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NEUROCOMMUNICATION AND STAGING. THE LANGUAGE OF DANCE. A CONCEPTUAL REVIEW

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ABSTRACT

Introduction: This research connects Neurocommunication with the performative framework of dance. Using dance as the primary form of expression, this study also considers the role of lighting, sound/music, and aesthetic elements, such as costumes and scenography, in creating signs and meanings. **Methodology:** To achieve this, the authors conducted a bibliographic and conceptual review of neurocommunication as applied to live performance audiences. The review aimed to identify communicative elements from the perspective of nervous system functioning. The authors used Jakobson's communication model as a reference. **Results:** Despite the stylistic variations within the genre, it was possible to establish a dialogue between communication, neurocommunication, and the representation of a live dance performance, with a focus on the audience. Through this exploration, the main neural networks activated in the audience during such events were identified. **Discussion and Conclusions:** Due to the multitude of signs used to convey its message, the staging of dance constitutes a comprehensive communicative act (choreography, sound/music, lighting, scenography, and costumes). At the same time, dance is a

complex communication system because its abstract nature primarily impacts subcortical structures, influencing the most sensory and corporeal aspects of the organism.

Keywords: Neurocommunication; staging; body language; Jakobson's model of communication; stage signs; nonverbal communication signs; neural networks in the audience.

1. INTRODUCTION

In the last two decades, the general interest in the functioning of the brain has led neuroscience to extend its axons towards other epistemological areas, creating an endless number of networks identifiable by their prefix "neuro" (neurodance, neuromusic, neuropsychology, neuromarketing...), connected to each other to continue enriching the mother ship of neuroscience.

Within all these fields, there is neurocommunication, which embraces the communicative act by taking the nervous system into account. This approach can be very enriching since how the brain functions is a determining factor in how people think, feel, act, and express themselves. Therefore, knowledge of this relationship with communication is essential to understanding its deepest aspects (Urbina, 2023).

Although each human being is unique and unrepeatable, their physiological nature, the general structure of the brain and its electrochemical functioning are similar. Therefore, it is possible to take an objective approach to the functioning of neural systems. However, what sets individuals apart is their cultural environment (Lewis-Williams et al., 2016). In this study, the focus will be on what unifies humans and enables communication, setting aside what differentiates them (cultural environment).

When focusing on what human beings have in common, communication emerges as a central tool for life in society. It can be understood as a web of interactions in which people construct and share meanings about themselves, others, and their environment (Rizo, 2022). Some authors argue that all behavior is an act of communication, regardless of whether the sender intended to send the message or the receiver intended to receive it (Egolf, 2012).

In the case of staging, the sender does intend to send the message, but what the receiver receives does not always connect or is understood. This is due to the characteristics of the poetic message of the stage and the abstract language that dance entails. Therefore, glimpsing the concepts of neurocommunication applied to the audience can be useful for the creators of this type of art.

According to Egolf's (2012) contributions, the world communicates with the brain and the brain is affected by messages from the world. That is, all messages from the world go to the brain, and all responses to those messages come from the brain. The main element that enables such a web of interactions is the nervous system. Thanks to proprioception and interoception, people are aware of themselves; thanks to perception and the senses, people are aware of others and their environment and they are able to interact with them.

Taking into account the number of people involved, communication can be categorized as intrapersonal (e.g., thinking, dreaming, problem solving, and fantasizing), interpersonal (between two individuals), in a small group, or public speaking (e.g., a speaker addressing an audience). Media communication is another category (Egolf, 2021).

If communication is categorized by message, it can be divided into two major groups: verbal and nonverbal. In this case, nonverbal communication is used in dance as well as in the other communication tools involved in staging.

Messages in nonverbal communication are conveyed through internal and external body movements, the use of time and space, and the use of objects or other sensory elements. Although nonverbal communication lacks a codified system or set of rules for conveying messages, it uses signs or symbols. Therefore, it can be concluded that dance's scenic language is nonverbal (Egolf, 2012).

The main instrument of dance, creator of signs and symbols, is the body. Not only in dance, but also in the act of communicating with the world, the body is the main discursive vehicle, with which one constructs and gives meaning to everything around oneself. However, the body does not belong only to the order of the individual, but is also a social and cultural construction that reflects the environment in which it inhabits (Rizo, 2022). It is from this collective bodily midset that the public translates the visual signs of the spectacle.

Both semiology and semiotics study sign systems. When applied to the world of theater, Pavis (1998) points out that theatrical semiotics is a method of analyzing text (in this case, choreography) and/or representation. This method takes into account form, dynamics, and the signification process established by theater and dance professionals and the audience.

The main objective of this work is to establish a dialogue between the sciences (communication and neuroscience) and the arts (dance and theater). To achieve this, the first step is to conduct a bibliographic review of concepts from a general perspective. This will lay the groundwork for future research delving into the most relevant and enriching aspects of both fields.

Communication and the performing arts have always had many things in common, including the human being as both sender and receiver of messages. If there is one thing all humans share, it is our biological constitution. Therefore, based on this epistemological trigonometry, the focus is on communication, neuroscience, and performing arts.

2. OBJECTIVES

The main objective is to identify the sources that collect the aforementioned terms. Then, once this literature has been analyzed, the aim is to be able to discover the relationships between concepts and to delve specifically into the main neural networks that are activated in the audience when attending the performance of a live dance show. From this objective, the following specific objectives are proposed:

O1: To identify the main scientific contributions that relate neuroscience to the performing arts.

O2: To identify the signs of non-verbal communication that are manifested in the performance and the communicative elements present in the staging of a dance piece.

O3: Establish a dialogue between the fields of neurocommunication and the art of dance to integrate scientific codes in the reception of artistic language.

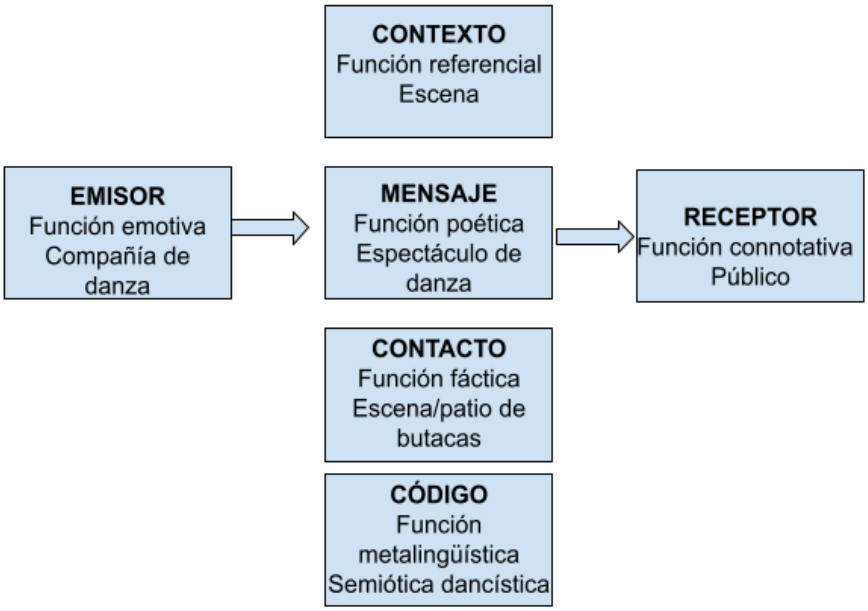
3. METHODOLOGY

For this study, a bibliographic review was conducted on neurocommunication and body communication concepts to apply them to the staging of a dance piece. To accomplish this, the focus was placed on key issues of body communication, such as perception, attention, memory, emotion, and the body itself. Additionally, the scenic languages were approached as communicative codes, with dance as the primary focus and music, lighting, scenery, and costumes as elements that enhance its message.

The language of dance communicates through a system of signs different from verbal communication, transforming everything on stage into a semiotic process in which each movement, action, gesture or visual composition carries meaning. To link semiotics and dance, communication is referenced using Jakobson's (1975) simple model of communication, which can be applied to stage language.

Figure 1.

Jakobson's communication model applied to scenic communication.



Source: Elaborated by the authors based on Jakobson's communication model.

Following the stages of Icart and Canela (1998), a conceptual bibliographic review is proposed in the first phase, based on a bibliographic search with three criteria (Guirao-Goris et al., 2008):

1. Search engines and scientific databases: Google Scholar, ResearchGate, Elsevier, Redalyc and Dialnet.

2. Search strategies: choice of descriptors related to the object of study and combinations of terms in Spanish and English: "neurocomunicación" (neurocommunication), "semiótica de la danza" (semiotics of dance), "modelos de comunicación" (communication models), "cuerpo y comunicación" (body and communication), "puesta en escena" (staging), "danza como lenguaje" (dance as language), "signos escénicos" (scenic signs) and "espectáculo" (performance).

3. Selection criteria:

Inclusion criteria: peer-reviewed articles, book chapters and doctoral dissertations from the field of neuroscience, communication, psychology and performing arts, all being open access.

Exclusion criteria: the terms "sports neuroscience" or "marketing communication" as well as studies related to clinical psychology or music education are excluded.

Dates: sources from the last 15 years related to neuroscience have been prioritized, as well as classic bibliography that include certain classic concepts related to the performing arts and that are still valid today.

In a second phase, and also due to the scarcity of previous empirical and experimental studies, the search was complemented with *Communication Source.* This database offers a greater coverage of international articles in the fields of communication, linguistics, rhetoric and public speaking and other relevant areas that fit the subject of this study.

As for the inclusion criteria, a search for articles and scholarly publications published at any date is performed, since previous attempts to limit the search date yielded no results. Using the Boolean operators of the search engine and after making multiple combinations of different words, the terms finally chosen are: neuro* AND performing arts AND dance. Truncation (neuro*), allows to further broaden the search.

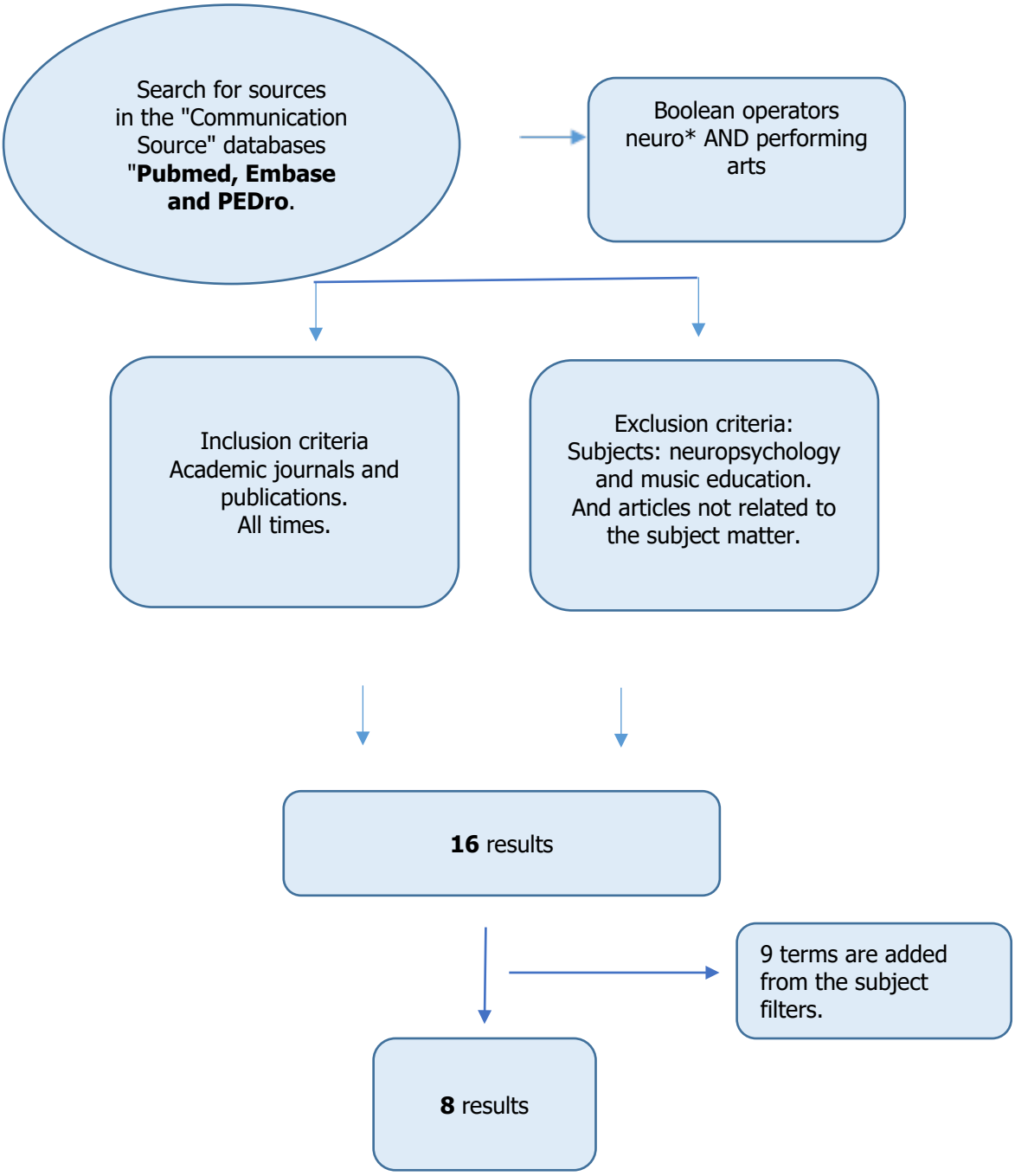
To further refine the selection of articles, other filters were selected from the subject sections and the thesaurus present in the database: *performing arts, singing, ballet, communications research, entertainers, facial expression, music & language, narratives, nonverbal communication.*

In addition, the "ampliadores" (expanders) and "opciones de búsqueda" (search options) provided by the platform itself were kept active: related words and equivalent subjects.

The search itinerary is shown in the following diagram:

Figure 2.

Flowchart.



Source: Elaborated by the authors.

4. CONCEPTUAL REVIEW AND RESULTS

Once the most useful results have been selected, a critical reading is made and the most relevant points for the research are extracted. The two tables presented below relate the fields of neurocommunication and staging and mark the itinerary for conceptualization:

Table 1.

Elements of communication and neurocommunication.

COMMUNICATION AND NEUROCOMMUNICATION	
Types of communication (Egolf, 2012)	Intrapersonal
	Interpersonal
	Public domain
Categories of nonverbal communication (Egolf, 2012)	Vital signs
	Organisms signs
	Cosmetic signs
	Costumes
	Haptic signs/touch
	Kinetic (body movements and posture)
	Personal signs (facial expressions)
	Ocular signs (eyes in communication) Vocal signs
Jankovic and Bogaerts (2021)	Personality and Intelligence
	Use of time
	Proxemics (referring to space)
Neural networks	Perception
	Mirror Neurons
	Default Neural Network
	Sapience Network
	Attentional Network
	Limbic Network
	Multimodal integration network
	Memory Network
Whiting Frank M. (1957)	Mental and emotional maturity

COMMUNICATION AND NEUROCOMMUNICATION	
Cuesta (2021)	Behavior, emotion and cognition

Source: Elaborated by the authors.

Table 2.

Elements of staging.

STAGING		
Genre	Dance	
Scenic neurocommunication channels	Body language	
	Music	
	Lighting	
	Scenography	
	Costumes.	
Semiotics of dance	Visual signs	Movements
		Gestures/ expressions
		Actions
		Visual composition
		Scenography
		Costumes, make-up, hairstyle
		Lighting
	Auditory signs	Music, noises, acoustic settings
		Sounds emitted by the dancer's effort
		Sounds produced by the dancer's contact with other surfaces (floor, other partners, structures...)

Source: Elaborated by the authors.

Both guides give an overview of the neurocommunicative tools in the scenic language of dance without delving into the creative process or analyzing any specific piece.

The following table shows the classification of the articles obtained in the second phase of the search:

Table 3.

List of articles in the communication source database.

Title of article and Author/s	Journal	Year	Country
Neuroscience and Communication. Sherry, John L.	*Communication Methods & Measures. Jan-*	2015	USA
Predicting success in the performing arts: Ballet and music. Jankovic, Marija and Bogaerts, Stefan	*Psychology of Music*	2021	Netherlands (Holland)
Are theater people different? Whiting, Frank M.	*Southern Speech Journal.*	1957	USA
Effects of attention focus instructions on amateur piano performance. Jentzsch, Inés and Braun, Yukiko	*Psychology of Music*	2023	UK
Communicating change - meaningful moments, situated cognition and music therapy: A response to North (2014). Fachner, Jörg	*Psychology of Music*	2014	UK
6. Mechanisms for Affect Communication from Dance: A Mixed Methods Study. Stutesman, Megan G. and Goldstein, Thalia R.	*Journal of Creative Behavior*	2024	USA
8. Emotional Expression, Perception, and Induction in Music and Dance: Considering Ecologically Valid Intentions. Susino, Marco	*Journal of Creative Behavior*	2023	USA
9. Cultural performances: Merging dance and communication for intercultural learning. Aksoy, Ahmet and Ling, Amanda	*Communication Teacher*	2024	USA

Source: Elaborated by the authors.

The following sections go deeper into the most important concepts reviewed in the field.

4.1. Stage signs

To speak of stage signs is to speak of semiology or theatrical semiotics. Both fields deal with signs and their meanings, but from different perspectives. The term 'semiology' was coined by the Swiss linguist Ferdinand de Saussure, who focused on verbal language. Semiotics, on the other hand, was developed by the American philosopher Charles S. Pierce and deals with both linguistic and non-linguistic signs, including objects, gestures, natural phenomena, and images, to name a few. For this

reason, in dance, semiology is used to analyse the signs on stage. In this research, an analysis of these signs will be conducted to establish connections with neurocommunication.

The stage is an audiovisual medium, as these signs can be perceived both visually and audibly. The following sections deal with both groups:

4.1.1. Visual signs during stage performance to audience

The text of the dance is the choreography, whose development in the representation happens through a body in space and at a specific time. Therefore, for the semiotic analysis of dance, the following parameters must be analyzed: body/choreography, space and time.

Choreography/body: Choreography is the language through which each creator expresses an idea, concept or sensation. The techniques and styles of dance that make up choreography include ballet, flamenco, contemporary dance, the Graham technique, release technique and vertical dance, either intermingled or in their traditional form.The techniques and styles of dance are determined by the context, the socio-cultural background and the formal components both at the level of movement and aesthetics.

2. Space: Space in dance has a bidirectional action as it surrounds the dancer and at the same time is created by the dancer. According to Sirote (2018) space is not only the physical place that houses the dancer or where the dance takes place, it is also a space created in real time by the directions, trajectories, volumes, planes and levels of both the choreography and the spatial composition of the dancers.

Time: According to Laban (2020), time is one of the factors involved in movement, influencing its duration, the urgency with which it develops, and its rhythmic arrangement. This involves the use of resources such as rhythm, silence, speed, accents, regularity, irregularity, and repetition, among others.

Other aesthetic elements such as scenery, costumes (including makeup and hairstyle) and lighting.

4.1.2. Auditory signs during the stage performance to the public

In a dance performance, the main auditory element is the music, although body sounds such as breathing, friction and percussive blows from different body parts (such as feet and hands) can also be heard, as well as vocal expressions such as crying, laughter and sighs. Other sonorous elements can also appear, such as sounds made by objects (keys, a horn, a door slamming) or sonorous atmospheres (rain, sea waves, car traffic).

Some authors who have treated music from a therapeutic point of view, highlight the effect it has on neuronal processing and brain regions involved in emotions (Fachner, 2014).

With respect to the relationship between music and dance, the following types are highlighted:

- Synchronized: the movements of the dance draw in the space the sound of the music, as it is usual in the most conventional dances: folk dances, ballet, swing, hip hop, etc.

- Desynchronized: when the music is in the background and the dance follows its own rhythm, without communicating on stage. Some examples can be found in the more contemporary stage.

- Independence: when they are two independent entities that coexist with more or less fortune of encounter. This would be a mixture of the two previous ones.

4.2. Non-verbal communication

As a preamble to non-verbal communication, here is an overview of the different categories of communication, classified by the number of people involved. According to Egolf's (2012) categorisation, the following types of communication occur during stage performances:

- Intrapersonal: it happens in the performer's body when managing movements, spatiality, effort, synchronization with the music, synchronization with partners and with the emotional-tensional line required by the piece.

- Interpersonal: the performers communicate with each other through the body, space, expressions and looks. When the choreographies take place between two people, they are called duets and evoke in the audience the most intimate relationships, commonly known as "one on one".

- Small groups: when there are more than two performers, the choreographies can be trios, group (more than three people participate, they can do the same or different steps, but they are all involved in the same dance) or choral (a group of people dance as if they were a single body, with absolute synchronization).

- Public: the moment of the performance is where all the work done during the creative process accesses a public dimension. This moment is what gives meaning to the previous work; the work of art is not finished until it is performed in public, since the purpose of the artistic act is to communicate, and it is at that moment when the dialogue between the spectacle and the audience takes place. In the words of Louppe (2011), "The force and the pregnance of the performative experience, of which the audience is the privileged witness, mean that for the dancer this experience is the one that sums up the work" (p. 316).

Nonverbal communication occurs both consciously and unconsciously and is traditionally divided into categories known as codes or modalities (Egolf, 2012): Vital signs (vitalics), Organisms signs (organismics), Costuming, Haptic signs (haptics), Kinesics, Personal signs (personics), Vocal signs (vocals), Use of time (chronemics),

and Proxemics.

In addition to all these classic characteristics of the variables that influence performance, Jankovic and Bogaerts (2021) also add the role of personality and intelligence, as these two factors influence effectiveness and performance in the performing arts.

4.3. Neurocommunication networks

Neurocommunication has been considered the application of neuropsychology to the understanding of human behavior in the field of communication. According to Cuesta (2021), the three main axes of human behavior are: behavior, emotion and cognition.

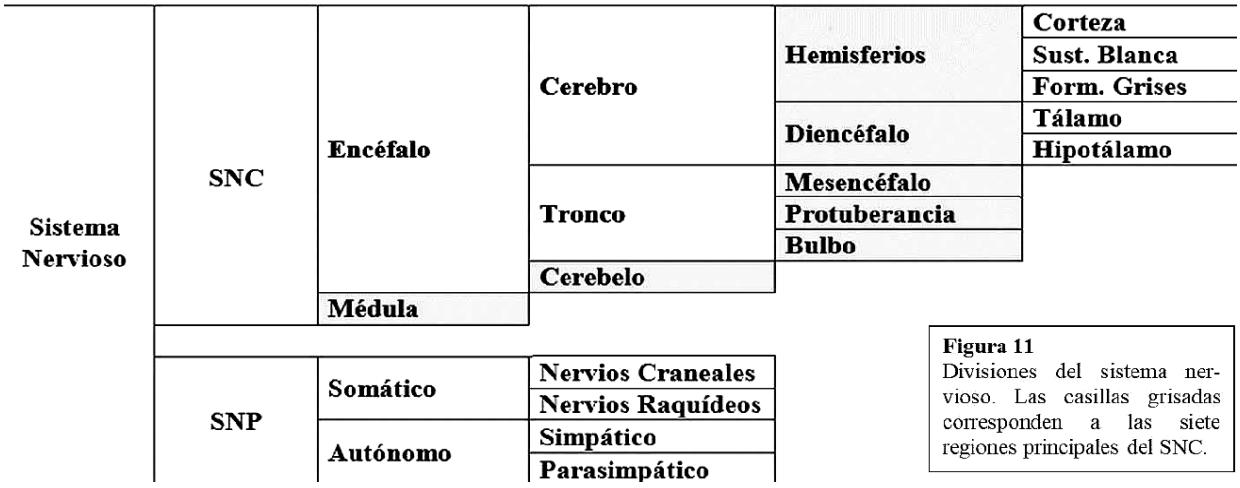
To understand these axes from a neurophysiological perspective, it is essential to understand the organ that gives rise to these behaviors: the brain. As a general summary, the nervous system is composed of the Central Nervous System (CNS) and the Peripheral Nervous System (PNS) (Gil Ochando, 2018).

The PNS is made up of the somatic PNS (spinal nerves and cranial nerves) and the autonomic PNS (sympathetic and parasympathetic). Within the CNS it is posible to find the spinal cord and the encephalon. Forming part of the encephalon and in ascending order, one can find the brainstem (bulb, pons and midbrain), the cerebellum and the cerebrum (diencephalon and hemispheres).

For greater visual clarity, reference is made to Ferreres Neurophysiology (2022), where the seven main regions of the CNS are contemplated (Fig. 3).

Figure 3.

Diagram of the nervous system.



Source: Ferreres, A. R. (2022). *Anatomy of the human nervous system.*

This great system that brings us to life transforms physical action, initiated by a stimulus (spectacle), into a subjective sensory impression, i.e. a psychic impression (Pinillos, 1986). To achieve this, systems composed of neural networks process both internal and external stimuli with the general aim of maintaining homeostasis (Damasio, 2021), i.e. ensuring survival and supporting life.

According to Contreras (2019), who relies on the work of Yuste (2015), the concept of neural network alludes to a model that involves the creation of a distributed circuit in which neurons are connected to each other at through points that can be modified by learning rules. This happens thanks to the brain's ability to organize neurons in different ways, with the intention of performing related mental operations, such as memory systems, language, attention and executive functions, among others. For this, synaptic transmission is essential, responsible for mediating the interactions between neurons through the release of neurotransmitters.

Already in the mid-twentieth century, authors such as Whiting (1957), drew attention to these neural issues and pointed out that sometimes performers of performing arts, and specifically theater, are stereotyped as excessively artistic, neurotic or psychotic, when in fact they should have a healthy degree of mental and emotional maturity.

The networks involved in the process of reception of the spectacular message are the following:

- Mirror neurons: these are a type of neurons that are activated both as soon as they see an action and when it is executed. They were discovered accidentally in 1992 by Rizzolatti's team in Parma, while studying a premotor area (F5) of the macaque brain (Gil Ochando, 2008). The human mirror neuron system is mainly located in the rostral anterior portion of the inferior parietal lobe and in the inferior sector of the precentral gyrus, as well as in the posterior part of the inferior frontal gyrus (Rizzolatti & Sinigaglia, 2006).
- Perception: is the apprehension of reality through the senses, a sensocognitive process in which things become manifest as such in an act of experience (Pinillos, 1986). Most areas of the nervous system are involved in this task, since information travels from the sensory receptors to the cortex, passing through intermediate areas such as the thalamus, hypothalamus, hippocampus, amygdala and cingulate cortex.
- Default mode network (DMN): set of brain areas that are activated when the brain system is at rest. Its activity is strongly linked to memory, planning and preparation of future actions, creativity and comprehension of abstract messages. It was discovered by Raichle and his team in 2001. The main brain areas that comprise it are the medial prefrontal cortex, the posterior cingulate cortex and the left and right inferior parietal lobes (Egolf, 2012).
- Salience network: it is part of the functioning of the default neural network, since it is responsible for switching from this network to the executive control network according to the importance of the stimulus/content (Castañeda, 2021).
- Attentional network: attention is an attribute of perceptual activity. Pinillos (1986) defines attention as the selective application of sensitivity to a stimulating situation, according to different degrees of clarity. It helps one to manage the mind's abundant

production of images. Doing so on the basis of: the intrinsic physical characteristics of the images (colors, sounds, shapes, relations) and the importance of the images; both personally (individual memory) and historically (Damasio, 2021). As Estévez-González et al. (1997) explain, attention is integrated by a wide range of systems such as the activating reticular system, the thalamus, limbic system, basal ganglia (striatum), posterior parietal cortex and prefrontal cortex.

- Limbic network: set of brain nuclei responsible for transforming certain stimuli into emotional responses such as fear, joy, anger or sadness, among others. The nuclei that make up this system are: the ventral tegmental area, the nucleus accumbens, the hippocampus, the lateral septal nuclei, the frontal cortex, the amygdala and the orbitofrontal cortex (López *et al*., 2009).
- Multimodal integration network: set of neural and cortical mechanisms that allow combining different sensory stimuli that reach our body, in order to create a unitary and coherent representation of objects and/or events that occur in the environment (Matamala-Gómez, 2018).
- Memory network: memory is a highly complex cognitive process. The structures involved in memory are the hippocampus, medial temporal cortex, amygdala, neocortex, prefrontal cortex, parietal cortex and cerebellum. Memory involves the consolidation of memories. Memories are the result of traces left by some external or internal phenomenon in the brain. As a practical matter, the brain tends to forget. Therefore, if information is to be stored, the memory trace must be deepened by repeatedly using that neuronal circuit (synaptic consolidation). Memory is also part of many other cognitive and emotional processes. (Dudai et al., 2015).

4.4. Dance performance on stage and neurocommunication (Jakobson's communication model).

Dance is considered a creative act with a multitude of facets that have managed to communicate emotions throughout human evolution. According to Stutesman and Goldstein (2024), the components of dance that determine the communication of emotions are: the narrative content, the social interaction, the intention of representation of emotions and the quality of the movement texture. of movement.

Cognitive and behavioral studies, encompassing neural explorations have addressed the communication of emotions in music and dance for their great capacity to transmit and elicit emotions. However, there are still studies that still aim to validate to what extent auditory expressive signs and embodied expressive movements can convey emotions (Susino, 2023).

The following relates Jakobson's model agents to the neural networks affecting the message receiver (audience).

4.4.1. Context (referential function) and message contact (haptic function)

If the path taken by the audience is considered, the context of the message can be understood: the physical space where the event is hosted, the theater. The word theatre comes from the Greek word 'theatron', meaning 'place from which to look' and 'point of view'. Theatre is the place from which the audience contemplates an action that is presented to them from another place: the stage (Pavis, 1998).

According to Jakobson's communication model, the theatre can be considered the context of the message, as it is a physical and symbolic space that is socially accepted for its own purpose. Considering the referential function of the message as the frame of the action, upon entering the space, the audience already knows and accepts the rules (e.g. sitting in silence and observing what happens on stage), enabling the message to be produced and understood.

A person, as a theater audience, must understand the place where he/she is in order to make sense of what is happening. To do so, he/she must use the memory network for to resort to the socially stipulated norms regarding behavior in that space. Similarly, he must pay attention (attentional network) to what is happening, since this is an extraordinary and metaphorical type of communication, a poetic analogy of reality. When the curtain sounds announcing: *"Ten minutes to the beginning of the show*...", the auditory perception is activated, and the audience prepares for the beginning, following the instructions to turn off cell phones and not to take flash photos, among others.

The contact established in a stage space, whether it is Italian-style, circular or amphitheater-type, is dual: stage and audience. The word "escena" (stage) comes from the Greek *skene*, a term that referred to a stage set up behind the orchestra, reserved for the appearance of gods and heroes. Throughout history, the stage gained significance, as it also began to refer to the set, the acting space and, later, the place of dramatic action (Pavis, 1998).

On the other side of the stage, the one who observes, the one who waits, the audience. The stage message is the one that relates a fictional space (stage) with a real one (audience). The fictional space must have the requirements to establish this relationship in a conventional way, while the real space will be occupied by a group of receivers, willing to accept this relationship (Oliva &Torres-Monreal, 2005).

This magical and ritual distance between the audience and the stage will determine the factual function of the contact of the message through the mirror neurons. For example, when the dancers have contact in a choreography, the motor zones and the receptors of the skin of the audience will be activated, provoking an internal motor and sensorial representation, without actually making the movements and the contact of this representation.

The distance between the stage and the audience will make the audience perceive the sound through the auditory system as well as through the skin, thanks to the vibration

of the sound system, either by the recorded or live music. If we look at the visual contact, there is a scenic concept that regulates this relationship: the "*fourth wall*", that imaginary wall that separates the fictitious space from the real one. According to Pavis (1998), when the "*fourth wall*" exists, the audience is invited to spy on the characters, who behave as if the audience did not exist. This wall is built or destroyed depending on the scenic style being attended, so that in the pieces where there is a fourth wall, the contact between the audience and the stage will be more distant than in those where the fourth wall is broken, the audience is looked at directly and the expressiveness of the message is directed towards it in an evident way.

4.4.2. Sender of the message (emotive function)

When the performance begins and the sender of the message enters the stage, it is important to bear in mind that the sender in a work of art is double. On the one hand, a message is created, and on the other, interpreters execute it during the performance. During the performance, two experiences intersect: the show itself and the visual and emotional experience of the audience. Focusing on the audience's experience reveals two elements to perceive and analyse: the work itself and its interpretation.

What the audience can perceive immediately is what appears in real time on stage, that is, everything related to the interpretation and staging tools that the creator of the piece has composed to convey a particular feeling or idea. While the message of the creator of the represented piece can be valued at the end, when there is an overall view of all the elements presented on stage.

When interpreting messages in real time, the limbic network comes into play due to the emotions awakened by the interpretative qualities; the attentional network due to elements of the scenic plot that keep us attentive; and the default neuronal network due to evocative elements that transport the mind to sensations and images. The salience network returns our attention to the stage thanks to a captivating effect, while the mirror neurons activate when identifying with emotions, events or characters. Finally, the multimodal integration network perceives different stimuli as a whole. This multimodal integration requires the somatosensory pathway to perceive what is seen and heard on stage.

For the message of the creator, that is, to understand the work as a whole, cognitive and analytical processes will be necessary, in which memory will play a fundamental role. Studies have shown that the more knowledge one has of the message being observed, the more effect it will have on our encephalic system, that is to say, that the brain's observation processes are modulated by the audience's experience and repertoire of movements (Calvo-Merino *et al*. 2005).

Considering the emotive function of the transmitters, it is very interesting to note that, due to the context of the message, although the communication is of a public nature, the fact that the audience is seated in the dark in front of the performers creates a certain intimacy that builds a safe environment for emotions to flourish. Damasio (2021) defines emotions as a set of involuntary internal actions that occur simultaneously (smooth muscle contractions, changes in respiratory and cardiac

rhythms, hormonal secretions, facial expressions or posture), triggered by perceptual and reminiscent activities (remembering an event also produces emotions).

Emotions are formed in the limbic network, which is subcortical and therefore inaccessible to conscious awareness. However, the hypothalamus transfers information from this network to the body through cardiac dynamics, respiration, muscle contractions and posture. Therefore, every emotion involves bodily sensations (Castellanos, 2024). The skin bristles before the emotion becomes conscious. This creates an initial dialogue between bodies: what the sender conveys through body language is reflected in the audience's bodily sensations before the analytical mind attempts to interpret what the body has already understood.

4.4.3. Message (Poetic Function) and Code (Metalinguistic Function)

In order to analyse the message, it is necessary to focus on its poetic function. Louppe (2011) defines poetics as the study of the mechanisms that elicit an emotional response from a system of signification or expression. In Jakobson's model, the message is attributed to the spectacle as an artistic object. According to Louppe (2011), the essence of dance poetics lies in bodily knowledge rather than aesthetic components. Therefore, the analysis of the message will focus on movement.

Humphrey (1972) tells that dance forms belong to the realm of feelings, sensitivity, and imagination; they must convey that aspect of experience that can be expressed through physical action. In this context, the body becomes a charged emotional and sensory discourse.

There are areas of the body that are more charged with semen than others. The head, as support of the face, is the most communicative area, as in the somatosensory cortex, where the face, specifically the mouth, has more neurons. The same happens with the hands, extremities with a high uptake power, which also have a large area reserved in the Penfield homunculus.

The torso occupies the third place as a carrier of emotion, since it is there where the vital organs are located and where emotion is physically perceived, thanks to the heartbeat and respiratory rhythm. Even if the audience does not know dance techniques and semiotics, everyone can interpret emotions through the breathing rhythm (since, unlike the heartbeat, it is visible), facial expressions and body posture.

In order to perceive dance, the audience activates the visual perception process, which begins with the retinal receptors and ends in the cerebral cortex. If this process were to be mapped, it would begin with an external stimulus, such as a dancer on stage, which is captured by the sensory receptors of the retina. There, it becomes a biological electromagnetic wave that reaches the thalamus, the main receptor in the brain. From there, information is distributed through subcortical structures such as the memory (hippocampus) and emotion (limbic) systems. These structures process information of which the conscious mind is unaware. The limbic system then informs the hypothalamus, which passes its verdict to the body, i.e. the viscera and sensations. Finally, the unconscious information becomes conscious as it passes through the

cingulate cortex to the cerebral cortex (Castellanos, 2024).

In the face of experience, bodily sensations precede the conscious act. In the case of retinal receptors, it takes about 100 milliseconds from the time the information arrives there until it becomes conscious. The body knows what the mind has not yet realized (Castellanos, 2024). Therefore, the dancer's body communicates with the audience's body before it communicates with the audience's conscious body.

However, for the dancer's body to be seen in a dark chamber, as is the scenic box, lighting is necessary, which in addition to fulfilling this utilitarian function, like any scenic sign is loaded with meaning and this is where the metalinguistic function of the message code comes in. Both visual and auditory signs are formed on stage so that the dance transmits a message.

What the creator composes with these scenic signs, reaches the audience as signs of non-verbal communication (vital, organic, personal, ocular, etc.). They are perceived by the audience through the somatosensory pathway, which connects the body with the outside world via the senses. The aforementioned visual and auditory pathways are of particular importance.

In order to perceive a sound, an auditory stimulus (such as music, noise or sound atmosphere) enters the internal auditory canal, causing the eardrum to vibrate. The eardrum is a membrane connected to the middle ear ossicular system, which amplifies the received signals and transmits them to the cochlea. Within the cochlea, the organ of Corti translates the stimuli arriving through the endolymphatic and perilymphatic fluids into bioelectrical impulses by depolarising the inner hair cells. These impulses then travel to the brain stem and on to the medial geniculate bodies, reaching areas 41 and 42 of the temporal lobe (Brodmann's areas), where a more in-depth acoustic analysis is performed at the level of sound interpretation and meaning (Sanchez, 2014).

To integrate the various scenic stimuli to which the viewer is exposed, the multimodal integration network processes them to perceive them as one. These areas, which developed most recently in the primate brain, take the longest to develop in humans. It is in these areas where the most complex processing takes place, where sensory information is integrated with motor information and with emotional and motivational information (Ferreres, 2022).

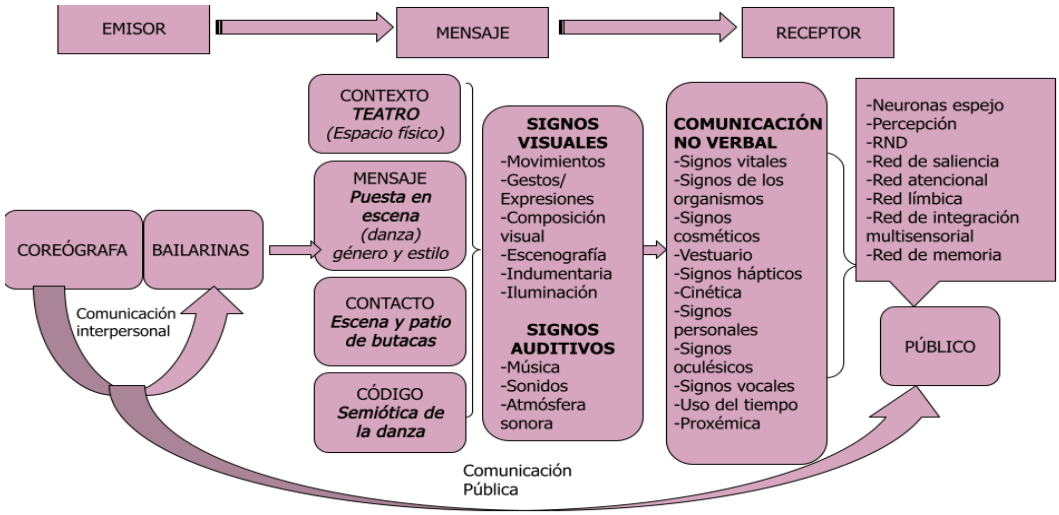
In addition to activating auditory perception, musical stimuli activate the following brain areas: those that regulate the motor system (the cerebellum); those related to emotions (the limbic network); and those involved in cognitive processes such as attention, memory, and thought (Jausset-Berrocal, 2010). These data verify that dance and music share brain activations. Music helps dancers synchronise with each other and gives expressiveness to their movements, or at least that is how it is perceived by the audience.

In conclusion, Figure 4 of this paper presents a conceptual scheme of how communication occurs in a dance performance according to Jakobson's model,

applying elements of neurocommunication to audience perception.

Figure 4.

Conceptual scheme of neurocommunication on stage.



Source: Elaborated by the authors.

5. CONCLUSIONS AND DISCUSSION

The performance of a dance show is a complete and complex communicative act. All the signs configured on stage, both at visual and auditory level, make this experience something integral, where if the audience is carried away by the scenic proposal and the beauty implicit in the corporal poetry, he can feel that he is dancing from the armchair. The complexity lies mainly in the fact that the message, due to its characteristics, affects our subcortical region, which means that it has more effect on the sensory than on the rational. This can be uncomfortable for people who live more in their mind than in their body.

Music perception affects the areas of the brain related to emotion, as does body language. This shows that the aspect that a dance performance has the greatest impact on is that of emotion. Interestingly, the word "emotion" comes from the verb *emovēre*, which means "to move outward" or "impulse born from within."

The effects of music are a powerful synchronizer, between the dancers, between the music and the dance, and between the audience and what is happening on stage. Many cultures use music and dance as elements of social cohesion, since while dancing to music they synchronize their emotions and reinforce the bonds of belonging to a group (Jausset-Berrocal, 2010). Sharing this live moment can create a feeling of union between audiences and performers, as well as among the audiences themselves.

In this article, by identifying the main neural networks activated in the audience, it is possible to open the door to studying the impact of live dance in a cultural context. It also enables the evocative power of the artistic disciplines discussed in this research to be translated into neurological terms. Mirror neurons enable self-recognition in

characters or situations, while the default neural network facilitates imaginative exploration, internal dialogue, and the cultivation of intrinsic creativity in our thinking.

Identifying the neuronal networks activated in the audience by a scenic event can provide a neuroscientific explanation of the transformation/purification process that occurs after seeing a performance, which the Greeks called *katharsis*.

Future lines of research are directed to the study of the nuances of dance and the relationship with the perception of audiences and emotions. Recent research by Stutesman and Goldstein (2024), have claimed that audiences accurately perceive emotions regardless of narrative content.

Other interesting lines of research address the pressure that performers are under in performance environments and the importance of investigating what are the best conditions and approaches to obtain the best performance (Jentzsch and Braun, 2023).

On the other hand authors such as Jankovic and Bogaerts (2021), propose lines of research that relate emotional instability and neuroticism to the prediction of success in musical performance as well as spatial skills related to success in ballet.

In short, all the aspects that affect the staging of the transmitter (material, psychological, neural...), have a significant impact on the outcome and projection of the discipline and therefore determine, to a large extent, the effect that they come to produce in the receiving public of these stimuli.

As future lines of research on the subject, it is important to delve deeper into how each aspect of the staging influences the audience's emotions; the intensity of this influence, the synergies it presents with the other elements, and its relationship with the audience. It would also be interesting to analyse the influence of an individual's characteristics at the moment of receiving a stimulus, as well as the influence exerted by an audience enjoying a show.

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