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Frameless cinema: Proposed scale of narrative involvement in virtual reality

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ABSTRACT

The possibility of recording in 360° has aroused the interest of entrepreneurs and researchers in the potential narrative powers of virtual reality in different fields. However, there are still some questions that have not been sufficiently confirmed, such as the higher level of narrative involvement of the viewer in this new form of storytelling. In order to make up for this lack, this research presents the design of an experimental analysis in different phases. It is a quantitative-qualitative pilot project based on the MNEQ scale[1] that allows us to evaluate and compare the viewing experience of a narrative story through virtual reality presentation and different types of two-dimensional screens to a minimum of 100 people divided into experimental groups. Under the assumption that each treatment or each technology (independent variable) has different impacts on the viewer's narrative involvement (dependent variable), the aim is to analyze empathy (EP), sympathy (S), cognitive perspective taking (CP), loss of time (LT), loss of self-awareness (LS), narrative presence (NP), narrative involvement (NI), distraction (D), ease of cognitive access (EC) and narrative realism (NR). Four different types of analysis (statistical, variance, observational, open-ended) are included. We offer a new model of self-developed analysis for complete Spanish-language cinematic virtual reality works. The experimental design seeks to establish a comprehensive research model in order to discuss whether virtual reality offers, as it is believed, greater engagement.

Keywords: virtual reality; 360º cinema; spectator identification; engagement; framing

1. Introduction

The invention of virtual reality (VR) screens and goggles, as well as access to 360° video cameras, has sparked interest among filmmakers and researchers in the potential narrative powers of this technology. Although research in this area is still in its infancy, with the improvement and lower cost of the equipment and an understanding of how it works, public acceptance will increase.

Although there has been a remarkable development, most of the commercial CVR projects have been aimed at fashion, tourism and sports companies, and narrative fiction projects, which have not generally exceeded six or seven minutes, are at an incipient stage and there are still many questions in the air. Some authors such as Kjær et al.[2] have started to ask whether traditional approaches to cinematography can be directly applied to cinematic virtual reality (CVR) or does this imply a substantial change in storytelling, especially focusing on the influence of the cutting frequency on editing and the viewers' ability to follow the story.

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This article presents the design of a pilot research project, which seeks to make significant contributions to the narrative language of virtual reality and to the understanding of its contributions and limitations. It also analyzes, within the framework of media ecology, the impact of the media on people, and focuses on the level of involvement and participation of viewers in the proposed diegetic universe.

2. Background: The language of cinematic virtual reality (CVR)

Mateer[3] locates the beginning of research around virtual reality in Sutherland's[4] article entitled: "A head-mounted three-dimensional display". Since then, the speed and low cost of processors have enabled it to penetrate the consumer market in two predominant ways: based on computer-generated graphics and sampling processes. In both, the experience has been carried out through the use of viewfinders mounted in front of the viewer's/user's eyes and attached to his or her head. In this way, the vision of reality is replaced by a synthetic environment[3], which produces the visual illusion of being physically present in the computer-generated environment. The user can look in any direction and visual information is generated in real time.

Likewise, this type of virtual reality presents different characteristics with respect to virtual reality based on sampling processes. For example, an image generated by vectors is based on equations and mathematical processes, which allows, among other things, to increase the size of the image to infinity without losing resolution. In contrast, images obtained by light sampling processes are limited by the number of samples initially taken, but the color quality, sample by sample, is going to be very high, which provides the image with realistic tones. These types of characteristics can also be found in computer music playback, notes generated through a MIDI interface, and playback of music captured through a sound sampling process. Both have advantages and disadvantages, but music captured by sampling processes provides more realistic playback. Finally, these differences have also been present in filmmaking using computer-generated three-dimensional models and through sampling processes (pixels per image, images per second and sampling rate per second for the case of sound). In this sense, computer-generated models allow the adaptation of multiple expressive elements during production (framing, lights, textures, environments, camera movement, etc.), although it is still very difficult to faithfully reproduce a human being.

As in the previous examples, conventional film is limited to content captured through sampling processes, but the quality of reproduction of a human actor and physical environment is very high. However, it reduces the viewer's gaze to a field of possibilities delimited by the frame. Cinematic virtual reality (CVR), based on sampling processes, has the limitation of offering only the point of view used at the time of recording, but provides a more realistic reproduction of human actors and physical spaces. As an audiovisual communication medium, like fiction film and traditional documentary film (i.e., not in VR), it can be used for storytelling.

3. Narrative changes in 360° virtual reality cinema

The model of institutional representation (MRI) a concept borrowed from filmmaker, critic and film historian Burch[5] in Praxis du cinema consists of a series of conventions or standardized rules adopted in the early 20th century, codifying film language in order for the proposed fictional world to offer internal coherence, linear causality, psychological realism, and spatial and temporal continuity. In turn, editing is understood, in a broad sense, as "the operation aimed at organizing the set of shots that make up a film according to a predetermined order. It is, therefore, an organizational principle that governs the internal structuring of visual and/or sound filmic elements"[6].

As underlined by Gubern[6], the syntagmatic operation of montage (selection and arrangement of spatial/temporal fragments) reproduces the conditions of selectivity of human perception and memory, in what they are discontinuous and privilege

certain significant aspects to the detriment of others that are not [...] so it is not surprising that montage appears linked from the beginning to narrativity.

Although the montage is the constructor of the piece's meaning, in the case of 360° cinema it offers the possibility of selecting the directionality of the gaze, which, although it cannot be controlled, can be defined. This internal causality produces a cause-effect relationship in the mind of the receiver. For this reason, when we speak of types of plane in MRI, we are referring to the different possibilities of framing the gaze. The plane conditions the framing, that is, the limits of the image, what is outside and inside the frame. Therefore, unlike the CVR, it allows us to experience different aesthetic experiences and, not only that, but also to provide different construction of meaning. For example, while the general shot provides information about the context or environment where the narrative takes place, the very close-up provides an intimate and emotional approach to the characters in the story. In the case of CVR, it is common for the plane to be constant, since there is no framing or, in other words, the user's field of vision is very wide and does not vary, as it would in a natural process of perception. In MRI, the way of looking is imposed by the planning (type and scale of the shots, distance, duration, etc.) while, in virtual reality, since there is no frame that delimits the staging, the framework of interpretations is apparently freer, something that, like other premises, has yet to be confirmed.

Therefore, the lack of a frame strips the creator of his ability to determine what should be seen at any given moment. When the user is given the illusion of being inside the physical space of the story, the ability to communicate important elements of the narrative is lost, as it is possible that while the focus is on a character or object within the frame, the gaze is turned in another direction and the viewer does not see it. The decision of where to look is a personal one, which means that the same work can be viewed many times in different ways.

This absence of framing will also affect the spatiotemporal articulation. Although the events of the story itself have a determined duration (real time), filmic time, different from real time in that it implies manipulation or constructively, would change in this case in each spectator (reception time). Although this focalization can be directed by internal elements of the story itself, the fact that it is not delimited will imply a greater difference between the viewing time of some spectators and others.

On the other hand, it is assumed that with immersive reality the viewer should be more involved in the proposed fictional universe; however, experience has so far indicated that this is not the case, especially in those projects where the viewer is assumed to be within the diegesis, that is, occupying the point of view of a character within the diegetic universe and adopting the position of the camera in a subjective point of view. However, this decision, in the case of 360º cinema, reveals, at present (when the shadow of the camera is seen), the narrative and technological artifice, in addition to generating a distancing due to the lack of identification with the character watching.

The way in which spectator identification is constructed is not something new, as there have been some experiments in this regard since the last century. The film The Lady of the Lake directed by Robert Montgomery and adapted from Raymond Chandler's novel of the same title- was shot using the subjective camera technique. The intention was for the camera to pretend to be one of the characters, in this case the detective, Philip Marlowe. It was shot entirely in subjective camera, except for a few cuts in which the director himself speaks directly to the viewer, clarifying certain points of the story. However, although the proposal and the risk taken by the director at that time are commendable, the story is quite confusing and the resource is repetitive.

How can we explain this example and why do we use it when talking about virtual reality? There is a close relationship in the processes. When trying to involve the viewer in the fictional universe by taking the place of the camera, the viewer does not get to see the face of the detective, that is, of the character, so the identification does not work. There is no subject

of the gaze, only the visual field in a subjective plane. Even when internal focalization is used, it is necessary to show from an external focalization scene that the character could not be seeing from the position in which he is, but that the spectator justifies and needs to be able to integrate the experience.

In the scene of The Godfather Part I, which takes place in the hospital, Michael, Sonny's brother, goes to visit his father who is seriously injured. He soon realizes that Don Vito is unprotected when he was supposed to be guarded, as the police captain has dismissed the bodyguards. We see all this from Michael's subjective point of view (his eyes would take the place of the camera). This is not the case throughout the scene. At times, despite being an internal focus of the character, actions and spaces are shown (the murderer climbing the stairs, images of the corridors) that, due to the location of the character, he would not be able to see. However, despite this distortion, there is an effect of identification with the protagonist and with the scene, feeling that one sees what he sees. Being less faithful to the character's point of view in the process of constructing the gaze as in The Lady of the Lake, where everything takes place through internal focalization and subjective plane, the spectatorial identification is greater.

This demonstrates that the processes of identification in cinema are complex. Focalization does not refer so much to the importance given to a character's gaze, as to the process by which the spectator's gaze is constructed and his or her degree of knowledge of the events and characters. As stated in the book The cinema according to Hitchcock[7], if a character is sitting at a table, unaware that there is a bomb under it, the viewer has the necessary perspective to be able to "see the bomb" in the narration of events, so his knowledge will be superior to that of the characters represented in the work, and this will be what generates suspense. However, if he were unaware of this fact, that is, if his knowledge were inferior, then he would discover what happened through an emotion of surprise.

Therefore, it is usual in audiovisual stories to find a variable internal focalization, since they are often articulated around the adventures of a protagonist, but they are not reduced to him as a channel of information, since there are usually assistant or antagonist characters who also serve as channels or other foci of narrative information.

The above explanation intends to reflect on the fact that immersion in the fictional universe is not always equal to greater identification or greater effect of reality. This is an interesting starting point to address narrativity in virtual reality stories, as well as the process of identification of the viewer with the events and characters.

This leads us to think that perhaps the fact of recording using 360º technology and without framing does not necessarily imply more identification with the represented universe or a greater participation, as one might suspect at the outset. There are many technological, narrative and psychological variables that may influence this. In any case, these aspects have yet to be investigated and will be addressed later.

4. Limitations and technological contributions of virtual reality

The 360º cinema, at a technological level, requires longer scenes due to the recognition of the environment where the action is located, as well as a greater redundancy of important information, anticipating the dispersion of the viewer.

Since there is no framing and it is not easy to use intra-scene cuts, traditional ways of manipulating information to create suspense or direct the viewer's gaze (such as detail shots to highlight a piece of information) are no longer valid in 360º video. This would seem to take it away from certain types of thrillers or complex melodramas, although suspenseful narratives can be generated through a certain control of the directionality of the gaze.

On the other hand, the difficulty of the cuts favors longer shots. Also, close-ups are complicated (due to the distortion of the lenses at close range), and a minimum separation between the camera and the actors is necessary, making it more difficult to direct

the viewer's attention to the area where you want them to look. Then there is the option of trying to manipulate the viewer to look where the filmmaker wants, or to respect his freedom and build a story with multiple possibilities of enjoyment at certain moments, even considering the option that each person, watching the same material, perceives a different story.

The 360° offers the opportunity to take mass audiences to narrative instances that are currently difficult: to work with slower rhythms, to let the elements flow more freely, to give greater importance to the sensory and the physical, which can generate a greater identification with the audience.

Regarding the place of the spectator or the construction of the spectatorial point of view, as mentioned above, in a context of profound mutations in the audiovisual field, it is necessary to redefine the real spectator as a subject that today embodies new functions and occupies varied spaces in the whole of cultural production.

When a recording is made with a specific frame, all the space outside the frame can be used. That is to say, the out-of-field can become part of the visible field if the spectator deems it appropriate during the viewing, a possibility that does not exist in the cinema to which we are accustomed, where the out-of-field can at most be imagined, but not seen, generating other effects in the spectator. However, in both, the out-of-field can be activated by the direction of the characters' gaze, sound effects, etc. marking where it should be directed so as not to lose control over the narration. However, the resources to generate effects during the recording are considerably limited, also because any technological artifact used during the shooting could be seen at any time as there is a 360º field completely visible.

In the case of CVR audio, unlike theater, this can be realistic or hyper-realistic as it is in cinema and, in the case of the image, the same can also happen through colorization processes. In favor would be the ability to look in any direction at any time, but the lack of framing makes CVR a unique experience. Ding et al.[8] found that the CVR has the ability to generate stronger emotions in users; although it is likely that this emotional aspect supports the false assumption as advanced above, the feeling of immersion in the diegetic universe provides greater identification in psychological terms and a sense of greater involvement within the story. Due to the above, it is necessary to create tools and analyses that allow the evaluation of these principles, so as not to start from assumptions but from validated premises. In this sense, this research aims to determine experimentally what is the effect of different technologies to visualize the involvement, empathy and identification of viewers when entering a story of these characteristics and with this technology.

5. Methodology: Model and evaluation tools for works made in virtual reality

The main objective of this project is to contribute to the development of virtual reality as a narrative medium. Specifically, we are interested in the use of the MNEQ scale[1] to evaluate and compare the viewing experience of a narrative story in different types of VR and traditional cinema. Although there are other subsequent researches[9], we start from the work of Busselle and Bilandzic[1] because, apart from being previous in terms of date, it focuses on the validated instrument.

Accordingly, the resulting Narrative Involvement Scale engagement/emotional involvement (**Table 1**) will be applied to determine differences between the various treatments. This helps to determine the validity and reliability of this evaluative instrument, and its use can be encouraged in broader studies in the field of audiovisual narratives and virtual reality narratives.

The methodology to be used consists of two phases and analysis tools: in the first phase, the Measuring Narrative Engagement Questionnaire (MNEQ) developed by Busselle and Bilandzic[1] is used. Although it was initially designed for audiovisual narratives in two-dimensional format, it had been used previously to evaluate virtual reality

narratives. The use of this questionnaire, adapted to the object of analysis, has specific objectives:

1) To offer a further assessment of the validity and reliability of the MNEQ as a narrative evaluation mechanism for virtual reality works.

2) To allow, using the MNEQ in Spanish, to make a comparative analysis of this evaluation tool in two different languages. To offer a version of the questionnaire in Spanish, which did not exist until now.

The questionnaire, as mentioned above, is based on the categories established by Busselle and Bilandzic[1], from their Measuring Narrative Engagement scale, where they generate several questions around the following variables: empathy (EP), sympathy (S), cognitive perspective taking (CP), loss of time (LT), loss of self-awareness (LS), narrative presence (NP), narrative participation (NI), distraction (D), ease of cognitive access (EC) and narrative realism (NR).

A negative component of interaction is distraction. Elements within the story can also divert attention from comprehension. It is assumed that observing instances of inconsistency (lack of realism or verisimilitude) during a narrative experience will interfere with engagement in the story.

Some authors have also worked on the concept of transportation which, in some way, also includes the previous ones and can be defined as: "Losing track of time, not observing the events occurring around them and feeling that they are completely immersed in the world of the narrative"[10]. The loss of self-consciousness combined with the construction of an alternative world provides an explanatory mechanism for the sense of narrative presence or being in that fictional world. It requires processes of perception and perspective taking. Since flow implies that a process, becomes automatic and single actions and cognitions do not require conscious deliberation, engaged viewers should not perceive difficulties in processing the story, but should feel it easy to maintain focus on the story. This also represents a dimension of narrative engagement called cognitive ease of access, a concept associated with reading experiences.

On the other hand, transportation has been found to be highly related to enjoyment[1,10], as has flow.

From these items and from the concept of Engagement or narrative involvement, we selected from the scale established by Busselle and Bilandzic[1], those in line with the research objectives collected above.

Table 1. Narrative engagement scale questionnaire

Narrative Engagement Scale
EP3: During the program, when a main character succeeded, I felt happy, and when they suffered in some way, I felt sad.
EP5: The story affected me emotionally[10].
S1: I felt sorry for some of the characters in the program.
CP4: My understanding of the characters is unclear.
NP1: At times during the program, the story world was closer to me than the real world.
NP3: The program created a new world, and then that world suddenly disappeared when the program ended.
NP4: During the program, my body was in the room, but my mind was inside the world created by the story.
D1: I found my mind wandering while the program was on. (-)[10]
D2: While the program was on I found myself thinking about other things. (-)
D3: I had a hard time keeping my mind on the program. (-)
EC2: I had a hard time recognizing the thread of the story. (-)
NR4: At points, I had a hard time making sense of what was going on in the program. (-)

Source: Own elaboration based on the Measuring Narrative Engagement Model[1].

The second phase, still to be developed, will include the production of a fictional narrative work that takes into consideration the needs of experimental design, in such a way that it manages to homogenize various parts of the narrative experience and allows comparisons to be made between visual

technologies with a high level of validity and with the following implementations:

1. On the one hand, instead of presenting a content created for a hegemonic medium, the idea and production of the fictional work considers that it will have two forms of narrative presentation: virtual reality and two-dimensional screen; and, on the other hand, the decision processes will seek to favor both at the same time.

2. For the experimental analysis, a short fiction film will be created with a virtual reality and two-dimensional screen presentation, which will allow comparisons to be made in the MNEQ with a higher level of validity. Although in one of these versions the user will be able to look in any direction and, in the other version, the framing will be determined by a professional editor, both works will have the same audio and the same sequence of events.

3. While the emphasis is on comparing virtual reality and the two-dimensional screen (the absence and presence of framing), the experimental design covers a diverse range of platforms currently available to the public.

    - Virtual Reality viewers (MP4 file or YouTube).
    - Mobile with gyroscope (YouTube or Facebook).
    - Two-dimensional presentation with interactivity (YouTube or Facebook).
    - Two-dimensional presentation (television).
    - Two-dimensional social presentation (cinema).

Regarding the use of cinematic virtual reality for the experience of fictional narratives, Keshavarz, Hecht and Lawson[11] mention that at the time of their study it was not possible to access complete narratives built for virtual reality. In order to make up for this lack, in this experiment the production of a complete audiovisual narrative will be developed, considering two main forms of presentation: CVR (3 forms of presentation, viewers, mobile and computer) and two-dimensional presentation (2 forms of presentation, television and cinema). The research process includes the realization of a story in CVR to provide a complex narrative experience, with intricate dialogues and dramatic junctures, allowing a valid comparison of the narrative implication (through MNEQ) between the five different forms of presentation (see **Figure 1**).

With the intention of focusing the comparative analysis on only one dimension, the visual, in the four treatments where the experience is individual, the same type of headphones will be used for the reception of the audio of the story. Although the focus of the research is the differences between cinematic virtual reality and regular cinema, 3 other treatments have been included because of their popularity and availability. Subjects in the cinematic virtual reality treatment will use Oculus Go viewers and subjects in the mobile treatment will use Pixel 3 devices. Online services such as YouTube, Vimeo, and Facebook are popular platforms that enable the experience of an interactive spherical video on a common two-dimensional screen. Therefore, the cinematic virtual reality narrative can be viewed interactively with a cellular device. During the experience, the user can move the orientation of the device and it will display, within its screen, portions of the spherical video. By using the sensors on the device, it is possible to simulate that the user is watching an event as if they were filming it from a fixed point.

Viewers	Mobile	Monitor	Television	Cinema
360° Video	360° Video	360° Video	Fixed frame	Fixed frame
Virtual Reality	Mobile Screen	Fixed screen	Fixed screen	Fixed screen
Headphones	Headphones	Headphones	Headphones	Speakers
Individual	Single	Single	Individual	Social

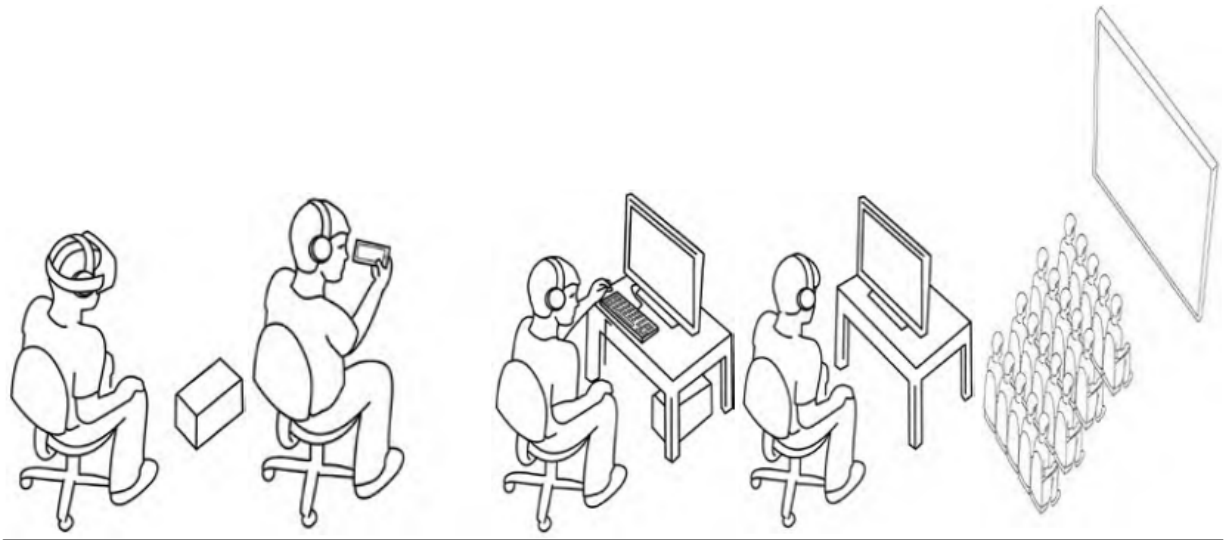

Figure 1. Experimental groups based on the type of experience of the play.
Source: own elaboration.

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Subjects with the monitor will be seated in front of a two-dimensional screen and will have access to a computer keyboard. They will previously receive a brief explanation on how to control the orientation of the spherical video through the keys (left, up, down, right, respectively).

The subjects in the content viewing processes in media such as television and film (not 360°) will be seated in front of a two-dimensional screen, and the framing throughout the work will be determined by an editor. Behind the subjects, in all processes, a camera will be positioned to record each session. For the experience of the work with the different technologies, identical cubicles will be used, completely isolated from external information and with a dim ambient light. In each of the experiences, the same swivel chair will be used.

6. Derivation of the hypotheses

Under the assumption that each treatment or each technology (independent variable) has different impacts on the narrative involvement (dependent variable) of the viewer. Considering that the immersion provided by the viewers and the ability to determine what is seen accentuates, it is speculated

that the greatest difference between the MNEQ results will be recorded between the CVR and the traditional film version or the television version.

H1: MNEQ (Viewers) > MNEQ (Cinema)

H2: MNEQ (Viewers) > MNEQ (Television)

Since in mobile and interactive video on monitor treatments there is not full immersion as with virtual reality viewers, narrative absorption is expected to be lower.

H3: MNEQ (Viewers) > MNEQ (Monitor)

H4: MNEQ (Viewers) > MNEQ (Mobile)

Similarly, a difference in MNEQ results is expected between interactive technologies in general (viewers, mobile and monitor) and traditional technologies (television and cinema).

Finally, we seek to conduct a secondary exploratory study that will help to deepen the general knowledge related to the use of CVR for fictional storytelling. This part of the study will be based on 2 additional activities: 1) The videotaping of the subjects in each treatment with the intention of observing their behavior in different moments of the work and 2) in the days following the experiment, using questionnaires with open-ended questions about the experience.

7. Stages in the realization of the experiment

The experimentation process will have the following protocol: 5 simultaneous sessions of approximately 45 minutes will be carried out in identical experimentation cubicles. A homogeneous protocol will be followed with all participants from 4 of the previously developed processes or treatments:

1. Subjects will begin by reading and signing a consent form.
2. Subjects will enter the cubicle with an assistant, who will position them, give basic instructions on how to use the equipment based on a script and place the headphones.
3. The assistant will begin recording the experiment.
4. The subjects will watch a 25-minute play.
5. Just after the end of the play, the subjects will answer a questionnaire with the MNEQ. At the end, they will be asked not to comment on the play until the end date of the experiment.
6. The next day, subjects will receive and answer the second questionnaire with exploratory open-ended questions.
7. Subjects will receive a small monetary compensation.

In order to increase the reliability of the statistical results, each experiment will have a minimum of 100 subjects. Subjects will be recruited through advertising and paid individually.

Based on an initial survey, interested participants will be randomly stratified among the 4 different treatments. The stratification seeks to ensure a wide age range in each of the groups in the study.

8. Data and results

1. Descriptive statistics of the participants in the experiment
2. The MNEQ as an instrument to measure involvement with the narrative:
    a. Descriptive statistics of the MNEQ for the experience of the work in each of the treatments or experimental groups: viewers, mobile, computer, television and cinema.
    b. Perform congruence analysis between the questions of the questionnaire and consider eliminating some of them to increase the validity of the instrument.
    c. Contrast the statistics of the treatment with virtual reality viewers with the original

study in which the MNEQ was used.

d. Investigate associations between individual MNEQ items and different types of demographic information (age, education, computer use and affinity, etc.).

3. Comparative analysis of the 5 groups:

a. Comparative statistical analysis to determine whether the hypotheses are true or not.

b. Analysis of variance to determine the effect of treatment on each of the MNEQ items.

c. Analysis of the observation of subjects in each of the conditions:

- Qualitative and quantitative analysis to determine subjects' body movement throughout the experience.
- Qualitative and quantitative analysis to determine subjects' interaction with the content throughout the experience.

d. Analysis of the open-ended questions:

- Qualitative analysis of the open-ended questions asked on the subsequent day.

Conflict of interest

The authors declare no conflict of interest.

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