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INVESTIGAÇÃO E ENSINO EM DESIGN E MÚSICA

INVESTIGACIÓN Y ENSEÑO EN DISEÑO Y MÚSICA

CHAPTER I

ARTIGO 4

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AESTHETIC ANALYSIS OF POST-HUMAN BODIES IN VIRTUAL REALITY PERFORMANCES

ABSTRACT

The development of new media technology provides a broader vision for the performing arts, and performance gradually begins to integrate with Virtual Reality (VR). The subjectivity of virtual reality performers, as human beings, becomes increasingly ambiguous, giving rise to diverse digital "post-human bodies." These post-human bodies, empowered bi-directionally from finite to infinite in virtual reality performances, generate artistic life with warmth and texture through reception, deconstruction, and reorganization. They create moments of creativity in the infinitely extended ambiance and establish an artistic atmosphere full of immersive sensations and aesthetic significance in the virtual space and time. This paper designs six forms of post human bodies. A total of 31 dancers were recruited in two rounds to experience wearing VR equipment. This study employs a qualitative research design to explore dancers' perceptions of experiencing post-human bodies in VR. In this process, it is more important to emphasize the connotation that the performance content brings to the audience, rather than focusing on the expansion of technology.

KEYWORDS
Virtual reality, Performance, Post-human, Virtual aesthetics.

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RESUMO

O desenvolvimento das novas tecnologias dos media proporciona uma visão mais ampla para as artes performativas, e a performance começa gradualmente a integrar-se na Realidade Virtual (RV). A subjetividade dos performers de realidade virtual, enquanto seres humanos, torna-se cada vez mais ambígua, dando origem a diversos “corpos pós-humanos” digitais. Estes corpos pós-humanos, potenciados bidirecionalmente do finito ao infinito em performances de realidade virtual, geram vida artística com calor e textura através da receção, desconstrução e reorganização. Criam momentos de criatividade no ambiente infinitamente extenso e estabelecem uma atmosfera artística repleta de sensações imersivas e significado estético no espaço e tempo virtuais. Este artigo projeta seis formas de corpos pós-humanos. Um total de 31 bailarinos foram recrutados em duas rondas para experimentar o uso de equipamento de RV. Este estudo emprega um desenho de investigação qualitativa para explorar as perceções dos bailarinos sobre a experiência dos corpos pós-humanos em RV. Neste processo, é mais importante enfatizar a conotação que o conteúdo da performance traz ao público, em vez de se focar na expansão da tecnologia.

PALAVRAS-CHAVE
Realidade virtual, Performance, Pós-humano, Estética virtual.

1. INTRODUCTION

"Virtual reality technology was born as early as 1968" (Negroponte, 2015). In 1981, Baudrillard systematically elaborated on the evolution of the concept of "simulacra" and its relationship with "reality" in Simulacra and Simulation. In the last decade of the twentieth century, computer technology has played an increasingly important role in theater, dance, and performance. New forms of drama and performance schools have emerged in interactive devices and the Internet. The virtual reality environment has provided the world with new live and interactive performance forms through the Internet (Dixon, 2015). With the rapid development of biology and information technology, humanity is becoming increasingly technological and technology is becoming more personalized. As the boundary between humans and virtual humans becomes increasingly blurred, human subjectivity becomes ambiguous, human existence becomes indistinguishable, and human superiority is challenged, "anthropocentrism" begins to take the stage of Western philosophy, opening up criticism of humanism and enlightenment ideas with different postures. We attempt to rethink the ancient philosophical proposition of how to be human under the premise of technological progress.

At this point, virtual reality performance and post-humanism unexpectedly collide, creating a variety of digital post bodies - whether it is a digitally reconstructed virtual human body or a digitally synthesized non-human body, the post-human body reflects the theoretical thinking of different dimensions of post-humanism through the simulation, mutation, fusion, symbiosis, regeneration (i.e., what Deleuze called "becoming"), disintegration and elimination of the human body (Zhang, 2020). In the current era where virtual digital aesthetics are becoming increasingly popular (Negroponte, 2015), it is worth considering whether post-humans can be highly saturated to represent performers in virtual reality performances. In this process, it is crucial to emphasize the impact of the performance content on the audience rather than focusing on technological advancements.

2. RELATED WORK

2.1. LIMITED TO INFINITE BIDIRECTIONAL EMPOWERMENT

The art of the digital replication era cannot be simply equated with the traditional paradigm of mechanical replication, and it fundamentally changes and subverts various essential characteristics of traditional art. It does indeed take replication as its life, but it undergoes endless changes in the process of replication. Davis discussed in "Art in the Digital Reproduction Era" (Davis, 1995) that digital signals can not only be infinitely replicated without distortion, but also undergo infinite changes. Virtual reality performances do indeed place greater emphasis on stronger creativity in the process of interaction and dissemination, fundamentally violating various artificially set categories, levels, and even standards of quality for performers. This makes performing arts increasingly diverse, vivid, and flexible.

In virtual reality performances, post-humans break free from the constraints of various traditional frameworks and are demonstrating inexhaustible vitality. Future Circus: A Performer Guided Mixed Reality Performance Art (Huang et. al, 2015) interacts and co-performs with the animals in the circus, symbolizing the

relationship between human and animal control and being controlled. During this process, the performer's physical sensitivity, perception, and presence in the world transform individuals from biological beings to cultural beings, and the symbol represented by "post-human" appears. In a sense, the world is a symbolic expression from its starting point, and the essence of expression is symbolic encoding. In other words, the world is a symbolic world, where symbolization explains the meaning of perception and is the fundamental way for humans to respond to experience. Therefore, some scholars have proposed that the world is composed of symbols (meaningful things that can be understood by us) and latent symbols (things that need to be understood by us) (Liu, 2019). In virtual reality performances, performers are things that we can understand, and the potential information brought by post-humans needs to be understood by us. It is precisely this uncertainty and metaphor that allows artistic power to display ultimate freedom.

However, even in the absence of a distinction between prototype and copy, there still exists a binary differentiation, the visible realization (performing) and the invisible digital code (Jiang, 2022). Drawing on Sean Cubitt's insightful summary, it is simultaneously "code" and "image." Therefore, in virtual reality, the visible images of performers continue to proliferate and change through repetition, but beneath this diverse and ever-changing surface, the invisible code and even algorithms remain constant and unified. Stacy Hsueh and her team first created five virtual post-human forms for performers (Hsueh et. al, 2019). By manipulating parameters on the chosen visualization or changing to an entirely new visualization, they disrupted the dancers' movement patterns. Real-time data parameter adjustments made the finite post-human forms countless in number. It replaced the binary opposition between authenticity and mechanical reproduction, as described by Walter Benjamin, with a binary relationship between the "one" of code and the "many" of the image (Hsueh et. al, 2019). It can be said that the "many" is the "expression" of the "one," and the "one" is "immanent" within the "many," realizing bidirectional empowerment from finite to infinite.

2.2. RECEIVING,DECONSTRUCTING, AND REORGANIZING THE HUMAN BODY

In virtual reality performances, the invisible code is not merely a restricted form or structure; it possesses generative and expressive qualities. If seen only as a form, it becomes relatively fixed and imposes limitations and constraints on different specific situations and images. The post-human body, as a crucial component, can manifest various usages and operations in different performance time-space contexts, displaying diverse forms and experiences (Davis, 1995). This capability stems from the understanding that a string of code is not merely an abstract and hollow set of digits; it inherently harbors endless generative possibilities (Hsueh, Alaoui & Mackay, 2019). Yet, how can this post-human entity, being a virtual creation, be compared to the vibrant and lively forms of life? How can it generate artistic life with warmth and texture?

The essence of humanity lies in the combination, reconstruction, and inscription of the genetic code. Therefore, it is entirely possible to interpret, simulate, and propel the mechanisms of life creation from the perspective of code (Jiang, 2022). Therefore, in virtual reality performances, the post-human body is presented to the audience through three stages: receiving, deconstruction, and reorganization.

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Receiving: The medium of reception is motion capture, which essentially involves measuring, tracking, and recording the movement trajectory of objects in three-dimensional space. In the study by Movement Qualities and others (Fdili Alaoui et. al, 2017). They combined multimodal data from position (motion capture), dynamics (inertial sensors), and physiological information (electromyography) and designed a multimodal capture and recognition method. Through experiments, they demonstrated that motion data received through multimodal means can enable performers to more fully express their body language.

Deconstructing: Deconstructing the behavior itself implies that the splitting and reorganization of the original elements of art or sentences have unique value (Davis, 1995). It involves breaking down the performer in virtual space into different, relatively independent parts, and then combining and weaving them into the post-human body at various levels and dimensions. The depth of virtual reality performances is both spatial and temporal.

Stephan Jurgens and his team conducted a study on the 4D visual effects experience in a VR Dance installation called BlackBox. In this VR project, there were a total of seven levels. In the first level, dancers could explore and improvise in virtual space. Due to the fourth dimension (time) in the 3D environment, their movement trajectories could exist in the form of pattern elements, visualized in colored graphic shapes. This was done in combination with solid geometry and particle systems, hinting at the characteristic of time-space persistence in virtual reality (Jürgens, Fernandes & Kuffner, 2020). Here, borrowing Cu-bitt's summary might be apt: The freedom of these works lies in their ephemeral temporality, constantly blossoming and shattering like bubbles, giving rise to emergent unknown futures through operations on accumulated data from the past (Jiang, 2022). In this system, the movement trajectories of actions can be transformed into visualized visual information, allowing the experience to intuitively observe the size, direction, and spatial positions of the movement trajectories. The expressive nature of post-human body language is recorded in a graphical form, breaking down dynamic movements into visualized effects for presentation.

In virtual reality performances, the temporal depth of the post-human is frozen in space. In the research of BlackBox at the second level, examples of embedded photography capturing selected moments of VR improvisation are presented. Two photography techniques were employed: high-speed photography or burst photography and stereoscopic photography. The high-speed photography sequence simultaneously displays all stages of movement. Individuals can walk around the image sculpture and experience the spatial acrobatics of the dancer's movements (Jürgens, Fernandes & Kuffner, 2020). Amidst the endless motions of gathering and dispersing, the post-human body still highlights a unique temporal aspect. In the aesthetics of virtual reality performance, time is no longer a linear process but has transformed into a crystalline structure with multidimensional and multilayered interwoven existence.

Reorganizing: According to Kant's philosophical ideas, space and time are effective only when applied to perceived things, representations, or phenomena. When applied to things in themselves or objects independent of our perception, they become ineffective, and we cannot use them beyond the world of experience. Virtual reality, based on the foundation of the empirical

world, extends and stretches real space and time in multiple ways. In virtual reality, space and time are retraced, allowing instantaneous leaps across the past, present, and future. This provides individuals with parallel, diverse experiences of identity and temporal-spatial encounters (Xiang, Tao & Shenyang, 2020). In the deconstructed virtual reality performance, the post-human body continually accumulates, interpenetrates, and transforms across time and space, forming the fundamental temporal premise for the realization of any present and the creation of the future. This allows for the reorganization and nurturing of the profound and vast creative source of the post-human.

Microscopic sensations form a sensory environment with a topological morphology (Wang, 2020). In virtual reality performance, the post-human can infuse microscopic movement languages into high-intensity, threshold-based bodily experiences and sensory memories. It is a bodily foundation that extends beyond mere materiality. This fractured yet intertwined existence serves as the basis for breaking the boundaries of everyday bodily habits in the performance setting (Duan, 2017). For example, in the works of Robin Otterbein et al. (Otterbein et. al, 2022), the virtual reality performance system consists of visual and auditory components. The visual system is determined by three parts. Firstly, a particle system where the performer's movements control the quantity, size, and color of particles. Secondly, a 3D sphere that supports interaction between particles and the sphere's boundary, with relevant parameters including radius, position, and direction. Thirdly, there is a physical system composed of the forces of attraction and gravity determining particle behavior. Performers can also alter the parameters associated with sound particles, such as density, length, and speed, thereby modifying the sound environment. The visual system and sound engine create a shared ecosystem by mutually influencing each other through these two systems. Different visual and auditory elements make the performance's themes, images, and rhythms resonate with each other. The post-human awakens viewers to adapt and contemplate during the fragmented and intricate viewing process, invoking various senses and experiencing the enchanting performance of sensory reorganization. This creates a multi-sensory aesthetic perception.

Therefore, it can be said that virtual reality performances redesign the "sensory ratios" of humans, thereby altering human perceptual structures. Marshall McLuhan, starting from the famous proposition that "all media are extensions of man," (Zhang & Xie, 2022) suggests that different media affect different senses. The integration of technology with the brain and body will enhance, improve, and transcend biological limitations, leading humanity to a 'super-human' state (Li & Wang, 2020). The artistic forms, existence, and modes of communication by post-humans have undergone a comprehensive extension and integration. Created collaboratively by Swiss choreographer Gilles Jobin and the Artanim team, "Immersive VR Dance Journey – VR_I" enables performers to truly immerse themselves in a VR environment, capturing the real-time body language of the participants. They can see each other's post-human bodies in VR and interact with them. Upon entering VR, they may witness several towering dancers above them, while they themselves become diminutive figures, with smaller figures dancing beneath their feet. Breaking free from the constraints of traditional performer bodies, the virtual reality performance of post-humans shifts aesthetic focus from the body itself to perceptual dimensions beyond the body. In this process, it activates and develops the full-body strength of post-human bodies, achieving a state of super-physiological immersive experience.

2.3. EXTENDED ATMOSPHERE

As Davis sees it, the Internet and its associated technological innovations, rather than denying our creative potential, have opened the era of post-originality. When each of us can freely endow ambiance, concepts related to the original and its mechanical reproduction can be thrown into the trash bin of history (Davis, 1995). "Distance" is an important factor in the realization of aesthetic experiences and a classic proposition in aesthetic studies. Due to continuous technological iterations, people can appreciate performances from thousands of miles away. The contradiction of distance in virtual reality performances can bring about aesthetics. Post-humans, through remote connections, can provide the audience with a sense of connection to the virtual performance environment, thereby extending ambiance across space. Three resident circus artists in Vancouver, Sidonie Adamson, Cameron Fraser, and Kasha Konaka, achieved a virtual reality remote connection performance through performance capture facilities (Tétreault, (n.d.)). This form of performance overcomes the barriers of spatial and temporal art, allowing people in distant locations to experience the sensation of "being there" at the scene.

We convey the vibrant ambiance of virtual reality performances through post-human expressions and further expand the extended ambiance limitlessly through remote means. This enhances the viewing experience with high degrees of freedom, breaking the constraints of "a specific time and place" and incorporating a broader world into the "here and now" of the "live" experience (Duan, 2017). We may find it difficult to distinguish between the present and the past, here and there, reality and artifice, original and modified. However, the ambiance is here; it lies not within the things themselves, but within that creative moment when we observe, listen, read, repeat, and modify (Wartenberg, 2023).

3. DESIGN

Research question: To understand the impact of post-human bodies in virtual reality performances we designed six virtual avatars (see Fig. 1), and invited a total of 31 dancers (see Fig. 2) to wear VR headsets for improvisational performances (not every individual experienced all six avatars). Subsequently, interviews were conducted.

3.1. POST-HUMAN BODIES

The Cartoon Character (CC) (see Fig. 1A), which distinguish the gender of men and women, because the dancers are Chinese, so the image of the cartoon character is Asian image. Dancers can choose the gender of their model while experiencing the dance.

The Particle Avatar (PA) (see Fig. 1B), which is based on the human form, creating a particle effect. The entire body is composed of blue and white particles. As the dancer performs, the particles form brief motion trajectories in response to the dancer's movements.

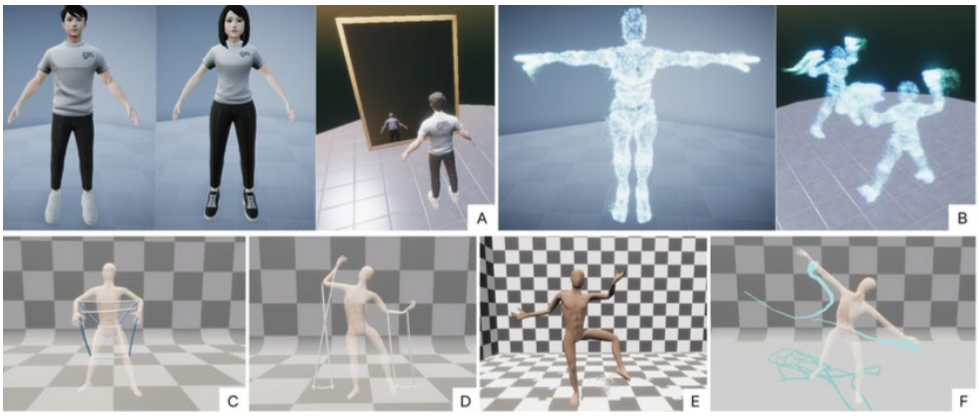

Fig. 1. NA dancer experiences six types of immersive visual feedback: (A) Cartoon Character (CC); (B) Particle Avatar (PA); (C) Body Joint Space (BJS); (D) Body Floor Space (BFS); (E) Penetrating Space (PS); (F) Trails Space (TS).

The Body Joint Space (BJS) (see Fig. 1C), which consists of 12 elastic wires connecting the joints of the left and right wrist, elbow, crotch, and knee joints, reflecting the spatial connection between the dancers' joints. To help dancers visualize the space formed by the joints more clearly, we made the model of the figure semi-transparent. We use this feature to enable the dancer to visualize the relationship between the joint spaces within the body and to experience the changes in the joint space.

The Body Floor Space (BFS) (see Fig. 1D), which consists of eight elastic lines connecting the wrist and elbow joints to four fixed points on the floor. Each side's joints are connected in pairs, reflecting the correlation between the dancer's movements and the ground. A semi-transparent figure model is employed to aid the dancer in visualizing the spatial relationship between the body and the floor.

The Penetrating Space (PS) (see Fig. 1E), which consists of an opaque virtual image of the dancer in a real form, and a water surface with real physical feedback, so that the water surface will splash when the dancer kicks or slaps the water surface with her feet or hands. This characteristic assists the dancer in sensing particular body surfaces and in guiding the penetration of space.

The Trails Space (TS) (see Fig. 1F), in which the virtual body can be composed of a floating belt bound to the wrist joint to record the trajectory of the movement for nearly one second, and a line that constantly records the trajectory of the right ankle joint. This attribute vividly illustrates the movement path through two distinct methods of extending the limbs, enabling the dancer to experience TS in various ways.

Fig. 2. The dancers' experience.

4. DISCUSSION

Among 31 participants (see Fig. 2), 19 experienced CC and PA, with 17 preferring PA and 2 preferring CC. Additionally, 13 participants experienced BJS, BFS, PS, and TS, with 2 preferring BFS, 3 preferring PS, 8 preferring TS, and none preferring BJS.

The Illusion of Abstraction: In the CC and PA, 89% of dancers show a preference for abstract embodiments. This preference stems from the visually captivating nature of abstraction, which leads dancers to experience unexpected effects in their dance creations, thereby enhancing their subjective perception of performance. The perceived improvement in visual fluency also contributes to a sense of smoother movement. Within the PA framework, dancers tend to favor movements involving the arms and larger ranges of motion. Abstract embodiments provide dancers with a conceptual understanding of time and space, enabling them to create more aesthetically pleasing movements.

Boundaries as Motivation: In the BJS and BFS, participants actively explore the use of large-scale movements to break free from the constraints of the framework, creating many innovative movements and thereby gaining new insights into body control and movement tension in dance. "In the process of confinement and liberation, I repeatedly try to overcome the restrictions of the rope. In the end, the confinement of the body is not an obstacle, but rather a motivating factor." "When my hands are bound to the virtual image by ropes, I perceive an expansion sensation in my chest and arms, which has sparked a deeper focus on my muscles and movements."

Idealization of Props: Many dancers unanimously believe that the idealized props used in the experiment provide greater freedom and creativity in the choreographic experience. For example, in the PS, "the underwater scene is very novel, something I usually wouldn't have the opportunity to dance in." In the BFS, one dancer expressed initial concerns about the ropes tangling during movement, but later found that this did not happen. This design, which deviates from real physical constraints, made her experience very enjoyable.

Visualization of Movement Path in Time: In the TS, many dancers create fluid lines in space through improvisational movements, constantly adjusting their body postures for improvisational creation. By improvising movements with their hands and feet, dancers delicately delineate the trajectories between them, visualizing the movement path's trace and guiding the movement of the whole body. For dancers, this visualization of movement path in time is crucial, so they try to increase the pace and perform multiple movements to better experience the visualization of movement paths presented in the virtual environment. However, due to limitations in the presentation of movement paths, some participants have suggested improvements. Some dancers suggest deleting some movement paths after a certain period, as too many movement paths can interfere with the clarity of the dance environment. Others suggest distinguishing the colors of movement paths by time sequence or adding more visual effects, such as flashes and streamlines, to better differentiate the visualization effects of movement paths at different time points.

Novel Perspectives: Many dancers express that compared to traditional grasp of movement details and their correlation with visual effects, thus enriching the possibilities of dance creation. "Watching my movements from a god-like perspective, I can more accurately grasp the rhythm and intensity of the movements"; "There is a certain difference in movement between the virtual embodiment and myself, which gives me the feeling of dancing with a partner"; "Digital dance creation provides me with a completely new perspective, allowing me to understand how to choreograph dance movements when movement and visual effects are combined."

5. CONCLUSION

In virtual aesthetics, the primary emphasis is on the beauty derived from technological logic, and as far as aesthetic theory is concerned, "in reality, form and content cannot be neglected" (Zong, 2017). While affirming the technological achievements in the aesthetic practice of virtual reality performance, it is crucial to emphasize the inherent attributes it carries. Balancing the richness and profundity of content implications is essential, to avoiding the unilateral expansion of technological rationality. This prevents overshadowing the subtle signals in artistic expression with excessive emphasis on technology (Negroponte, 2015). At the same time, there should be a clearer cognitive understanding of the post- human aspects of the performance. It is essential to fully unleash subjective agency, making effective use of virtual space to serve real-world needs (Wang & He, 2021).

This study explores the design of six post-human bodies in a virtual reality environment, involving the receiving, deconstruction, and reorganization of the human body, and invites dancers to experience these bodies for movement creation. The findings indicate that virtual dance creation provides dancers with a new perspective, enhancing their understanding of movement details and visual effects, thereby broadening the pos sibilities of dance performance. Dancers can adjust their postures in real-time based on visual feedback, enhancing their muscle awareness and control over rhythm and strength. However, interviews reveal challenges such as a potential disconnection from the actual dance environment, which can reduce the realism of the performance despite the innovative perspectives offered by the technology. Regardless of how post-human entities manifest in virtual reality, individuals often find themselves entangled in the complexity of their bodies, leading to challenges in self-identity recognition (Zhang, 2020).

Certainly, "the purpose of exploring digital art is not to confirm the 'existing' but to facilitate the formation of the 'yet nonexistent.' This 'yet nonexistent' serves as the foundation for the future and already exists in the present" (Cubitt, 2016). Therefore, in the construction process of virtual reality performance systems, it is necessary to both conform to the trends of artistic and aesthetic practices in the context of the entire media landscape, adapt to the present circumstances, respond timely; and critically examine and reflect on the theoretical heights and macro perspectives, addressing the drawbacks and contradictions in virtual aesthetics. Through continuous responses and solutions to real- world issues, it is possible to genuinely promote the healthy development of aesthetic practices and the effective advancement of aesthetic research. Only then can the artistic form of post-humans in virtual reality performances have its unique practices and development.

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O primeiro volume da coleção Convergências Research Books, foi publicado em 2017 com o título "Investigação e Ensino em Design e Música", que resultou do 5º EIMAD - Encontro de Investigação em Música, Artes e Design, a primeira edição com *Double-blind peer review*.

No mesmo sentido, em 2024 o livro "Investigação e Ensino em Design e Música", Volume IV, resulta dos artigos curtos aprovados em *Double-blind peer review* e apresentados no 9º EIMAD - Encontro de Investigação em Música, Artes e Design.

The Convergências Research Books editorial project is a collection of books on research in the areas of Design and Music, which result from conferences, editors or open calls for papers, requiring Double-blind peer review.

It is part of Edições IPCB and is associated with Convergências - Journal of Research and Teaching of the Arts, with which it shares the name, although they constitute two autonomous editorial projects. The first volume of the Convergências Research Books collection was published in 2017 with the title "Research and Teaching in Design and Music", which resulted from the 5th EIMAD - Research Meeting in Music, Arts and Design, the first edition with Double-blind peer review.

In the same sense, in 2024 the book "Research and Teaching in Design and Music", Volume IV, is the result of short articles approved in Double-blind peer review and presented at the 9th EIMAD - Research Meeting in Music, Arts and Design.