-19 sanitary pandemic, can attract scientific interest and the current research bears useful elements for crisis decision-making by public authorities and institutions. Indeed, a better understanding of the specificities of the mass media influences during the health pandemic situation would provide concrete elements for a better consideration of human aspects in managing current and future health crises similar to the COVID-19 pandemic.

8 Conclusion

In-depth knowledge, understanding, care, and caution are required when making such visual representations that can immensely impact people’s emotions, attitudes, and behaviors during global crises of any sort. Therefore, in times of health crisis, experts from health sciences, psychology, crisis communication, and mass media must work hand in hand to aware the public about the problem. Thus, developing critical public thinking represents one of the best challenges for crisis management effectiveness of future global pandemic outbreaks. Furthermore, in pandemic situations, production and diffusion of real scientific images of the virus are essential to build public trust in the scientific discourse and to enable the public to identify the risk as a reality. These images, used in collaboration with mass media and public policy experts, will be essential for the information and awareness of the general population during major pandemics.

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Appendix

The targeted mass media image presented to the participants during semi-structured research interviews was downloaded from the official website of the government of Québec, Canada. In particular, this image has been used to illustrate COVID-19 information, entitled “Science in the Fight Against COVID-19: Stay Well Informed,” related to the diffusion of research projects conducted on the COVID-19 pandemic and official COVID-19 information websites: <https://www.scientifique-en-chef.gouv.qc.ca/impacts/covid-19/>.

