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Towards the Design of Transformation: A Review of Transformative VR Experiences

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ABSTRACT

Within the context applied to Virtual Reality research, the present work focuses on a literature review within the emerging field of Transformative Experience Design. The review focuses on studies that have adopted a strongly empirical, phenomenological and qualitative approach to the creation and evaluation of transformative experiences in VR, with the purpose of finding out not only how these are being created, but also which are the main factors that enable a transformative dimension in this type of experiences. The results present a number of possible stimuli regarding the most prominent dimensions of awe and the sublime found in the literature: perceptual vastness and need for accommodation. These results are then systematized and discussed, and further possibilities are then suggested within this context.

Keywords: Virtual reality, Transformative experience design, Sublime, AWE, Literature review

INTRODUCTION

The present work focuses on a literature review within the emerging field of Transformative Experience Design (TED): a domain in interaction design that aims to create experiences that foster self-actualization and self-transcendence. Introduced by Gaggioli (2016), this framework is built on the premise that certain experiences can induce lasting changes in an individual's self-perception, personality, beliefs, and values, being defined as unique and extraordinary events that provoke both emotional and epistemic expansion (Gaggioli, 2016).

Central to this discussion is the study of awe: a complex emotion that blends amazement, admiration, fear and humility (Chirico and Gaggioli, 2018; Gaggioli, 2016; Keltner and Haidt, 2003; Yaden et al., 2019). Awe is conceptually linked to the philosophical notion of the sublime, which was extensively elaborated by Kant (1790) and Burke (1767) within the domain of aesthetics. Kant (1790) distinguishes between the mathematical sublime - experiences of vastness that exceed our perceptual capacities - and the dynamical sublime - experiences that challenge our cognitive limitations and evoke a need for accommodation. In contrast, Burke (1767) emphasizes the somatic aspects of the sublime, associating it with visceral responses such as terror, pain, or a bodily paralysis when confronted with overwhelming stimuli.

Both concepts share common themes of belonging, elevation, and the active engagement of imagination (Clewis et al., 2022), and the concept of transformative experiences shares common particularities with phenomena such as self-transcendence, peak experiences, and mystical encounters (Chirico et al., 2022; Kitson et al., 2020).

Gaggioli (2016) is a leading proponent of Transformative Experience Design, idealizing a "perturbation experiment" approach that deliberately destabilizes users' existing frames of reference to stimulate a restructuring of meanings and beliefs. Here, Virtual Reality (VR) is highlighted as a particularly promising medium for facilitating transformative experiences (Gaggioli, 2016). VR's unique phenomenological characteristics - such as its ability to engender a profound sense of presence, to allow users to adopt alternative embodied perspectives, and to create environments that defy the conventional laws of physics (Gaggioli, 2016) - can stimulate both the mathematical and dynamical aspects of the sublime. This, in turn, can provoke significant emotional and epistemic shifts as users adjust to new, unfamiliar paradigms.

Despite these promising insights, several questions remain open. Therefore, the review calls for a deeper investigation into the contexts, methodologies, and applications through which VR is utilized to maximize transformative experiences.

MATERIALS AND METHODS

The methodological Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) Statement was used to conduct the current review. The scientific multidisciplinary databases used for the search were SCOPUS and Web of Science. The only implemented filter was related to the English language. Thus, the search combinations were the following:

Scopus:

> (TITLE-ABS-KEY ("transformative experience design" OR "awe" OR "sublime" OR "self-transcenden*" OR "self transcenden*" OR "transcenden*" OR "peak experienc*" OR "mystical experienc*" OR "spiritual experienc*" OR "transformative experienc*") AND TITLE-ABS-KEY ("virtual reality" OR "VR")) AND (LIMIT-TO (LANGUAGE, "English")).

Web of Science:

> (TS=("transformative experience design" OR "awe" OR "sublime" OR "self-transcenden*" OR "self transcenden*" OR "transcenden*" OR "peak experienc*" OR "mystical experienc*" OR "spiritual experienc*" OR "transformative experienc*") OR AK = ("transformative experience design" OR "awe" OR "sublime" OR "self-transcenden*" OR "self transcenden*" OR "transcenden*" OR "peak experienc*" OR "mystical experienc*" OR "spiritual experienc*" OR "transformative experienc*")) AND (TS =("virtual reality" OR "VR") OR AK=("virtual reality" OR "VR")).

The first part of the search index concerns terms related to the different theoretical concepts already mentioned, and that highly relate to the concept of transformative experiences and it's transcendental valence. The second part includes terms and words related to the dimension of virtual reality. This search string followed a search based on title, keywords, and abstract, in order to filter out works that had these terms as fundamental pillars of their texts.

It was decided not to include works that addressed VR in a superficial way and that were inherently theoretical, with the aim to base the study on practical implementations of VR technology in this context. On the other hand, studies that did not apply procedures to evaluate transformative experiences with participants were not included, since without this it is not possible to effectively verify which factors foster this type of experience. Since the body of theory is still quite recent, the decision was made to incorporate different types of documents available in the search, avoiding the risk of excluding important contributions in this study's scope.

The initial search resulted in the collection of a total of 448 articles. After eliminating duplicate studies, 304 articles remained. Here, the initial screening phase was based on reading the respective abstracts and titles, and from this excluding noticeably irrelevant studies based on the inclusion/exclusion criteria previously listed, resulting in a total of 71 articles. Of these, and after the full-text reading, 49 papers were considered eligible for inclusion in this research context.

RESULTS

This section reports on the different factors considered important in the experience of transformative experiences in the studies collected.

Key Formal Elements of Awe: Perceptual Vastness

Indeed, and as previously mentioned, the experience of awe and the sublime can be viewed from two distinct but complementary dimensions: of perceptual vastness (Keltner and Haidt, 2003) or mathematical sublime (Kant, 1790); and of need for accommodation (Keltner and Haidt, 2003) or dynamical sublime (Kant, 1790).

In this first section we'll discuss some properties related to this first dimension of perceptual vastness. Perhaps the most prominent category among these is the use of natural VR environments, ranging from settings such as forests (Chirico et al., 2017; Hao et al., 2024; Ito et al., 2024; Ochadleus et al., 2023; Quesnel and Riecke, 2018; Urban and Bossaller, 2024), mountains (Chirico et al., 2017; Mancuso et al., 2024; Otsubo et al., 2024; Rauhoeft et al., 2015), seas and huge waves (He et al., 2024; Mancuso et al., 2024), or even awe-inspiring phenomena such as the aurora borealis (McPhetres, 2019; Miller et al., 2023). One particularly paradigmatic example was the view of Earth from outer space - a setting that has been repeatedly shown to foster the Overview Effect and evoke feelings of a *"small-self"* (Chirico et al., 2024, 2018; Kahn and Cargile, 2021; Lin et al., 2024; Liu et al., 2022; Miller et al., 2023; Quesnel and Riecke, 2018; Song et al., 2023).

An interesting case is presented by Chirico et al. (2021), which highlighted the emotional potency of natural environments in evoking the sublime - characterized by a blend of vastness and fear, due to an inherent sense of potential existential threat – when compared to an art-based scenario that provided a more controlled, safer experience. This observation is consistent with earlier results from Chirico et al. (2018), in which a high snow mountains stimulus, while highly effective at eliciting awe, also induced significant negative effects due to fear. Similarly, He et al. (2024) reported that the vastness of virtual elements such as the moon, huge waves, and intense interplay of sound can convey terror, aligning with Burke's (1767) concept of the sublime, where perceived danger is a crucial factor.

Another important dimension to here emphasize is related to environment design itself, and how the experience of space plays a vital role in fostering sensations of the sublime and awe. Rauhoeft et al. (2015) revealed that that visual access to expansive vistas is a key determinant in the perception of vastness. Complementing these findings, Han et al. (2024) found that large environments were specifically associated with heightened awe, reinforcing the notion that exposure to unusually expansive spaces (reminiscent of cathedrals, large conference halls, or auditoriums) can evoke a profound sense of awe. Similarly, Chirico et al. (2018) demonstrated that neutral environments (with a circular navigation path) elicited a form of disorientation and monotony, whereas a scene depicting a vast panorama near a cliff evoked a kind of disorientation based on the perception of awe, danger and fascination, thus further constructing upon Burke's ideas (Chirico et al., 2018).

Most interestingly, one of this study's environment featured high snow mountains that were enclosed by high stones that obstructed the view for the user. However, by following the path of stones, one is presented with a beautiful and unexpected panorama of the snow-capped picks that causes a heightened sense of awe (Chirico et al., 2018). In the same study, researchers introduced a forest environment with a similar path design that guided the user to a waterfall hidden behind the trees, and which was assimilated as a special case of surprise (Chirico et al., 2018).

A parallel study by Otsubo et al. (2024) suggested two things: that the embodied quality of a first-person perspective intensified the profoundness of awe, and, most curiously, that the design of a path that begins with an enclosed construction which (almost in a narrative way) progressively evolves into a greater openness until a kind of *grand revelation* of a vast environment, presents itself as a quite rich awe-inducing factor (Chirico et al., 2018; Otsubo et al., 2024). This suggests that dramatic spatial changes can, indeed, intensify awe responses. In fact, this valence of surprise seems also pivotal in the dimension of need for accommodation.

Key Reflexive Elements of Awe: Need for Accommodation

Concerning the second dimension of awe proposed by Keltner and Haidt (2003) and Kant (1790), the need for accommodation valence is, indeed, characterized by a prominent influence of cognition on an effort to adapt

the current mental schemata of oneself according to the incoming stimuli: to unknown information.

The nature of the stimuli is, however, quite different from the verified in perceptual vastness (Otsubo et al., 2024). Feelings of enlightenment, for example, were registered in He et al. (2024) as a way to foster awe. In fact, the own medium of VR could be a factor that demands need for accommodation, thanks to its particular phenomenological affordances and its ability to disregard the constraints of our empirical reality - namely, the laws of everyday logic (Gaggioli, 2016).

However, need for accommodation can be an especially hard aspect to work upon, due to factors such as exaggerated increment of information - like when the level of terror is too high (He et al., 2024) - or when there's a repetition of exposure to the same awe inducing stimulus, which leads to a decrease on novelty and need for accommodation (Ochadleus et al., 2023). Nevertheless, awe differentiates itself from other knowledge emotions like curiosity and wonder (McPhetres, 2019), being related to much more grandiose experiences and affordances.

In this context, paradoxical elements emerge as a key strategy. For instance, Chirico et al. (2018) point out that VR's capacity to simulate paradoxical phenomena is instrumental in generating the need for cognitive accommodation. This finding is reinforced by subsequent work (Chirico et al., 2024), which observed that the more a VR scenario departs from real-world equivalence, the greater the sense of awe experienced by participants. In parallel, Lin et al. (2024) report that participants found supernatural awe content to be more enjoyable, arousing, and suspenseful than natural stimuli. Urban and Bossaller (2024) further elaborate on this by showing that environments imbued with uncanny characteristics - for example, a forest with bent trees - create a larger knowledge gap, thereby intensifying the experience of awe. The underlying principle is that paradoxicality implies an inherent impossibility, thus disrupting existing mental schemata with phenomena that defy straightforward cognitive processing.

This disruption is achieved through the introduction of fantastic, unreal, and magical elements, almost as a form of theophany. Adam and Frewen (2024) illustrate this with examples such as a dark sphere encircled by planets (evoking the imagery of a black hole), spirit animals, or the ability to write words in mid-air, which successfully fostered awe and mystical experiences in users. Particularly, Urban (2022) emphasizes that incorporating fantastical elements is crucial for evoking awe in VR environments.

A prime example of this approach is demonstrated in *Awedyssey*, by Miller et al. (2023). This experience is designed to progressively intensify surrealism: starting in a dark environment lit by a campfire, users witness shape-shifting clouds that transform into animal forms, experience the overwhelming presence of Mars as it grazes the atmosphere, and eventually undergo a journey that lifts them from Earth into space. This narrative, structured in progressive layers of surreal events, challenges established mental models, thereby mandating a deep cognitive accommodation and evoking powerful feelings of awe and the sublime. Liu et al. (2022) crafted an environmental narrative that takes participants on a similar transformative

journey. Quesnel and Riecke (2018) tested design factors that leverage "magical realism": a deliberate violation of real-world expectations in order to foster curiosity, imaginative immersion, and a suspension of disbelief.

Figure 1: Images retrieved from the experience of *Awedyssey* by Miller et al. (2023).

These experiences are intimately linked with the idea of obscurity as introduced by Keltner and Haidt (2003) and Burke (1767): the difficulty our minds face when trying to fully grasp sublime phenomena, thus demanding continuous cognitive engagement and re-interpretation of these uncanny elements. Here, the integration of symbolic/metaphoric elements appears particularly potent in capturing the dimensions of obscurity. Ito et al. (2024) and Collar and Eve (2020) provide compelling examples of VR-mediated ritualistic journeys (whether through a sacralised pilgrimage or a mountaintop sacrificial rite, respectively) that evoke powerful feelings of awe, humility, and reverence. These symbolic atmospheres are often challenging to replicate in the physical world, thereby underscoring VR's unique potential in redefining the boundaries of transformative experience design.

Additionally, the analysed studies reveal an ambivalent paradigm between agency and contemplation in eliciting sublime VR experiences. For instance, Quesnel and Riecke (2017) demonstrated with an interactive flying demo that VR can induce awe. Miller et al. (2023) further integrated gaze-based interactions to study this. Glowacki et al. (2020) had participants adopt a "mudra pose" to generate light, reinforcing bodily engagement. Fauville et al. (2024) found that a lack of interactive agency disrupted the feeling of presence. In Quesnel and Riecke (2018), a balance was struck between agency and a guided narrative, thus allowing free exploration of the environment while maintaining a structured storyline that fostered both active engagement and reflective immersion.

However, Chirico et al. (2018) suggested that while interactivity enhances bodily presence, it may also introduce a degree of uncertainty that may detract from the experience of awe. Similar views are presented in Kahn and Cargile (2021) and Liu et al. (2022), where the latter developed a "HeadJoystick" interface that offered an embodied flying experience aimed at increasing users' sense of control and freedom. Paradoxically, this heightened agency reduced the intensity of awe when compared to a standard hand controller, which promoted a more peaceful and contemplative state. This finding resonates with Keltner and Haidt's (2003) and Burke's (1767) arguments on awe being elicited by feelings of powerlessness. Indeed, Miller et al. (2023) highlighted that while some participants experienced the VR scenarios as meditative and contemplative, others craved greater freedom to explore, thus underscoring that interactivity should be considered within the broader experiential design and not in isolation.

DISCUSSION AND CONCLUSION

This section serves to draw up some reflections on the diverse topics covered so far, and to propose future developments from these.

Highlighted Elements

Deriving from this review's different findings, VR seems to be explored through its particular phenomenological affordances as a means to advance two fundamental dimensions of Transformative Experience Design: perceptual vastness and need for accommodation.

Concerning the first dimension of perceptual vastness (Keltner and Haidt, 2003), different properties stand out in the elicitation of the latter. Firstly, the typology of perceptual stimuli was mainly concealed between the representation of natural scenarios, and, most importantly, Earth's view from outer space. The latter is here deemed prototypical, since it presents a special potential to apply the Overview effect and the sense of small-self, two quite successful methods of eliciting awe experiences. Additionally, it was noted that environments that present an almost exaggeratedly extensive structure (Hao et al., 2024; Rauhoeft et al., 2015) are those that, according to the data, appear to have the best chance of fostering awe. However, and rather more interestingly, it has been revealed that the design of spaces and paths that present a dynamic and dramatic structure, which guides the user in a progressive opening up to the revelation of an incredibly extensive environment, is where the sensations of awe are most prevalent, particularly based on a feeling of surprise (Chirico et al., 2018; Otsubo et al., 2024). This opens up the possibility of using architectural elements and the dynamics of spaces to foster transformative experiences that explore the elicitation of awe and the sublime.

On the other hand, the more epistemic dimension of need for accommodation appears to be more complex to work with, predominantly due to the variety of factors and properties drawn from the different studies.

Nevertheless, it is aforethought that, indeed, the exploration of paradoxical, supernatural, uncanny elements represent the main way to

develop a need for accommodation, mainly focusing on disrupting the laws of reality (Gaggioli, 2016) which, therefore, begs for the accommodation of these abnormal stimuli within our current mental schemata. Thus, the use of fantastic and unreal elements finds fertile soil to then develop a magical experience that can make use of symbols, metaphors, gestures, ritualistic structures, mysterious and magnanimous elements in order to implement mystical and transformative experiences. Furthermore, the potential of VR as an interactive medium also opens up a deep perspective upon the fostering of sublime experiences, since it is not yet clear if the sense of either agency or contemplation, of powerfulness or powerlessness duly stimulates the theorized feeling of awe.

In this way, the different elicitors here listed and their respective impact on the cultivation of transformative experiences serve as preliminary ways to further develop this framework.

Reflections and Future Developments

A critical perspective on these results thus allows for the proposal of elements to be further explored in the future development of this theoretical current.

As a first step, the incorporation of areas such as architecture, spatial design and spatial phenomenology should be urged. The potential to create dramatic spatial design dynamics that successfully fostered sensations indicative of awe and the sublime was notable in these studies. Furthermore, narrative valences were barely explored in the studies analysed. In fact, it remains to be seen how the narrative has implications for the user's experience, particularly in terms of need for accommodation. Moreover, the issue of interaction during the experience is still prevalent, thus emphasizing the necessity to continue to assess this matter. For this, it is here proposed a special consideration of Burke's (1767) work in the creation of these interactions, namely through the introduction of somaesthetic dimensions (Shusterman, 2012) as catalysing elements of a truly corporeal transformation. Finally, the consideration of symbolic factors proves to be particularly suitable for fostering transformative experiences, specially from the philosophical perspective of Carl Jung (1971), Gaston Bachelard (1996) and Gilbert Durand (1964): where the symbol is seen as a basic element of imagination that encourages the infinite expansion of consciousness on the search for the multiple meanings it evokes, thus urging for a constant transcendental exercise based on a sense of mystery and obscurity (both effective elements to elicit a need for accommodation).

Thus, this study creates an appeal for what Glowacki et al. (2020) baptize as *numedelic* experiences: experiences that, based on VR's adequate embodied and phenomenological affordances, can stimulate a real transformation in the individual's body, mind and spirit through the theoretical and practical principles of the sublime, aiming, ultimately, to foster a greater sense of personal well-being.

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