The Impact of Visual Communication in COVID-19’s Prevention and Risk Mitigation

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Abstract. This study aims to analyse the visual and graphical elements used in health communication during the coronavirus pandemic, with the purpose of identifying its characteristics at a global level and understanding the impact and efficacy of the materials in COVID-19 prevention and risk mitigation. A total of 264 materials have been examined and submitted to a coding system with variables regarding the message and graphic representations in the information presented about coronavirus by the health departments and ministries of ten countries. The results show that health communication should walk alongside visual communication, particularly when communicating risks during public health emergencies once that materials combining both text and pictures have been highlighted as the greatest in improving understanding and comprehension.

Keywords: Visual communication · Health communication · Health literacy · COVID-19 pandemic · Coronavirus disease

1 Introduction

As humans we are constantly communicating information. Sometimes even involuntarily through, for example, our facial expressions, our posture, the clothes we wear, using a variety of languages and communicative elements and processes that go beyond the rules of speaking or writing [1]. Communication is a primary social process that allows us to live in a society and establish relationships with other people since a very early age, so it needs to be effective in order to avoid poor human interactions [1]. In the health field, communication plays a fundamental role in disease prevention and public health promotion, as it provides a set of tools and information for people to make better health decisions and engage with their health, which also helps with increasing the recovery rate for patients in the hospital [1, 2]. On the other hand, pictures have been proven to be a very helpful instrument in health communication, facilitating patient’s attention, recall and adherence to information and treatment, which is especially important for people with low literacy levels and poor reading skills.

This paper aims to study the impact of visual elements in the communication of a public health crisis, especially during the coronavirus outbreak. There have been examined all the graphical information released during the pandemic by the health...
departments and ministries of ten countries. The sample collected involved materials such as infographics, posters, and social media posts, focusing on statistical data about the outbreak, recommended behaviours to prevent infection or information about the virus itself. The criteria to choose the countries for the analysis included the top 3 with more infected patients in the main affected countries, being, at the beginning of the study, Spain, Italy and Germany on Europe, the United States, Canada and Brazil in America, and China, Turkey, and Israel on Asia. We also included Portugal in the analysis even though it was not one of the most affected countries at the time.

2 Literature Review

2.1 The Importance of Health Literacy

At the moment, in the modern society, people are expected to be able to manage their health and make health decisions in an informed, active, and independent way. Hence, it is important to focus on the way in which the information is transmitted, so that the patient follows medical orders and adheres to treatment resisting to it. As a consequence, focusing on a great health communication enables an optimization of the health services as well as an individualization in the health care according to the needs of the patients, increasing their knowledge and adaptability to the risks of a disease. However, this process is not linear, and sometimes health communication does not play its role in the most effective way. Communicating with marginalized groups can be challenging and there can be some gaps in the communication, especially with patients with low literacy levels or language limitations, people with disabilities, mentally ill patients or people living with HIV [2]. Consequently, it is crucial that the information about health is easily understandable and accessible, as well as adequate to the social context in which the patients are involved [3].

Despite the scientific community being the primary source for information in health care since the beginning, with the growth of technology and the internet, health issues quickly started to be acknowledged by the media, which provided a greater number of reliable health sources and resources to the public, making health information more accessible. According to Ishikawa and Kiuchi, the existence of “skills in understanding and applying information about health issues may have a substantial impact on health behaviors and health outcomes”, capacities that have been conceptualized as health literacy not a long time ago. Health literacy can be defined as the ability to achieve “a level of knowledge, personal skills and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions” [4], which means more than just being able to read health related posters or pamphlets. In addition, health literacy is based on the degree of efficacy with which people can use the tools that they are provided with to manage their health problems, task that is eased by the access to information. Thus, low literate individuals have many difficulties managing their health issues, what can lead to higher hospitalization and hospital stay rates, as well as a lower probability of prevention against diseases [5–7].
2.2 The Role of Visual Communication in Health Care

Today, with the development of an increasingly digital society and a fast and easy access to information, science communicators face a new challenge: to communicate at the same fast pace and, at the same time, to take information further and to more people [8]. As a result, the scientific community has increasingly used other channels to transmit information that go beyond traditional media, namely television, social networks, mobile applications, posters and billboards, which, despite their characteristics, they have something in common that makes them exploitable: “they share a language - the visual language” [8]. Thus, in the environment soaked by images in which we live, visual culture has increasingly prevailed over written and printed language, in the same way that it has overlapped orality previously [8]. We are often confronted with “(…) complex texts that contain elaborate visual images, complex design elements and unique formats” [8], which requires individuals to interpret both the visual elements and the text at the same time. It is therefore essential that both science communicators and the public are visually literate, so that, on the one hand, those who communicate are able to produce effective materials and, on the other, those who receive them are able to interpret and understand them as a whole. Accordingly, it becomes even more relevant to focus on an effective use of the visual language in the health care, since it directly interferes in the prevention and mitigation of risks, mortality rates of the population, among other factors. Furthermore, visual communication is particularly useful and important to communicate health to an audience with low literacy, since they are individuals who need help understanding written information. Similarly, because they have poor reading skills, people with low literacy tend to rely more on orally transmitted information and, for this reason, images help them remember what they have heard and retain information better [9].

However, not all health communicators have adequate visual literacy; they sometimes tend to focus on written information and add a visual representation only as an extra, to make the material more appealing. Consequently, visual elements in health communications do not always supplement the text in the most appropriate way, which does not allow to fully explore the potential of visual language [8]. According to an investigation by Levie and Lentz of 155 experimental studies [9], when compared the impact of combining text and images with text alone, comprehension proved to be significantly better in the cases where images were related to the message, and images that were not related to the text did not have any positive influence on comprehension. In addition, there was also a more significant increase in the learning of low-literate individuals than in the more literate ones, and the presence of images enabled retaining information for longer in the memory [9]. On the other hand, a study by Fillippatou and Pumfrey [9] shows that images can sometimes interfere with comprehension, although they are useful in most cases. If the images represent concepts that go beyond the comprehension capabilities of low-literate individuals, there is a strong possibility that the message will not be fully understood; if, on the other hand, they are known to the individual, it becomes easier to understand the text [9].

Research also shows that images can shift the attention of people with low literacy from the message, as they are more likely than literate people to focus on irrelevant details in images. That being said, it is recommended that simple images are
incorporated into communications, with few details and a small caption that guides the interpretation, which allows the maximization of the public’s understanding, especially in illiterate people with poor reading skills [6, 9, 10]. Readance and Moore point out that simple line drawings are more effective for comprehension than photographs or shadow drawings and that, as Fillippatou and Pumfrey state, the advantage lies in minimizing distractions. Moreover, another way to meet these needs is through the proximity between the text and the image in the composition, since the closer the individuals are in space, the faster they can establish an association and understand the meaning of both [9].

3 Method

In order to achieve the aims previously mentioned, we chose to use a content analysis based method with a categorial analysis technique. The scope of the study encompasses the three countries with the highest number of infected people at the time of the collection of data, in Europe, America and Asia. This being said, in the European continent, Spain, Italy, and Germany were selected, as well as Portugal, even though it was not one of the most affected countries. In America, the United States, Canada, and Brazil were chosen, whilst in Asia, the analysis involved the materials presented by China, Turkey, and Israel. The analysis was extended until June 8, 2020, so the materials released after that date were not counted in the analysis. A total of 264 materials were registered in the software IBM SPSS, Statistical Package for Social Sciences, in which the frequencies of the variables were counted.

3.1 The Coding Scheme

Based on the literature review, two major categories were coded: the content of the message and the graphical representation. In relation to the discourse of the message, there were coded the variables “Type of material”, “Verb tenses”, “Target audience”, “Type of information”, in order to understand mostly the main purposes of the information presented in the material, i.e., if the target audience was the general public or health care professionals, and if the message was intended to give a recommendation and persuade to follow a certain behavior or just inform. The type of information involves materials with information directly aimed to a certain group, mainly risk groups and particular situations. The graphical representation category included the following variables: “Basic elements”, in which the frequency of basic visual communication elements like colours, saturation or typography were registered; “Type of graphic”; “Level of complexity”, which refers to the level of detail of the visual elements; “Level of aesthetic”, associated with the general aesthetic of the material, i.e., if all visual elements belong to the same set or if the type of drawing varies between graphics; “Graphic-text ratio”, i.e., if the proportion of the text and the picture is balanced or if the material focuses one more than the other; and “Graphic-text relationship”, which refers to the degree of relationship between the text and the graphic, i.e., if the picture clearly illustrates the information, if some illustrate perfectly and other do not, or if none of the graphics is related to the text at all.
4 Discussion and Results

The entire sample included 264 graphical material, of which about 50% correspond to publications on social networks such as Instagram or Facebook. The next most frequent type of material was the infographic, with a total of 78, equivalent to almost 30% of the sample. The remaining 20% of documents were posters (12.2%), guides (6.5% registered in the variable as “Other”) and pamphlets (1.5%). As for the distribution by country (Fig. 1), Portugal is the one with the highest frequency of graphic materials on COVID-19 among those analysed, with a total of 50 documents (19.0%), followed by Spain with 36 (13.7%) and Turkey with 35 (13.3%). China is the country with the lowest number of materials, with a total of 6 (2.3%).

It is however important to note that, although the data collection process was extensive, we cannot rule out the possibility of existing more materials than those collected, since knowledge of and access to international official sources is more difficult in countries like China or Israel, for example. Thus, there is the possibility that the number of graphic materials produced by each country is higher; on the other hand, given that the main objective of this research is to understand the patterns of government communication from the various countries on COVID-19, no materials were collected from unofficial websites and social networks or from the media channels.

![Fig. 1. Distribution of COVID-19 materials by country (%)](image-url)

In relation to the content variables (Table 1), results show that the use of imperative form and present simple was registered as the most frequent in every country, which enhances the expected main purpose with health communication and COVID-19’s in particular: to persuade to follow recommended behaviours and to inform about the...
virus. The infinitive was also very frequently used, preceded by verbs in the present tense, as a more subtle intention to recommend a certain thing. The general public was the target audience significantly more aimed to, as well as the present of information of a general nature, such as recommendations about hand washing or mask usage. However, Turkey stands out as the only country that presented a good amount of materials aimed to the health care workers.

Therefore, the intention to reach the common person with the communications is understood, but we suggest the creation of contents that may also be useful to health care workers, such as, for example, practical guides for dealing with emotional health during a pandemic, as Portugal presented, or graphic materials on the most correct procedures to be taken when treating infected patients, namely before and after the provision of services, as was seen in the communication from Turkey. The code “Other” was also very frequent, as the countries produced some materials for specific daily contexts, situations, or groups of the population, such as information related to isolation, caregivers, or blood donors. In addition, there are some well-produced materials aimed at children; however, although it is the group with at the lowest risk of contracting the disease, none of the countries has presented any content or recommendations aimed at the young and adolescent public. Given the age range and the possible normal immaturity of the age, one would expect some attention from the government media to convey the message that the issue is serious and prevention is important.

With regard to the graphical variables (Table 2), it is possible to see a great frequency in the use of blue as the dominant colour in the graphic materials, besides white which is present in 100% of the cases, followed by green and red. As blue conveys, according to Heller [11], harmony, trust, and tranquility and is strongly associated with science, the frequency of colour in health communication graphics materials is justified. Next, green is often associated with hope, life, and nature, which refers to the health field [11] and is therefore expected to be used frequently in health communication. In addition, red represents the colour of blood and life, which is often associated with danger, as is the case, for example, of road signs, especially when combined with black. Red is therefore the symbol of “warning” and “forbidden” and its use is therefore justified in a pandemic context.

As far as the basic forms of visual communication are concerned, the most commonly used are the rectangle and the circle, and since it recognizes similar forms as belonging to the same category, the use of the circle to delimit illustrations and icons allows them to be associated with the same set. By using rectangular text boxes to highlight titles and key terms we are immediately called to attention to these elements, allowing the brain to understand them as important and priority in information retention. Regarding the degree of saturation and contrast of graphic materials, in general more neutral tones were combined with more saturated colors, which consequently justifies the strong contrast in 100% of cases. Also all graphic materials have a strong hierarchical relationship between the elements, manifested by the difference in font size of the titles compared to the running text and by the prominence given also to certain illustrations or icons. As far as the most commonly used types of representation are concerned, the illustration can be highlighted as the main element of the visual composition, followed by the icon. almost all graphical materials presented simple
graphical representations with few details, which also helps in understanding and avoids distraction from irrelevant visual information.

Also, the level of aesthetic in the visual elements proved to be high in most cases, also contributing to a more effective visual communication. Regarding the ratio and relationship between the textual and graphical elements, there is a balance in the ratio in most cases and a high graphic-text relationship also in most materials. This guarantees an easier assimilation of visual information, since the text describes the idea represented in the illustration, being able to add extra information, but allowing everyone to understand the meaning of all elements easily and quickly.

**Table 1.** Frequency distribution of the content variables

| Variables                  | Count         |
|----------------------------|---------------|
|                            | ES | IT | DE | PT | US | CA | BR | CN | TR | IL |
| **Type of material**       |    |    |    |    |    |    |    |    |    |    |
| Infographic               | 18 | 1  | 1  | 2  | 6  | 13 | 0  | 6  | 23 | 8  |
| Social media post         | 17 | 22 | 14 | 37 | 19 | 0  | 22 | 0  | 1  |
| Poster                    | 0  | 6  | 0  | 8  | 5  | 0  | 3  | 0  | 9  | 1  |
| Pamphlet                  | 0  | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 2  |
| Other                     | 1  | 0  | 0  | 2  | 2  | 9  | 2  | 0  | 1  |
| **Verb tenses**           |    |    |    |    |    |    |    |    |    |    |
| Imperative                | 35 | 18 | 1  | 29 | 28 | 22 | 24 | 1  | 27 | –  |
| Present simple            | 27 | 22 | 15 | 39 | 16 | 20 | 23 | 6  | 21 | –  |
| Future simple             | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Past tense                | 0  | 1  | 0  | 4  | 0  | 0  | 0  | 1  | 1  |
| Other                     | 8  | 5  | 0  | 28 | 4  | 2  | 6  | 3  | 6  |
| **Target audience**       |    |    |    |    |    |    |    |    |    |    |
| General public            | 36 | 30 | 15 | 49 | 31 | 22 | 27 | 6  | 26 | 10 |
| Health care workers       | 0  | 0  | 0  | 1  | 1  | 0  | 0  | 0  |
| **Type of information**   |    |    |    |    |    |    |    |    |    |    |
| Statistical               | 1  | 3  | 0  | 0  | 0  | 0  | 0  | 0  |
| General                   | 26 | 25 | 12 | 24 | 29 | 16 | 14 | 6  | 12 | 8  |
| **Specific**              |    |    |    |    |    |    |    |    |    |    |
| Elderly people            | 2  | 0  | 1  | 0  | 0  | 0  | 1  | 0  |
| Smokers                   | 1  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
| Chronic patients          | 5  | 0  | 0  | 1  | 1  | 0  | 1  |
| Weakened patients         | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| Pregnant women            | 0  | 0  | 0  | 1  | 0  | 0  | 1  |
| Children                  | 3  | 0  | 0  | 0  | 0  | 0  | 9  |
| Youngsters                | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Other                     | 3  | 2  | 2  | 24 | 0  | 6  | 1  | 23 | 1  |

**Total**                  | 36 | 30 | 15 | 50 | 32 | 22 | 27 | 6  | 35 | 10 |

Note: ES – Spain; IT – Italy; DE – Germany; PT – Portugal; US – United States; CA – Canada; BR – Brazil; CN – China; TR – Turkey; IL – Israel.
### Table 2. Frequency distribution of the graphical variables

| Variables            | Colour   | ES   | IT   | DE   | PT   | US   | CA   | BR   | CN   | TR   | IL   |
|----------------------|----------|------|------|------|------|------|------|------|------|------|------|
| Basic elements       | Colour   | ES   | IT   | DE   | PT   | US   | CA   | BR   | CN   | TR   | IL   |
| Colour               |          |      |      |      |      |      |      |      |      |      |      |
| Red                  |          | 2    | 0    | 1    | 0    | 0    | 0    | 0    | 1    | 0    | 0    |
| Red-orange           |          | 1    | 0    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    |
| Orange               |          | 5    | 0    | 0    | 1    | 1    | 0    | 1    | 0    | 0    | 0    |
| Yellow-orange        |          | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Yellow               |          | 0    | 0    | 0    | 1    | 1    | 0    | 1    | 0    | 0    | 0    |
| Yellow-green         |          | 3    | 0    | 0    | 0    | 0    | 0    | 9    | 0    | 0    | 1    |
| Green                |          | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Blue-green           |          | 3    | 2    | 2    | 24   | 0    | 6    | 1    | 0    | 23   | 1    |
| Blue                 |          | 29   | 18   | 11   | 32   | 32   | 22   | 4    | 5    | 19   | 10   |
| Blue-purple          |          | 12   | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 0    |
| Purple               |          | 1    | 6    | 2    | 6    | 1    | 0    | 5    | 0    | 3    | 0    |
| Red-purple           |          | 1    | 17   | 0    | 1    | 0    | 1    | 0    | 0    | 0    | 0    |
| White                |          | 36   | 29   | 15   | 50   | 32   | 22   | 27   | 6    | 26   | 0    |
| Black                |          | 3    | 2    | 0    | 10   | 17   | 20   | 6    | 4    | 26   | 0    |
| Grey                 |          | 13   | 3    | 0    | 7    | 2    | 0    | 3    | 1    | 14   | 1    |
| Other                |          | 0    | 0    | 20   | 0    | 1    | 30   | 0    | 0    | 1    | 0    |
| Saturation           | Neutral  | 11   | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 2    | 0    |
| Saturated            | 14      | 11   | 1    | 2    | 18   | 3    | 10   | 2    | 12   | 6    |      |
| Both                 | 11      | 19   | 14   | 49   | 14   | 19   | 17   | 3    | 21   | 4    |      |
| Contrast             | High     | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 2    | 0    |
| Low                  | 35      | 30   | 15   | 50   | 32   | 22   | 27   | 6    | 33   | 10   |      |
| Shape                | Square   | 10   | 0    | 0    | 2    | 1    | 2    | 0    | 4    | 8    | 0    |
| Circle               | 27      | 25   | 0    | 13   | 13   | 13   | 16   | 2    | 11   | 7    |      |
| Triangle             | 1       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Rectangle            | 34      | 14   | 12   | 50   | 32   | 17   | 26   | 3    | 16   | 5    |      |
| Other                | 1       | 1    | 0    | 0    | 0    | 0    | 0    | 3    | 2    | 2    | 1    |
| Typography           | Sans serif| 36  | 30   | 15   | 50   | 32   | 22   | 26   | 5    | 35   | –    |
| Serif                | 0       | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    | –    |
| Both                 | 0       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | –    |
| Type of graphic      | Pie chart| 0    | 2    | 0    | 0    | 0    | 0    | 0    | 1    | 0    | 0    |
| Bar chart            | 0       | 1    | 0    | 1    | 0    | 0    | 0    | 1    | 0    | 0    | 0    |
| Diagram              | 4       | 1    | 1    | 2    | 0    | 1    | 1    | 3    | 1    | 0    |      |
| Map                  | 0       | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Icon                 | 33      | 3    | 0    | 4    | 0    | 1    | 2    | 3    | 6    | 2    |      |
| Illustration         | 13      | 25   | 15   | 46   | 29   | 22   | 26   | 5    | 27   | 7    |      |
| Photography          | 0       | 1    | 0    | 3    | 5    | 0    | 0    | 0    | 8    | 1    |      |
| Level of complexity  | Simple   | 35   | 28   | 15   | 48   | 26   | 22   | 27   | 3    | 31   | 9    |
| Complex              | 1       | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 0    |
| Both                 | 0       | 1    | 0    | 0    | 2    | 0    | 0    | 2    | 0    | 0    | 0    |

(continued)
Table 2. (continued)

| Variables                  | Count          | ES | IT | DE | PT | US | CA | BR | CN | TR | IL |
|----------------------------|----------------|----|----|----|----|----|----|----|----|----|----|
| Level of aesthetic         |                |    |    |    |    |    |    |    |    |    |    |
| Unaesthetic                | 1              | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |    |
| Slightly aesthetic         | 17             | 2  | 0  | 9  | 3  | 0  | 1  | 4  | 8  | 1  |    |
| Aesthetic                  | 18             | 27 | 15 | 39 | 26 | 22 | 26 | 2  | 22 | 9  |    |
| Graphic-text ratio         |                |    |    |    |    |    |    |    |    |    |    |
| Text-centred               | 19             | 10 | 5  | 10 | 9  | 19 | 9  | 2  | 17 | 1  |    |
| Graphic-centred           | 1              | 14 | 2  | 5  | 11 | 2  | 1  | 0  | 6  | 6  |    |
| Balanced                   | 16             | 6  | 8  | 35 | 12 | 1  | 17 | 4  | 12 | 3  |    |
| Graphic-text relationship  |                |    |    |    |    |    |    |    |    |    |    |
| Low                        | 2              | 0  | 2  | 0  | 2  | 0  | 0  | 7  |    |    |    |
| Medium                     | 17             | 5  | 5  | 11 | 10 | 11 | 12 | 2  | 14 |    |    |
| High                       | 17             | 25 | 8  | 39 | 20 | 9  | 15 | 4  | 14 |    |    |
| Total                      | 36             | 30 | 15 | 50 | 32 | 22 | 27 | 6  | 35 | 10 |    |

Note: ES – Spain; IT – Italy; DE – Germany; PT – Portugal; US – United States; CA – Canada; BR – Brazil; CN – China; TR – Turkey; IL – Israel.

5 Conclusions

In conclusion, it is possible to ascertain that, although the cultures are distinct, many countries present visual compositions using the same elements repeatedly, which refers to the universal meaning that visual language can have, regardless of socio-cultural factors. In addition, researchers argue that data visualizations help people understand information at a deeper level, as they promote accessibility and equity in the public health field, which is especially important amongst poor literate individuals. Particularly, during the massive global crisis of coronavirus, visual communication tools proved to be crucial in spreading the message and simplifying critical theories, engaging the public in behavioural change, allowing a greater sense of social responsibility and facilitating public health communication in an era where digital medium rules.

Interestingly, the analysis proved that Portugal was the country that provided the largest number of graphical materials regarding risk and prevention of COVID-19, compared to countries with a much higher number of infected people. Presumably, one would expect that the higher the number of deaths or patients with the disease, the greater the investment in health communication and the more evolved the communication over time, in order to lower the statistics and avoid the contagion; however, the opposite has happened.

Some of the limitations to the study are the little extensiveness of the sample materials from China or Israel, both due to lack of knowledge and difficulty in accessing them, and simply because they do not exist. In addition, we suggest the study of this issues in a deeper level in the future, as the role of visual communication in public health emergencies communication has not been much explored. COVID-19’s pandemic is the living proof of the power of visual communication and interpretation in the public health field, allowing “to do good with data” [12].
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