

Digital Graveyards: A study about data visualization portraying death during the COVID-19 pandemic

Túmulos digitais: Um estudo sobre visualização de dados retratando a morte durante a pandemia da COVID-19

Larissa Ugaya Mazza, Luciane Maria Fadel

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Data visualizations have been widely used during the COVID-19 pandemic, serving as a source of information about the disease or helping researchers establish patterns and make predictions. However, data visualizations carry many hidden messages, and it is up to the designer to use visual elements wisely in order to foster a healthy interaction. When it comes to death, information becomes delicate, and it is important to consider the connections between form and meaning, as these can influence audience behavior. Seeking to better understand how data visualizations have dealt with such a topic, this article analyzes two data visualizations on the number of deaths by COVID-19 through the analytical lens of remediation. The Close Reading method was applied to map the elements of both visualizations and analyze how these can promote death awareness.

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As visualizações de dados foram bastante utilizadas durante a pandemia da COVID-19, servindo como fonte de informação às pessoas sobre a doença, ou ajudando pesquisadores a estabelecerem padrões e fazerem previsões. Contudo, as visualizações de dados trazem muitas mensagens ocultas e cabe ao designer utilizar os elementos visuais a fim de fomentar uma interação saudável para o público. Quando o assunto é morte, a informação torna-se delicada e é importante considerar as conexões entre a forma e seu significado, uma vez que estes podem influenciar o comportamento do público. Procurando compreender melhor como as visualizações de dados têm lidado com o tema, este artigo analisa duas visualizações de dados sobre números de mortos por COVID-19 sobre a lente analítica da remediação. Assim aplicou-se o método Close Reading para mapear os elementos de ambas visualizações e analisou-se como esses elementos podem promover a consciência da morte.

1 Introduction

From the beginning of the COVID-19 pandemic, tracking dashboard data visualization were adopted to inform the population about the virus spread (Cooley, 2020). Using data visualization for communication can be positive, as they foster understanding on a deeper level than

raw data, and allow users to see impossible or complicated phenomena (Gomes, Pimenta & Schneider, 2019, Rodríguez, Nunes & Devezas, 2015). Additionally, they often aid in objectivity, emotional distance, and impartiality (Gray, 2020). However, excessive neutrality risks transforming data about sensitive topics, such as death, into management numbers (Hepworth, 2016).

For the specific situation of COVID-19, Doan (2020) discussed how visualizations have been used to mislead users by manipulating percentages (Doan, 2020). Data designers can alter a representation to persuade or mislead the user, change perspectives, or even cause misinterpretation (Pandey et al., 2014). Information presentation is never incidental, nor are the conclusions drawn from it (Eisner, 1997). Therefore, it is impossible to make visualization devoid of bias. Instead, designers should aspire to make visualizations for a purpose and choose supporting graphical elements (Viégas & Wattenberg, 2007).

Additionally, with COVID-19 data, there is the subject of representing death. Interacting with death is complicated, Greenberg and Arndt (2012) explain this with the Terror Management Theory (TMT), which arises from the conflict caused by humans' ability to understand their mortality versus self-preservation instincts (Greenberg & Arndt, 2012). The clash of these systems causes ever-present terror known as death anxiety (Grant & Wade-Benzoni, 2009).

People adopt self-made systems based on cultural worldview, self-esteem, and close relationships to manage this anxiety (Greenberg & Arndt, 2012; Pyszczynski et al., 2020). This system controls terror by providing the comfort of a meaningful life. Unfortunately, because of the current state of the world, managing TMT becomes harder as anxiety-buffering systems can be impeded by healthcare guidelines (Pyszczynski et al., 2020).

Furthermore, literature suggests that healthcare guidelines are seldom followed, despite providing safety (Greenberg & Arndt, 2012). Instead, the anxiety-buffering system tries to remove focus from death reminders, which makes people tend to favor choices that boost their worldview and self-esteem and not necessarily what is healthy (Goldenberg & Arndt, 2008).

Data visualizations affect how people perceive death, inferring emotions and meaning (Viégas & Wattenberg, 2007). In addition, these representations function as Mortality Cues, reminding people of the threat of death (Grant & Wade-Benzoni, 2009). Miguel et al. (2020) and Qian and Yahara (2020) highlight the need to customize information to target resistant people, and visualizations are essential for that, since they often lead to successful persuasion (Pandey et al., 2014).

However, customizing information requires media understanding. One way to glean insights might be by mapping the media remediation process. Remediation represents old media in new media (Bolter & Grusin, 2000). Analyzing an object through remediation allows the researcher to understand how people interacted with old media and how this might govern the interactions with new media (e.g., Bizzocchi, 2003; Bizzocchi, 2005).

Considering this scenario, it can be reasoned that data visualizations impact death awareness, shaping how people process and act upon it. Based on that, this paper aims to analyze two polarizing data visualizations under the lenses of remediation to estimate how people would interact with the mortality cues presented in each.

2 Literature review

2.1 Terror Management Theory

The Terror Management Theory (TMT) states that humans are biologically wired for self-preservation but have developed enough cognitive abilities to grapple with the inevitability of death, a dissonance that causes existential terror (Goldenberg & Arndt, 2008; Greenberg & Arndt, 2012). This terror is managed by an anxiety-buffering system comprised of cultural worldviews, self-esteem, and close interpersonal relationships (Pyszczynski et al., 2020).

Cultural worldviews provide beliefs that deny the precarious nature of existence and promise literal or symbolic immortality (Greenberg & Arndt, 2012; Pyszczynski et al., 2020). Literal immortality comes from religions that believe in life after death or reincarnation. Symbolic immortality happens when people believe that by standing by a cause, they will become part of something endless (Goldenberg & Arndt, 2008; Greenberg & Arndt, 2012; Rosenblatt et al., 1989).

Self-esteem is a “sense of personal value that results from believing that one is living up to the standards of one’s cultural worldview” (Pyszczynski et al., 2020, p. 2). Finally, close relationships provide external validation of worldviews and boost self-esteem. This triadic system manages existential terror through the comfort of a meaningful life (Pyszczynski et al., 2020).

Research on mortality often accompanies two theories: “mortality salience” and “anxiety buffer” (Friedman & Rholes, 2007). Mortality salience states that if individuals have beliefs that protect against death-related concerns, their confidence in those beliefs will increase when they are reminded of death. Anxiety buffer hypothesis states that if a person has a psychological structure that buffers death-related concerns and that structure is weakened, their mortality awareness will increase (Friedman & Rholes, 2007).

However, for the anxiety-buffering system to activate, two things must happen: (1) belief that one’s worldview is correct, and (2) belief that one is upholding the values of said worldview (Rosenblatt et al., 1989). This becomes complicated because worldviews are socially constructed and vulnerable to differing views or social validation. When outside interference happens, people tend to either confront that their beliefs are not universally valid or antagonize the transgressor (Grant & Wade-Benzoni, 2009; Rosenblatt et al., 1989). In stressful times, it is more common to do the latter (Rosenblatt et al., 1989). This can make people

more violent toward those different and more lenient to those that uphold similar values (Goldenberg & Arndt, 2008; Rosenblatt et al., 1989; Stein & Cropanzano, 2011).

Pyszczynski et al. (2020) argued the system's fragility is more pronounced for the pandemic. Managing TMT becomes complicated because health measures sometimes go against support systems (e.g., social distancing interferes with close relationships). Moreover, letting existential terror go unmanaged can harm a person's mental state (Pyszczynski et al., 2020).

When thoughts of death are in focal attention, people tend to push them aside by either engaging in avoidance or erasure of potential threat (Goldenberg & Arndt, 2008). Thus, conscious thoughts of death lead to health over beauty, but unconscious lead to beauty over health (Greenberg & Arndt, 2012).

The key to a healthier coping mechanism is to have secure bonds that increase the chances people will respond with kindness instead of violence (Greenberg & Arndt, 2012). Another possibility is to enforce compassion and empathy when reminding people of mortality (Greenberg & Arndt, 2012).

Mortality reminders (MR) impacts user behavior (Lykins et al., 2007). When MR lasts for an extended period or is consistent with a user's internal goal structure, the user becomes more intrinsically motivated and healthier (Lykins et al., 2007). Thus, encouraging inherently oriented people to engage in death reflection might lead to positive psychological growth. As for extrinsically motivated people, focus should be in reflection of after-death as well as their current life goals, and those might help promote positive psychological growth and, over time, influence them to shift towards intrinsic goals (Lykins et al., 2007)

Thus, the potential for reducing destructive forms of terror management relates to the worldview to which individuals subscribe. When one's worldview prescribes prosocial behavior, flexible thinking, tolerance, and compassion, constructive responses to MR are likely (Greenberg & Arndt, 2012).

2.2 Terror Management Health Model

Terror Management Health Model (TMHM) is a "conceptual vehicle that integrates Terror Management Theory and health psychology" (Goldenberg & Arndt, 2008, p. 1035), and discusses the unique implications of death awareness to health-related behaviors.

This theory states that people are motivated to take beneficial health measures when thoughts of death are in the conscious mind (Goldenberg & Arndt, 2008). However, when those thoughts are subconscious, health motivation becomes self-relevant (Goldenberg & Arndt, 2008).

Thus, people are motivated to reduce health-relevant concerns when it causes death awareness. This can happen in two ways: healthy behaviors that make death seem less imminent, or denial of perceived

threat. Unconscious thoughts of death override health motivations, which does not mean the outcome will be unhealthy, but that the primary reason behind it is denial.

In the context of non-conscious death awareness, health outcomes are related to the person's involvement with their physical body. The more people are reminded of their physicality, the less they can defend themselves against non-conscious MR. Goldenberg and Arndt show that, across literature, conscious death awareness causes people to seek ways to remove these thoughts from focus, either by making themselves healthier or lowering their perceived danger.

When thoughts of death are not conscious, people are more likely to engage in behavior that boosts self-esteem, even against health guidelines (Goldenberg & Arndt, 2008). TMHM explains why long-term compliance with health guidelines is challenging, especially once the immediate threat leaves the focus of attention.

However, the authors highlight better ways to promote healthy behavior, such as adaptive coping strategies, health optimism, response efficacy, and perceiving oneself as less vulnerable. Those can push people to react more conductively to conscious MR (Goldenberg & Arndt, 2008). Therefore, it is especially relevant to consider how one can affect self-esteem and worldviews when promoting healthy behavior to foster prosocial behavior (Greenberg & Arndt, 2012; Grant & Wade-Benzoni, 2009; Goldenberg & Arndt, 2008).

2.3 Death Anxiety vs. Death Reflection

One crucial element of TMT and TMHM is mortality reminders (MR), which allow people to engage in either death anxiety or death reflection (Grant & Wade-Benzoni, 2009). These two types of death thoughts differ in cognitive processes and consequent behaviors. Grant and Wade-Benzoni (2009) separate them into processed by a "hot" (death anxiety) and "cold" system (death reflection).

Death anxiety "describes an emotional state of death awareness in which individuals experience fear, panic, and dread about their mortality" (Grant & Wade-Benzoni, 2009, p. 605). It is processed by the "hot" cognitive system, causing immediate, emotional, visceral, and impulsive reactions (Metcalf & Mischel, 1999). Terror Management Theory is active in the "hot" system and causes self-preservation instincts to activate. Therefore, TMT can be categorized as effect-driven or reactive, meaning people will have visceral emotional responses to MR that will lead to self-absorbed acts of preservation (Grant & Wade-Benzoni, 2009; Goldenberg & Arndt, 2008).

On the other hand, death reflection "describes a cognitive state of death awareness, one in which individuals put their lives in context, contemplate their meaning and purpose, and review how others will look upon them after they have passed." (Grant & Wade-Benzoni, 2009, p. 605). It is processed in the "cool" cognitive system, which deliberates, analyses, and reacts rationally with intentional control (Metcalf & Mischel, 1999).

Grant and Wade-Benzoni (2009) highlight three differences between death reflection (DR) and death anxiety (DA): emotionality, duration, and focus of attention.

Death anxiety garners extreme guttural emotions, while death reflection causes controlled thoughts. Death anxiety focuses on specific events and lasts for a short period. On the other hand, DR can span a long time because of its intentional contemplative nature. Lastly, DA emphasizes protecting the self, while DR prioritizes promoting positive changes for others.

2.4 Remediation

Frosh (2018) argues that all media reveals rich and fulfilling worlds to the user. According to him, media borrows and replicates elements from previous media. For example, the screenshot of a tweet can display the same characteristics as a document, meaning it can be legally binding and incriminating (Frosh, 2018). The representation of old media in new media is what Bolter and Grusin (2000) define as remediation.

When one media remediates another, they incorporate and refashion some of the old's core characteristics (Frosh, 2018). Much of people's interactions with digital media come from interacting with old media. For example, shuffling web pages is similar to moving around pieces of paper (Bolter & Grusin, 2000). In addition, the Internet often employs hypermediacy, which is the opening of multiple windows onto separate representations (Bolter & Grusin, 2000).

The authors also define remediation as the oscillation between hypermediacy and immediacy. When navigating from one window to another, the user performs remediation as they perceive the multiple representations and are challenged to consider which medium is more appropriate. When confronted with that relationship between the old and the current media, the user performs remediation.

In this paper remediation will be used to analyze two data visualizations that have opposing ways of representing death.

3 Object of study

The analyzed objects are data visualizations (DV) displaying death during the COVID-19 pandemic. A sample was gathered made of DV from governmental or academic sources, spanning six websites: Coronavírus Brasil, Portal da Transparência do Registro Civil, John Hopkins University, Worldometer, IBGE, European Centre for Disease Prevention and Control, Gyro UTFPR, and Dados Transparentes.

The analyses of the 36 data visualizations revealed four categories of visualization, following Börner et al. (2019): map (Figure 1), graph (Figure 2), chart (Figure 3), and one that was not accounted for: artistic (Figure 4).

Figure 1 shows a data map. These were characterized as still images depicting geographical locations, which utilized color or size to represent quantities. These visualizations came with legends describing the metaphors and were commonly used to show differences. The only interaction was hovering the mouse over one geographical position, wherein a box would appear with further information.

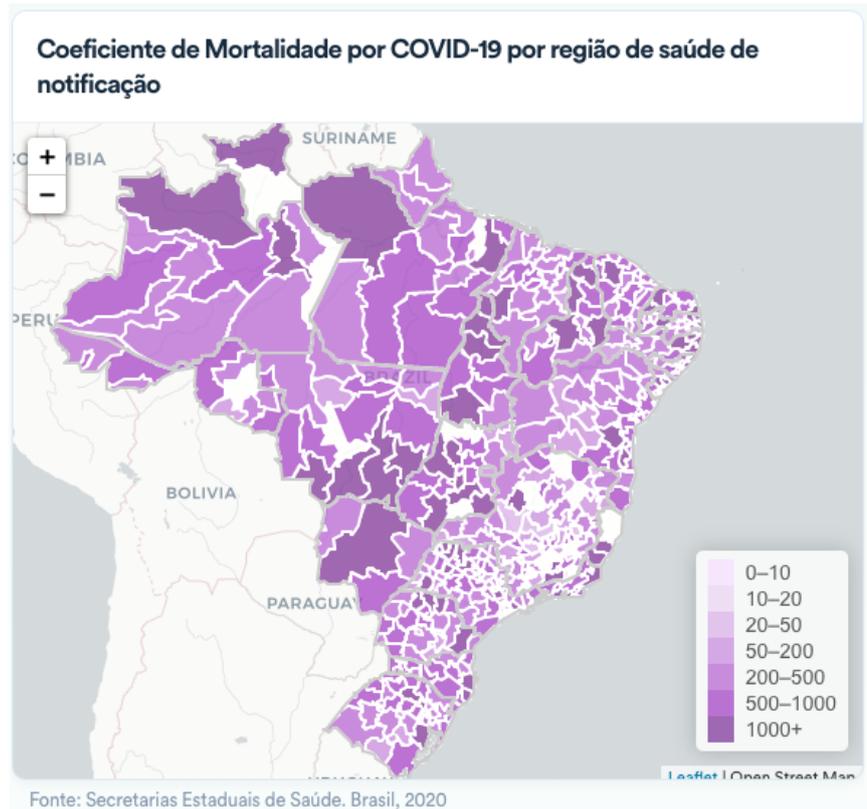


Figure 1 Maps DV. Source: Coronavírus Brasil (24 Nov, 2020).

Figure 2 shows a graph representing death by age and gender. The charts often differed in content, however, their general representation remained constant. Some charts used interactive filters (i.e., geographical state, period, etc.). They often came with legends explaining each color, and by hovering the mouse over the bars, more information would be revealed. The single difference within the group was that line charts represented changes across time, and bars usually meant differences within a group.

Figure 3 shows an example of the percentage DV. Charts use colors to separate different parts and represent differences within a group. Unlike the others, none in this category were interactive.

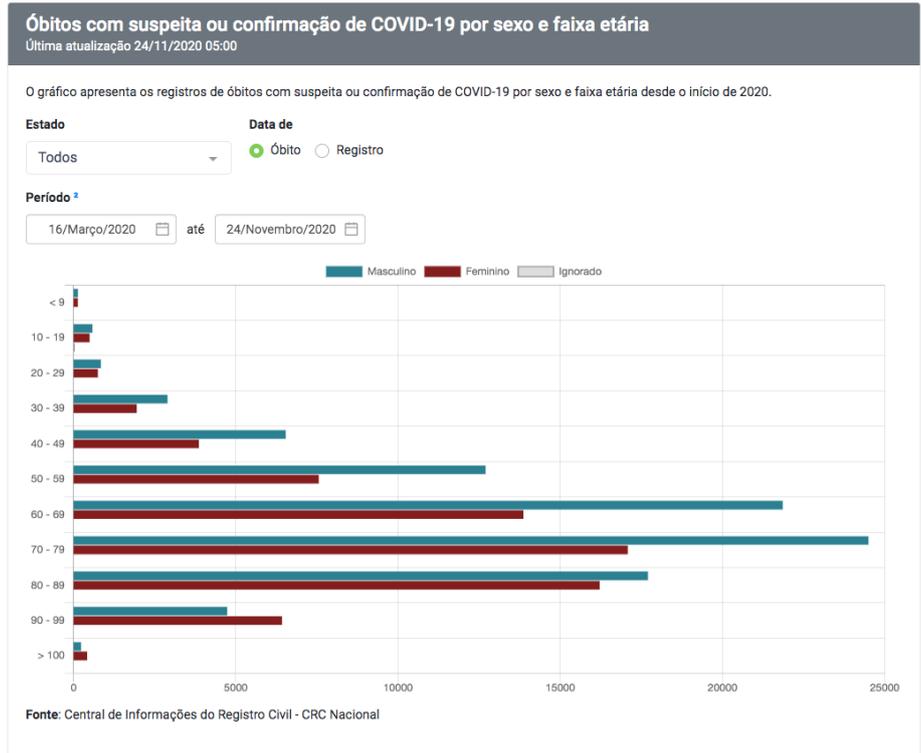


Figure 2 Bar graph dv. Source: Dados Transparentes (18 May, 2020).

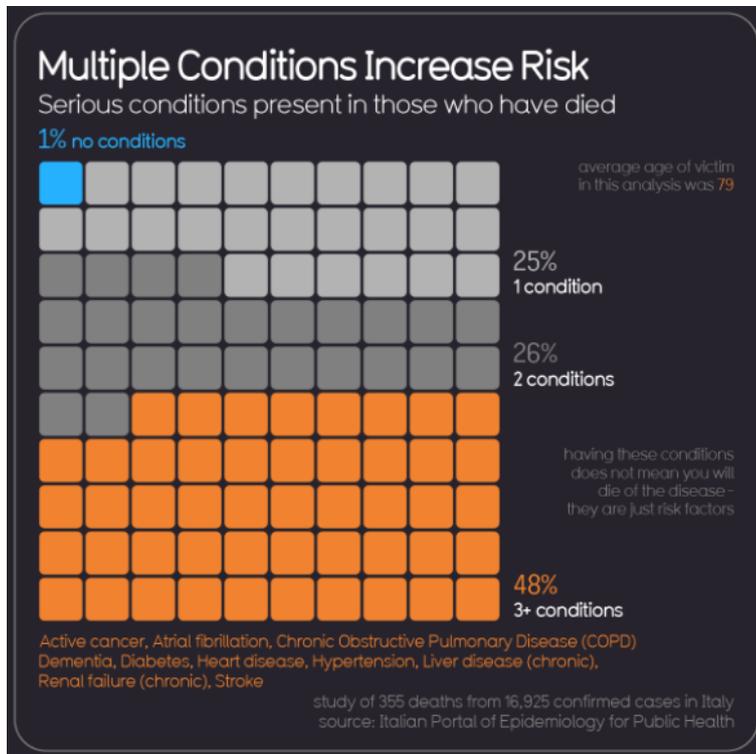


Figure 3 Percentage dv. Source: John Hopkins University (24 Nov 2020).

Lastly, Figure 4 shows the only artistic data visualization. It comprised of a single screen and a title saying, “in memory of the 169264 victims of COVID-19” (*em memória das 169264 vítimas da covid-19*) with the number of reported deaths changing when new information was collected. Under the title was a block of black crosses arranged in rows of 77. The interaction was scrolling down the rows to reach the bottom. A sidebar was available, so the user could see how far they moved. As the data would be updated, each refreshing would yield casualties and more crosses to scroll through.

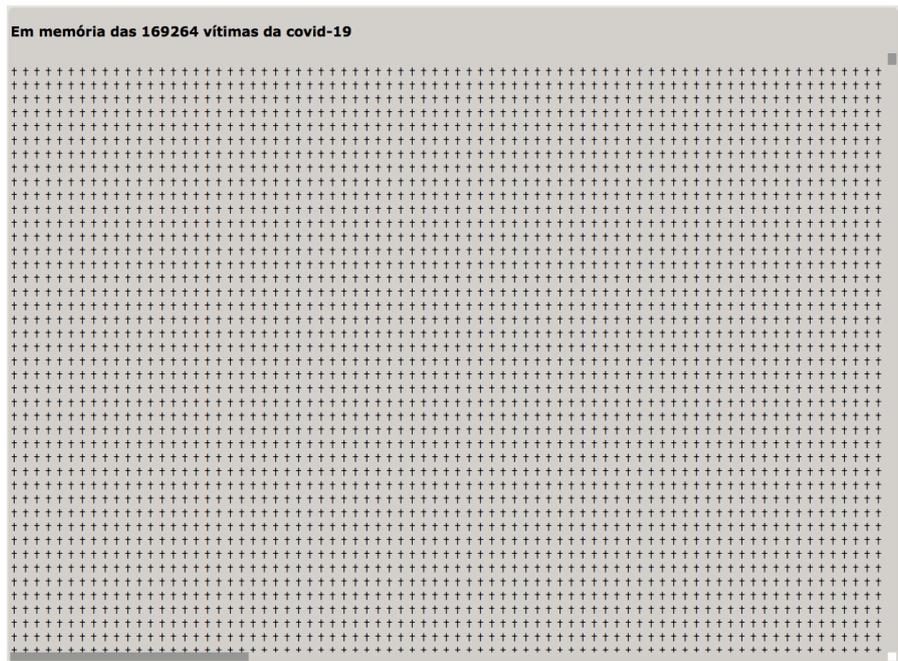


Figure 4 Artistic DV. Source: GYRO 4life UTFPR (24 Nov 2020).

4 Method

Close Reading is a qualitative and subjective methodology that generates insight if performed systematically (Bizzocchi, Ben Lin & Tanenbaum, 2011). It is the process of meticulously analyzing media until one can describe its meaning (Bizzocchi & Tanenbaum, 2011). More recently, the method has been applied to analyze objects using specific lenses (Bizzocchi & Tanenbaum, 2011), which will be remediation for this paper.

Fadel (2020) established five stages to the method: (1) Object, where the object of analysis is chosen and experienced, (2) First Reading, when the remediation of the old media is identified and the initial argument is formed, (3) Theory, when relevant theories for the new and old media are gathered and compiled into a table, (4) Additional Reading when the table is iteratively edited as the analysis progresses, and (5) Conclusion.

An annotation table was created using the concepts of remediation, TMT, TMHM, death anxiety, and death reflection (Table 1). The analysis was

split into the artistic DV (Figure 4) and the others (bar, line, percentage, and map). The table starts with establishing what old media the DV remediate. Following, the remediation process is described, highlighting the elements that are common within both media.

After, theories can be used alongside TMHM to analyze how the DVs foster death awareness and whether it is conscious or subconscious. Then the elements that foster each type of death awareness are highlighted.

In addition, TMT was used to identify the design elements that support the defense modes and if they are more likely to provoke distal or proximal defense mechanisms. The reason why either of those defense mechanisms would be activated is noted. Once the defense mechanism is sorted, the process of death awareness is analyzed alongside the theories of the old media to establish if interactions might sustain death awareness or reflection. Finally, the possible consequences of fostering anxiety or reflection are discussed.

5 Results and consideration

Two significant categories were noticed during the analysis: emotionally engaging and data-driven data visualizations (Table 1).

The emotionally engaging DV presents death as crosses. One of the most critical variables for the artistic DV is the interaction through the cursor. When the users opens the page, they see a beige background with small black crosses. The only interaction available is to scroll down, as demonstrated by the tiny scroll bar on the right side.

As the user scrolls, a sense of grandeur appears. It appears to be a simple task, however, the more the users scroll, the more they realize that the bar has barely moved. So, they might scroll faster, and at one point, while trying to cross that immense page, realize that each of those crosses represents a person. And suddenly, there is a sense of magnitude to the tragedy that was, and still is, the COVID-19 pandemic.

The cursor represents the self within the screen. As the users scroll, the fingers do what legs would when walking. Indeed, the cursor is not just a tool but also a fundamental design part. It acts as a conduit to manipulate the interface, which provides a sense of engagement and control (Bizzocchi, 2003).

In this case, the artistic DV remediates a walk through a cemetery. Each of the crosses remediates a tomb, and scrolling down the page becomes the act of walking across the aisles. The movement evokes agency through mastering of space (Eichner, 2014). This type of representation focuses on eliciting emotions from the users to appeal to their sensitive side. It garners gut reactions.

The creator of this DV expressed that she wanted people to feel the “heaviness” of the deaths. The inspiration for this DV comes from the Memorial to the Murdered Jews of Europe in Germany, where each one of the dead was personified to give meaning and weight to the tragedy.

Table 1 Annotation table. Source: The authors, based on Bolter and Grusin (2000), Grant and Wade-Benzoni (2009), Greenberg and Arndt (2008), and Goldenberg and Arndt (2008).

			Elements of Artistic DV	Elements of Data-driven DV
Remediation	What is the old media?		Graveyard.	Organization system of a cemetery.
	How does it remediate the old media?		Movement of the mouse as walking. Agency as manipulation of space as spatial awareness.	Graphic images as organization tools. Graphs as simplifications used for analysis.
Terror Management Health Model	Death awareness conscious	How do the reminders of mortality behave?	Graveyards directly implicate thoughts of death. Personal and shocking.	Death awareness happens in numbers. The focus is on the data and not the mortality itself.
	Death awareness is sub-conscious	How does it handle awareness of bodily functions?	Remediation of the cursor as a digital body makes the physical presence more known to the user.	Awareness is supported by analyzing the context and the representations when looking for patterns and trends.
Terror management theory	Proximal defenses	Death as a focal point	The implication of a graveyard is a grim reminder of human mortality.	—
	Distal defenses	Death pushed to the sub-conscious	—	Death as numbers. The experience of death is far removed from context.
Death anxiety vs. Death reflection	How does it foster death anxiety?	Visceral instinctive reactions	DV remediates a graveyard to evoke the weight of the number of deaths.	—
		Focus on specific events spanning a short period	Focus on the experience of scrolling/walking. Quick shocking interaction.	—
	Death reflection	Controlled rational thoughts	—	Analysis of graphs as a form of prediction fosters rational and controlled thought.
		An extended period	—	The time spent with them is longer as the graphs are used for analysis and prediction.

On the other hand, the data DV focuses on numbers and focuses on recognition of patterns and trends (see Khanam et al., 2020). No weight is given to the information, the form of representation would not change based on context.

This differs from the artistic DV, which carries informational purpose. The connotation of a graveyard implies death in a way that the graphs do not. The crosses are a common symbol for tombstones and are easily recognizable. When looking at the data DV, it is easy to push the thought of mortality into the subconsciousness, while for the artistic DV, death is

the focal point. Therefore, one can assume that when looking at the data-driven DVs, death reflection is activated, while for the artistic DV, death anxiety arises (Grant & Wade-Benzoni, 2009).

If the artistic DV remediates a walk through a graveyard, the data DV remediates the papers keeping track of how many people there are in the cemetery. This data is impersonal and serves the purpose of helping those that manage the cemetery. In this sense, the representations act as compilations of large quantities of data for better managing (Sadiku et al., 2016). Indeed, many of the data representations seem to serve the same purpose during pandemic times, coming from websites that monitor or predict how the pandemic would behave: a dashboard (Cooley, 2020). This type of representation is rational. They were made to monitor and help construct arguments for funding allocation, or quarantine needs.

Death awareness is happening differently in these two cases. Death anxiety is more likely in the artistic DV, which aims to cause emotional responses (Grant & Wade-Benzoni, 2009). Walking through a graveyard ranks number two in factors that incited death anxiety (Neimeyer, 1997). As the artistic DV remediates that experience it might incite the self-preservation that Terror Management Theory mentions (Grant & Wade-Benzoni, 2009; Greenberg & Arndt, 2012).

This is not necessarily prejudicial, as death anxiety can incite self-preservation and health guidelines compliance, as shown by the TMHM (Goldenberg & Arndt, 2008). However, death anxiety has also been linked to aggression and rejection of perceived danger (Friedman & Rholes, 2007; Rosenblatt et al., 1989; Stein & Cropanzano, 2011).

As for the data-driven DVs, the elements previously discussed support death reflection. As Sadiku et al. (2016) and Khanam et al. (2020) discuss, data visualizations are essential assets for data analysts. This representation supports analytical and rational responses (Grant & Wade-Benzoni, 2009). The result can be a process that promotes positive changes for others, prosocial behavior, and increased intrinsic motivation (Grant & Wade-Benzoni, 2009; Lykins et al., 2007).

6 Conclusion

Different types of visualization foster different reactions, and it is the designer's responsibility to choose visual elements that are adequate to the intended message. The results suggest the artistic approach is not superior or inferior to the data-driven, but instead, each serves a different purpose.

Data-driven DVs seem more adequate for representing complex data. Moreover, they can be conveyed straightforwardly, allowing the researchers to find patterns and trends and engage in behaviors that focus on positive societal changes. Similarly, emotionally engaging DVs are necessary to present the mortality cues that allow people to engage in healthy lifestyle changes or positive prosocial outcomes.

When making a DV, the designer should know beforehand the reaction they seek to enact so design elements can be chosen to foster healthy and safe behaviors that ultimately collaborate for positive social changes, as Goldenberg and Arndt (2008) suggested.

When seeking to make the user confront their mortality, a more physically engaging visualization could be employed, using elements that foster agency over the data visualization and some fear. When seeking to make emotionless decisions, it is better to abstract the human body and deliver the information to activate the “cool” cognitive system.

Future works could perceive the user perception of these two data visualization categories to compare these findings.

References

- Ainsworth, S. (2008). *How do animations influence learning?*
- Bizzocchi, J., Lin, B., & Tanenbaum, T. (2011). Games, Narrative, and the Design of Interface. *International Journal of Art and Technology (IJART)*.
- Bizzocchi, J., & Tanenbaum, J. (2011). Well-read: applying close reading techniques to gameplay experiences. *Well played 3.0: video games, value, and meaning*. ETC Press, Pittsburgh, PA, USA, 262–290.
- Bolter, J. D., & Grusin, R. (2000). *Remediation*. The MIT Press.
- Doan, S. (2020). Misrepresenting COVID-19: Lying with charts during the second golden age of data design. *Journal of Business and Technical Communication*, 35(1), 73–79.
- Eichner, S. (2014). *Agency and media reception: Experiencing video games, film, and television*. vs Verlag für Sozialwissenschaften.
- Eisner, E. W. (1997). The promise and perils of alternative forms of data representation. *Educational Researcher*, 26(6), 4–10.
- Fadel, L. M. (2020). *O método close reading aplicado à análise de mídias interativas*. Universidade Federal de Santa Catarina. Florianópolis, SC. Notas de aula.
- Fraser, S. (2003). *Ceremony of Innocence and the subversion of interface: Cursor transformation as a narrative device*.
- Friedman, M., & Rholes, W. S. (2006). Successfully challenging fundamentalist beliefs results in increased death awareness. *Journal of Experimental Social Psychology*.
- Frosh, P. (2019). *The poetics of digital media*. Polity.
- Goldenberg, J., L. & Arndt, J. (2008). The implications of death for health: A Terror Management Health Model for behavioral health promotion. *Psychological Review*, 115(4).
- Grant, A. M., & Wade-Benzoni, K. A. (2009). The hot and cool of death awareness at work: Mortality cues, aging, and self-protective and prosocial motivations. *Academy of Management Review*.
- Greenberg J., Rosenblat, A., Solomon, S., Pyszczynski, T., & Lyon, D. (1989). Evidence for Terror Management Theory: 1. The effects of mortality salience on reactions to those who violate or uphold cultural values. *Journal of Personality and Social Psychology*.

- Greenberg, J., & Arndt, J. (2012). Terror Management Theory. *Handbook of Theories of Social Psychology*.
- Khanam, F., Itisha, N., & Mondal, M. R. H. (2020). Data visualization and analyzation of COVID-19. *Journal of Scientific Research & Reports*.
- Lykins, E. L. B., Segerstrom, S. C., Averill, A. J., & Evans, D. R. (2015). Goal shifts following reminders of mortality: Reconciling posttraumatic growth and Terror Management Theory. *Personality and Social Psychology Bulletin*.
- Metcalf, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychology Review*.
- Miguel, F. K., Machado, G. M., Pianowski, G., & Carvalho, L. F. (2021). Compliance with containment measures to the COVID-19 pandemic over time: Do antisocial traits matter? *Personality and Individual Differences*, 168, 110346, ISSN 0191-8869.
- Neimeyer, R. (1998). Special article: Death anxiety research: the state of the art. *Semantic scholar*.
- Pandey, A. V., Manivannan, A., Nov, O., Satterthwaite, M., & Bertini, E. (2014). The persuasive power of data visualization. *IEEE Transactions on Visualization and Computer Graphics*, 2012, 2211–2220.
- Pyszczynski, T., Lockett, M., Greenberg, J., & Solomon, S. (2020). Terror Management Theory and the COVID-19 Pandemic. *Journal of Humanistic Psychology*.
- Qian, K., & Yahara, T. (2020). Mentality and behavior in COVID-19 emergency status in Japan: Influence of personality, morality, and ideology. *PloS One*, 15(7).
- Rodríguez, M. T., Nunes, S., & Devezas, T. (2015). Telling stories with data visualization. In *Proceedings of the 2015 Workshop on Narrative & Hypertext (NHT' 15)*. Association for Computing Machinery.
- Sadiku, M. N. O., Adebowale, E. S., Sarhan M. M., & Cajetan M. A. (2016). Data visualization. *International Journal of Engineering Research and Advanced Technology (IJERAT)*.
- Stein, J. H., & Cropanzano, R. (2011). Death awareness and organizational behavior. *Journal of Organizational Behavior*.
- Tversky, B., Morrison, J., & Bétrancourt, M. (2002). Animation: Can it facilitate? *International Journal of Human-Computer Studies*.
- Viégas, F. B., & Wattenberg, M. (2007). Artistic data visualization: Beyond visual analytics. In D. Schuler (Ed.), *Online Communities and Social Computing. ocsc 2007. Lecture Notes in Computer Science*, 4564.

About the authors

Larissa Ugaya Mazza

lari.u.ma@gmail.com

University of Waterloo, Canada

Universidade Federal do Paraná, Curitiba, PR

Luciane Maria Fadel
liefadel@gmail.com
Universidade Federal de Santa Catarina
Florianópolis, SC

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