Body and Mind in Virtual Dark Tourism Experiences and Artwork Creations: Embodied Cognition Reaction Perspectives

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Abstract. Dark tourism experiences visualized in destinations evoke diverse tourist experiences, triggering negative emotions and offering insights into historical events. Embodied cognition reactions prompt distinct expressions, reflections, and artwork creation, which can leverage Virtual Reality in tourism and augment dark experiences for distant tourists. This study examines embodied cognition reactions in virtual dark tourism with 32 participants, investigating their responses to narratives and auditory stimuli while impacting artwork. Results show amplified affective experiences via added auditory stimuli and cognitive experiences influenced by narratives. Post-experience, participants manifest their encounters in artworks, reflecting body-mind links.

Keywords: Artwork Creation · Dark Tourism · Embodied Cognition · Sensory Stimuli · Virtual Reality

1 Introduction

Sharpley and Stone [1] posit dark tourism as ***a visit to sites, attractions, or events linked to adverse historical events where death, violence, suffering, or disaster played a significant role***. Dark tourism in tourism research has been studied for decades by bringing the tourism themes of a historical place with a sense of death, disaster, and horror.

Chornobyl in Ukraine and Ground Zero in New York offer different types of tourism experiences since these destinations present a "***dark history in human life***" to the visitors, help them to learn about those disasters, and evoke negative emotions [2, 3]. The concept of dark tourism is the most frequently used since this concept offers a basic continuum concept of "dark" and "light" in the unusual form of travel. Sharpley [4] discovered various "***shades of darkness***" of the behavior of the tourists while experiencing dark

K. Berezina et al. (Eds.): ENTER 2024, SPBE, pp. 115–127, 2024.
https://doi.org/10.1007/978-3-031-58839-6_12

tourism and visiting those sites. Further, the development of the dark tourism continuum has evolved from ***"dark"*** to ***"pale"*** and vice versa [1].

Despite the contradiction of dark tourism continuum, dark tourism seems interesting since it can connect visual stimulation with the tourism experience, covering cognitive and affective experiences [2, 3]. People see and learn to create connections between vision and experience, mainly mental experience [3, 5]. The physical sensation at the tourism site due to the activation of the human senses might influence the unconscious mind of the visitors [6]. During their visit, tourists are exposed to various sensory experiences, such as touching the museum collections, smelling authentic food aroma, or tasting local food. Sensory experiences trigger embodied cognitive reactions to how individuals perceive and respond to the surrounding environment [7–9].

The recent development of multisensory extended reality, including virtual reality (VR) in tourism, can impact destination image processing in different stages of tourism experiences [10], indicating the effect of sensory stimuli in the virtual environment. The emergence of VR in tourism can help people from far to enjoy destination in which tourists can have different reactions on certain digital stimuli from the embodied cognitive reactions perspective [2, 11], connecting body and mind in virtual dark tourism contexts.

We extend our study by understanding the effect of additional auditory experiences and narratives on embodied cognitive reactions of virtual dark tourism [11]. As a reaction, we asked participants to create a reflection and an abstract clay model after experiencing virtual dark tourism. Art creation can help to understand people cognitions, emotional states, and sensory engagements [12, 13] after exposing to certain stimuli. Hence, this study aims to answer the research question: ***How do narratives and/or auditory stimuli in virtual dark tourism experiences influence individuals' cognitions and affections, considering the embodied cognitive reactions?*** To provide a theoretical background for this research, we explain on virtual dark tourism. Then, we elaborate dark tourism and artwork creation that involves activation on certain reactions. Third section explains the research methodology and data collection procedures. Lastly, we provide a discussion on our findings.

2 Literature Review

2.1 Virtual Tour Experience: Influences of Sensory Stimuli and Narratives

VR can create an immersive multisensory environment by augmenting digital human senses, creating any sensations in the virtual environment [10, 14]. Sensory stimuli can facilitate individuals to create perceptions through cognitions and affections, enhancing user experiences in an immersive environment [10, 15]. When a stimulus impinges on the receptor cells of sensory organs, sensations aid in the perception of sensory stimuli [6]. The sensory experiences stimulated in the virtual environment can influence individuals' perceptions, such as human minds, mental imagery, or cognitive imagination.

Moreover, users can construct their storylines and imaginations while exploring virtual environments depicting places they have never been. A content stimulus like a narrative enables users to build original stories based on their experiences [15]. Content

can transports people to another world and a transported individual can have emotional responses in which users are involved and interact [15, 16].

2.2 Embodied Cognition in Dark Tourism

Dark tourism is emotionally laden tourism that evokes tourist negative emotions [2] and simultaneously proceeds the cognitive experience [1]. Negative emotions, such as fear, sadness, or sorrow can influence psychological state of tourists, as described by embodied cognition theory [8, 9, 11]. This theory describes how people respond cognitively, affectively, and physically to an environment and some sensory stimuli. Cognitive processes necessitates comprehending their intimate relationship to the motor surfaces that may generate action and the sensory surfaces that offer sensory signals about the world. The embodiment implies the information processing, facilitating connection between cognitive processing and the sensorimotor systems happen [17, 18]. Experience in dark tourism can help tourists process information by activating sensory information processing, which is gained through sensations from predominant visual stimuli [2, 3, 11, 14]. Simply having people visualize physiological sensations and read verbal expressions associated with sensory-based metaphors can elicit embodied cognitive reactions [18], resulting in cognitive, affective, and behavioral states [7].

2.3 Art Creation as a Cognitive and Affective Effort

Art creation involves cognitive and affective, by involving cognitive intervention, critical engagement, positive challenge, physical and mental development [12, 13]. Further, art is a conduit for externalizing our inner cognitions, emotional states, and sensory engagements [12, 13]. The creative process and the resultant artistic product serve as conduits for innovation, fostering avenues for introspection and sociocultural influence [19]. Historical movements within the realm of art have consistently wielded significant agency in effecting shifts within the social fabric, with artistic endeavors frequently catalyzing transformative cognitive changes and engendering alterations in ideological inclinations. Creating artwork establishes a seamless synergy between the human apparatus (psychomotor faculties), mental, and affective through an interactive fusion of artistic elements and materials [13, 19]. However, creating artwork transcends just the chemistry between the body and mind. The process encompasses a plethora of multi-interactions with visual elements and materials. In other words, the interaction of artists with the features and materials significantly influences our aesthetic perception of the artwork, contributing to the establishment of the brain's state of consciousness [19, 20]. Visual elements and art materials becomes a vital conduit for an aesthetic analysis and appreciations of an artwork. Predominant visual stimuli can provide a connection between body and mind in the art creation through sensorial engagement.

Combining dark tourism and art creation can provide this study with an integrative body and mind through virtual dark tourism experiences. Figure 1 shows our conceptual framework, which we observe in this study. This framework posits experiencing virtual dark tourism through different stimuli triggers different sensations, and an individual can create any perception. The source, such as embodied experience, can generate more

abstract outcomes, often from the concrete sensory domain [18]. This sensory information processing might be enhanced with other sensory channels. Sensory information processing can start sensorimotor enactivism [17], a sensorimotor activity that can explain the perceptual experience. Individuals create any possible perception to understand the relationship in the sensory experience and perceptions.

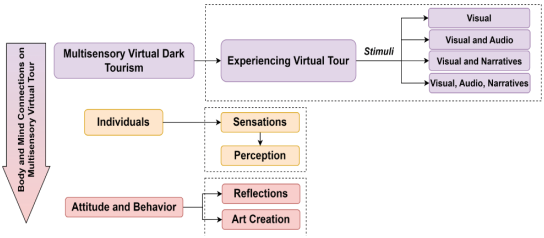


Fig. 1. Conceptual Framework

3 Research Methodology

3.1 Research Design

This study employs a qualitative vignette experiment design [21] as a direction to bridge the quantitative experiment and qualitative research method. Qualitative Vignette experiment design denotes vignettes used in qualitative semistructured interviews to introduce experimentally controlled variety in information and can be considered a mixed method. This study started with creating a virtual tour as an experimental tool. We use one of the dark tourism sites in Indonesia, "Museum Sisa Hartaku" (English: *Museum of the Rest of My Treasure*). This museum is a museum to remember the volcanic eruption in Indonesia in 2010 with 400 casualties and mass evacuations. Figure 2 shows the screenshot of two scenes of Museum Sisa Hartaku.

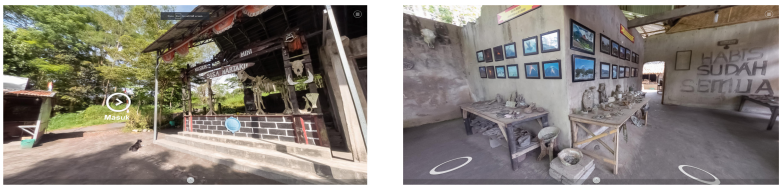


Fig. 2. Virtual Tour of Museum Sisa Hartaku

3.2 Experimental Procedure and Data Analysis

This study involves Ghanaian college art students as voluntarily respondents by asking their consent before their participation. Given the geographical distance between Ghana

and Indonesia, virtual tours offer a suitable means for potential tourists to explore museums. One of the research team members from Ghana helped with the data collection from May to June 2023. Initially, 41 students from the art department of two Ghanaian colleges of education expressed willingness to participate. The respondents (*named with RX with X: number sequence*) should complete two stages: (1) Experiencing the virtual tour and (2) Creating a colorful abstract artwork.. Ineligible participants failing to complete both stages are excluded. Nine participants didn't finish the two stages, resulting in a final count of 32 participants, who is randomly assigned in a non-immersive virtual dark tourism experience using desktop: (1) no sound and no narrative; (2) narrative and no sound; (3) sound and no narrative; (4) sound and narrative. Participants receive US$3 as an incentive. Each group consists of eight participants with a maximum time for a virtual tour is 15 min per person to experience virtual dark tourism.

Employing a vignette experiment design enables researchers to conduct experimental design and provide context-rich data with a mixed-method approach to understanding causal relationships [21]. In the first stage, each participant provided a written reflection on their virtual dark tourism encounters. Participants then create an abstract clay model representing their virtual tour experience, uploading three pictures of the artwork and writing an art appreciation. Table 1 shows the example of datasets. Then, the collected data underwent deductive content analysis [22], comprising reflections, artworks, and appreciations which prioritized the identification of patterns and themes [22], encompassing both negative and positive expressions of sentiment.

4 Findings

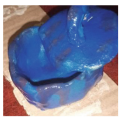
We extracted participants' responses, including virtual tour reflections, artwork pictures, and appreciation. First, one of the researchers, a lecturer from the art department, evaluated the artwork by providing some reviews according to the collected clay model pictures. Then, two researchers joined to conduct a deductive content analysis by analyzing the reflections and artwork appreciation. Figure 3 shows our content analysis approach that is applied to determine our findings. We analyzed the content of the users reflections and artwork appreciation by highlighting keywords that can illustrate their experiences.

4.1 Virtual Tour Reflections Among Individuals

- **Group 1: No audio and No narrative**

Participants in this group elicited various emotions, most telling the excitement of the virtual tour. They observed the museum collections virtually and used their artistic background to analyze the museum collections. For instance, R4 declared, "*In the Virtual Tour at Sisa Hartaku, I saw kinds of works made in different mediums.*" They just reacted naturally and expressed positive emotions, as written by R12 as follows: "*I saw a lot of artworks such as ceramics, wall hanging, painting works, am really happy to go through this tour.*" We also found a misinterpretation of the meaning of virtual tour, as declared by R5, "*Please, what I experienced was the old artworks.*" R5 understands that

Table 1. Sample of Virtual Tour Reflections, Artworks, and Appreciations

ID	Virtual Tour Reflections	Artwork	Appreciation
Group 1: No Narratives and No Sound			
R12	I saw a lot of artworks such as ceramics, wall hanging, and painting works, am really happy to go through this tour.		The artwork was produced by an artist called Dufie. The work is in three-dimensional form. It is assembled with clay l started modeling the clay to form a pot. After that, I painted it with colors. I used some elements and principles of design like shape, colors, and other designs in developing my cooking pot. The artwork serves as cooking material which we use in our various homes. It can be used to cook foods some of our parents even use it to boil traditional herbs. In virtual tourism, I saw some of the pot, which l think they were used for cooking foods
R19	It was very interesting and nice artwork and how they arranged things. And I felt emotional about how the room is very dark.		My work represents television at that time they use television to get information, or if something happens somewhere, they will get through the news or they will get what is going around all over the world.
Group 2: Narratives and No Sound			
R2	My experience of this observation was quite good, but what pains me most was the disaster because it killed living things and spoiled their habitats. I gained more knowledge about the museum, how the artifact was made, and how it was organized, This has given me an insight into artworks, and I appreciate it. Thank you for giving me this opportunity to go through your museum.		This is a work that was done on the 2nd of May, 2023, this work is a jewelry container that the victim uses in keeping jewelry, and it has been broken because of the disaster. The work was done using clay which I kneaded, and I used the three-dimensional technique, which is modeling in making the artifact. The color of the work shows newness because of the things stored in it and the natural environment. This work was done to show that disaster is a bad cause that leads to great loss of life and property. The artwork was built to show how disaster can destroy our items.Thank you
R25	Through my experience of viewing this museum collection about the disaster can also inspire empathy and compassion. Seeing the faces of survivors and the tireless efforts of rescue workers can remind us of the resilience of the human spirit and the importance of coming together in times of crisis. In this way, the museum's collection of disaster pictures can serve as a powerful tool for education, awareness, and empathy-building. By appreciating these images and the stories they tell, we become better-informed and more compassionate citizens of the world.		The story was a disaster that happened in one of the countries. The main motive behind this clay model is the properties that got burnt during the disaster. So I made this clay model to represent the houses that got burnt during that time. And I also painted with white, black, and dark reddish colors. I used white color for the wall, and I used dark reddish for the roofing, and black color was the burnt and the broking place in the house. Smoke in the house also represents how the house was burning during the disaster. So the meaning of this work is the properties that got burnt during the disaster in Indonesia.
Group 3: Sound and No Narratives			
R8	The experience I had in this video was very emotional because I was picturing the incident in my mind. Im worried about the victims of the incident, especially helpless women and children. This experience will be the first thing I will never wish for. May God protect us from such an experience. Thank you.		This art piece is a bone representing the poor victims who lost their lives during this natural disaster, especially women and children who were helpless at that moment, they had no strength to save themselves. The red pigment on the bone represents the blood of innocent people shared in the incident. imagine how sorrowful it will be. Lastly, the red band tied around the bone means danger. In conclusion, Natural disaster is nothing good to be prayed for. God is our protector.

(*continued*)

Table 1. (*continued*)

R16	The full awareness of passing the good quality of the artwork. In my experience, I saw many visual artworks, like textile works, in which I saw clothing being hanged on the wall. Then also I saw sculpture works and ceramic works in the museum. I noticed that our forefathers suffered a lot during this disaster. I felt worried and potty for the people who were there in that era. I saw the bones of human beings. I wish to join this museum live. Thank you.		The clay model is a clay pot, in my experience, I saw many clay pots of different kinds. Pottery works an important role in studying culture and reconstructing the past. Historically with distinct cultures, the style of pottery changed. It reflects the social, economic, and environmental conditions a culture thrived in, which helps archaeologists and historians understand our past.
Group 4: Narratives and Sound			
R24	The museum helps the victims to reflect on the incident that happened to serve as a remembrance, and also, the museum help as a collection and gathering of the materials that couldn't burn during the disaster. The museum can also help to generate money to support the victims financially. Thank you ❤️🩹😢 🙏🙏🌎💐		The artwork is a burnt plastic plate that represents the cooking utensils that got burnt during the disaster and also tried to turn every opportunity I had to create this artwork as a reflection or remembrance of the properties that got burnt. I also came about a black color dominating my artwork that symbolizes sophistication, death, mourning, and depression about the disaster.
R30	I felt very sad seeing the leftover things in the museum left on the land of Yogyakarta. It was a nice experience, though, and it was my first time experiencing such things with background sound being so emotional 😢😢. I never want to be a victim of such an incident 😢💔.		It's a cup, and it reflects my experience on the tour because it was an object that was used to serve water, but afterward, it has now become a leftover thing after the disaster.

the artwork is a part of old collections. Some participants also have negative emotions by feeling dark and scared, as stated by R29, "*It was a little bit scary and interesting*," and R23, "*And felt emotional about how the room is very dark.*"

- **Group 2: Narratives and No Audio**

Respondents of the second group felt the excitement of the virtual tour and wondered about the museum's creation. R31 stated, "*I was so excited to experience this tour as my first time seeing something like this.*" Narratives can evoke some negative emotions, such as sorrow. R6 reflected, "*I felt emotional watching these scenes because the place was dark. I have never seen broken arranged pots, old ragged bags, some cracked buildings with bushy areas.*" They also reflected on the event of the disaster and understood the story behind the Museum Sisa Hartaku. Based on their understanding and reflection, they can show empathy for the victims.

- **Group 3: Audio and No Narratives**

Audio can evoke more negative emotions, such as sadness, worry, and potty, as stated by most participants. R8 reflected, "*The experience I had in this video is very emotional because I was picturing the incident in my mind.*", whereas R18 said, "*I have not experienced anything like this one, but this museum exploitation with the sound made me kind of emotional, but I wanted to try without the sound.*" Participants observed that the several museum collections can make them feel emotionally involved, enhanced by the auditory stimuli. From the museum collections, participants learned about the museum, while auditory stimuli evoked negative emotions. R9 wrote in the reflection,

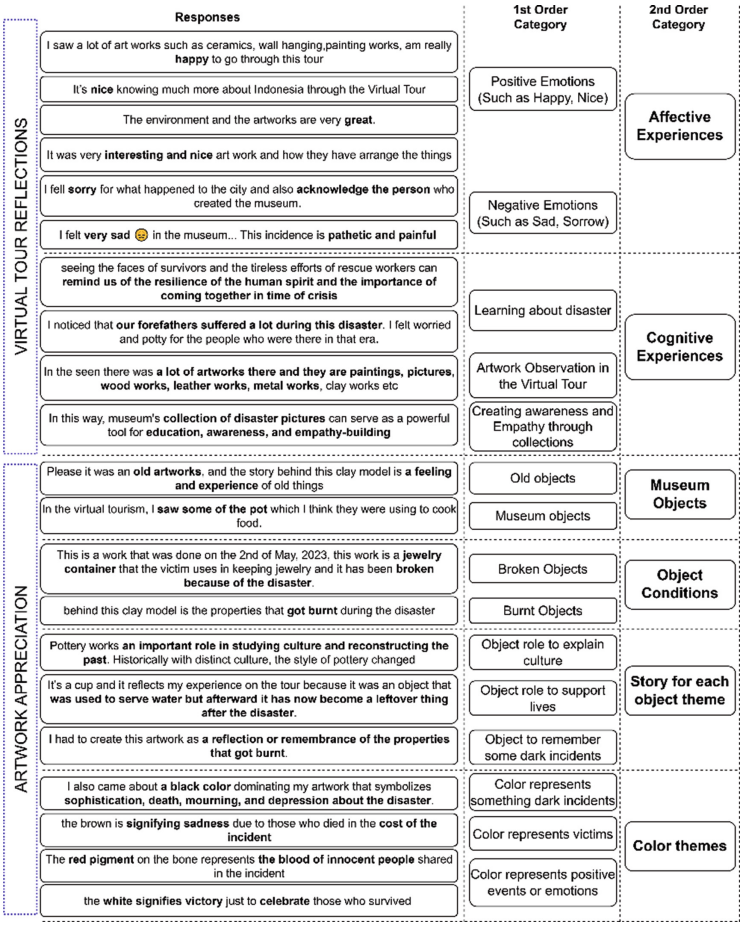


Fig. 3. Coding Scheme

"*I observed many items that depicted the way the people live their lives,… they used before the disaster. I felt so emotional during the observation of the museum.*"

- **Group 4: Audio and Narratives**

We also found a similar mechanism within this group. Auditory stimuli evoke negative emotions, which appear during virtual dark tourism experiences. Participants reflected that they elicit sadness, pain, and pathetic in their reflections on virtual dark tourism experiences. R1 mentioned, "*I was very sad to see such a museum. I saw a designed art made with old metals and bags made with natural leather.*" Other participants expressed their feelings using emoticons. Meanwhile, narratives influence their cognitions and help participants to have meaningful experiences. They can provide a deeper appreciation of the museum by understanding some museum collections.

4.2 Artwork Creation and Appreciation

- **Group 1: No audio and No narrative**

Participants harnessed artistic talents within this group to decode virtual tour visuals, yielding artworks that mirrored their experiences. Absent narrative or sound, they instinctively formed objects like televisions and household utensils. Participants found and observed these collections during the virtual tour experiences. R12 appreciated the cooking materials artwork, as described, "*The artwork serves as cooking material which we use in our various homes… In the virtual tourism, l saw some of the pot l think they were using it to cook food.*" In terms of the object colors, these groups tend to use bright colors to project more positive emotions, which can be recognized as their excitement with the virtual tour, as mentioned in the virtual tour reflections.

- **Group 2: Narratives and No Audio**

The narrative significantly predominantly influenced cognitive encounters for this group of participants. In their artwork descriptions, some expressed condolences for victims. This group creates artworks that encompass the interpretation of the volcanic eruption. Participants highlight the effect of volcanic eruption by creating fragmented and burnt objects, such as shattered earthenware bowls, fragmented pots, and burnt houses. R17 reflects on the artwork by expressing, "*This work was done to show that disaster is a bad cause which leads to great loss of life and properties. The artwork was built to show how disaster can destroy our items.*" The artworks created use dark hues to signify the conditions after the disaster, evoking adversity. Meanwhile, several participants used bright tones to project their sympathy and empathy.

- **Group 3: Audio and No Narratives**

Within this group, diverse thematic artworks emerged with a different range, such as museum-related objects, household objects, and museum collections, indicating various interpretations of the virtual tour. We posit that the mournful resonance of the sound likely influenced affective aspects, enabling the participants to link their creations to museum artifacts and ancient museum collections that appeared in the virtual tour. R9 expressed, "*The story behind this clay model represents the animals around the museum when the disaster took place and take their lives.*". Participants crafted artwork with a less bright color.

- **Group 4: Audio and Narratives**

The artworks of this group indicate both intact and damaged objects. Reading the narrative and listening to the audio stimuli predominantly influenced cognitive and affective virtual dark tourism experiences. Our analysis unveils that some pieces vividly depict their disaster experiences. For instance, participant R24 crafted a charred plastic plate to tribute destroyed properties, as stated, "*I had to create this artwork as a reflection or remembrance of the properties that got burnt. I also came about a black color dominating my artwork that symbolizes sophistication, death, mourning, and depression about the disaster.*" Participants in this group primarily use a dark-theme color, reflecting their dark experience.

5 Discussion

This study highlights virtual dark tourism experiences from an embodied cognition reaction perspective. Without any auditory stimuli and narratives, predominant visual stimuli help participants to observe the museum collections, looking at some dark collections, such as broken housewares and animal bones. Dark collections shown in virtual dark tourism can help individuals recognize the purpose and meaning of the virtual tour experiences [2, 3]. Neglecting narratives and explanations to tourists can lead to misinterpretation of the virtual tour experiences, resulting in less meaningful experiences, as found in Group 1. Connecting their predominant cognitive experiences, participants remember some museum collections and try to recreate these collections in their artworks. However, providing individuals with a narrative can help participants reflect on virtual dark tourism more profoundly and meaningfully, resulting in dark hue artworks related to disasters. Participants tend to create artwork connecting to their mental consciousness and emotional states [19, 20]. This finding indicates the integration between cognitive and affective experiences [11], with cognition appearing and triggering affective experiences [2].

Adding auditory sensory stimuli into virtual dark tourism experiences enhances the affective experiences of participants. Predominant visual stimuli enriched by auditory can help to understand the experiences, creating any sensations that can trigger individual emotions [6, 14]. Individuals elicit slightly negative emotions to show sympathy and empathy for bad experiences without acknowledging the story behind the dark tourism. As a result of these experiences, individuals tend to create artworks to connect their sympathy to survival and encouragement in supporting the affected people.

Integrating narratives and audio stimuli into virtual dark tourism experiences can help people enhance the affective experience and recognize the meaning of the dark tourism experiences [2]. Individuals tend to have a darker and pale experience [1, 4] due to combining auditory and narratives, such as sadness and sorrow. Virtual tour dark tourism using auditory activates two human senses to facilitate sensory information processing and enhance individual emotional involvement [6, 14]. This emotional involvement becomes more engaging once the individuals activate the cognitions through narrative, bringing them to the another virtual dimensions. Following this deeper emotional engagement, participants try to reflect by creating artwork that portrays vary from before the incidents and after the disasters. Participants also use dark colors in their artwork to symbolize death and depression.

6 Conclusions

Our study uses embodied cognition perspectives to examine the connection between individual experiences and their perceptions of virtual dark tourism [8, 9] using narratives and auditory. Our investigation showed that respondents, categorized based on their respective research groups, generated reflections and artworks that intricately mirrored their encounters within dark virtual tours. Our analysis also unveiled a correlation and uniformity in applying cognitive semiotics [20], encompassing both color and form by

participants to articulate their cognitive and affective experiences. Participants predominantly employed dark hues to symbolize negative sentiments while conversely utilizing vibrant shades to represent the persistence of life and optimism.

6.1 Limitations and Future Research Directions

Our study involved only 32 participants from Ghanaian undergraduate art students. We acknowledge our small sample size. However, we must be careful when we generalize the result to a more enormous population. Future studies can extend our research by exploring a larger sample size and comparing it within different countries. In addition, due to limited access to VR head-mounted devices, we only provide a non-immersive virtual tour experience with less technology embodiment. Technology embodiment influences emotions and engagement [16], and future research can understand the impact of technology embodiment on the embodied cognition of virtual tours.

6.2 Theoretical Contribution

This study provides a theoretical contribution by extending the embodied cognition reactions in virtual dark tourism by relating the virtual tour with artwork creation [8, 9, 11]. The finding reveals that participants are not only associated with the level of darkness of the colors but also reflect their clay models with different objects, choosing the suitable theme to express their experiences. In addition, we extend the current study by covering the other stimuli, such as content stimuli (narrative) and sensory stimuli (visual and auditory), in the virtual dark tourism experiences [10, 15].

6.3 Practical Contribution

The emergence of VR in tourism can benefit destination managers in expanding existing markets to different countries and lowering the cost of travel. Many destination managers already adopted the virtual tour; however, they do not capture what is precisely the tourist experience. This study's findings can help unbox online travelers' embodied virtual travel experiences and provide an understanding of the different effects of auditory and narratives in the virtual environment.

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