



Poetry and Brain: Interfaces for Empathy Development

Eduarda Isabel Hübbe Pacheco¹ and Samira Schultz Mansur^{2*}

¹Health Sciences Center, Federal University of Santa Catarina, Brazil

²Biological Sciences Center, Department of Morphological Sciences, Trindade, Florianopolis, SC, Brazil

*Corresponding author: Samira Schultz Mansur, Biological Sciences Center, Department of Morphological Sciences, Trindade, Florianopolis, SC, Brazil.

Email: samira.mansur@ufsc.br

Received Date: December 16, 2022

Published Date: January 02, 2023

Abstract

The word empathy originated among German novelists and its meaning developed through art appreciation and studies in psychology, psychoanalysis, philosophy, and education. One of the ways to promote empathic behavior can occur with the reading of poetry, whose literary format allows the expression of particular aspects of emotions and cognitive skills, facets that encompass the conceptualization of empathy. As an example, neuroimaging studies showed that Shakespeare's poetry significantly stimulated the left caudate nucleus, the right inferior frontal gyrus and the right inferior temporal gyrus, in addition to brain areas typically activated in language-related tasks. Taking into account that literature, especially in poetic format, has the potential to activate brain areas involved with empathic behavior, the main objective of this study is to understand the way in which the emotional and cognitive aspects of empathy are manifested from literary poetry, highlighting the areas of the brain responsible for this process. The specific objectives intend to explain how the emotional and cognitive aspects of empathy are manifested through poetry and describe the brain areas specifically activated through this literary form. The research is exploratory of the bibliographic type, which consisted of a bibliographical survey, reading, logical organization of data, discussion of the theme and writing, whose method was inductive. Data were collected from the Science Direct database, as well as from university library sites and other academic and scientific repositories. It is suggested that literary poetry can awaken in the reader who is emotionally and cognitively involved with the masterpiece, the ability to deal with complex emotions and develop reflective skills through the activation of specific brain areas related to empathy.

Keywords: Poetry; Brain; Empathy; Cognition; Emotion

Introduction

The word empathy emerged among German art critics with the term *einfühlung*, which was used within an aesthetic bias by the philosopher Rudolf Lotze (1817-1881) in 1858 and, similarly, by the art historian and philosopher Robert Vischer (1847-1933) [3], bringing the idea that, from the perceived object, the observer could project himself [1]. However, similar descriptions previously occurred, for example, in 1774, in the studies of the philosopher and novelist Johann Herder (1744-1803), when he associated the word in German with enlightenment to understand other times and cultures [3] and by Friedrich von

Hardenberg (1772-1801)-known by the pseudonym Novalis-proposing reflections to understand empathy from "feeling nature", such as a correction to scientific attitudes [2].

The development of empathy from the aesthetic context of the 19th century to the philosophical core of the human and social sciences is a result of the work of Theodore Lipps (1851 to 1914) [3]. In this sense, empathy is defined as the ability or willingness to immerse yourself and reflect on the experiences, perspectives and contexts of others [3] and, as described by Lipps, it is an emotional perception capable to activate the same emotion in the observer

without the intervention of any judgment [1]. Before *Empathy* was translated into English-feeling into-in 1909 by the British psychologist Edward Titchener (1867-1927), phenomena related to empathy were known as sympathy [2].

In the area of neuroscience, the characterization of empathy emerged through an article published in 1967 by the physician and neuroscientist Paul MacLean (1913-2007), when he studied the evolution from reptiles to mammals, demonstrating it between these [4, 5] MacLean portrayed empathy as the ability to identify one's own feelings and needs with those of another person, making it fundamental for resolving problematic issues of modernity, such as insensitivity, and hypothesized that it was intensely dependent of the prefrontal cortex [4]. However, empathy reflects multiple neural processes involving emotions, cognition and motivation through cortical and subcortical structures and connections that promote this behavior in various species [4, 5].

Artistic expressions, including literature, are capable of showing the reader a different reality and to inspire them to have empathetic acts that help other people [6]. The intellectual and affective stimuli that stand out through this art make it an important ally to education, with consequent possibility of social transformation [7]. The Australian philosopher Roman Krznaric comments that the English novelist Mary Ann Evans (1819-1880)-known by the pseudonym George Eliot defended this literary power when observing that reading could act in the development of "compassion", just as we know today by the characterization of empathy (2015, p. 170).

In this context, the poetic format shows its own characteristics related to rhythm and rhyme, capable of expressing human language through the transformation of what is real into something that can awaken emotional contemplation [8]. Therefore, literature-especially poetry-is a way of reacting to the experienced reality, being an expression with aesthetic and/or critical purposes that requires the reader to constantly associate the cognitive and affective sides [8, 9].

Taking into account the brain bases that involve empathy behavior and the importance of literature, especially in the poetic format, for the development of its cognitive and emotional aspects, the question is: which are the brain areas related to the cognitive and emotional aspects developed during the poetic reading that make empathetic behavior possible?

The main objective of this study is to understand how the emotional and cognitive aspects of empathy are manifested from literary poetry, highlighting the areas of the brain responsible for this process. The specific objectives intend to explain how the emotional and cognitive aspects of empathy are manifested through poetry and describe the brain areas specifically activated through this literary form.

Material and Methods

This is exploratory research as it "provides an approximate overview of a given phenomenon" and bibliographical, as "it is developed from material already prepared, consisting mainly of

books and scientific articles" [10], which involved bibliographic survey, reading, logical organization of the data, subject discussion and writing. The inductive method was used. The data were collected from Science Direct and Pubmed databases, libraries and websites of many research institutions, universities and academic and scientific sites. The associated descriptors were poetry and empathy; poetry and compassion; poetry and emotion; brain and empathy; brain and poetry; empathy and neuroanatomy and poetry.

Results and Discussion

Emotional and cognitive aspects of empathy from poetry

Literature has social responsibility by the stimulation of emotional and cognitive aspects through the creation of fictional universes that resemble the real world and allow the reader to develop empathy by involving them with the feelings and thoughts narrated [11]. Reading poetry has specific characteristics that can encourage the development of the connection between mind and feeling in order to lead the reader to a harmonious and thoughtful perception of the world [7].

Reading texts that present emotions in detail has the potential to influence the emotional response of readers, according to comments extracted from an empirical investigation of [12], based on the use of Wattpad, a platform that enables interaction between writers and readers. In addition, meticulous writing also promotes the activation of cognitive systems, as occurs during the reading of Shakespeare's poetry, which encourages the reader to interpret the work differently due to functional changes resulting from the substitution of grammatically appropriate words, such as the noun "lip" in place of the verb "kiss" [13]. This was observed through functional magnetic resonance (fMR) in the investigation of the relationships between words, sounds, meanings, and structures of textual elements [13].

In the works of William Shakespeare (1564-1616), there is a peculiarity in the way of expressing emotion and cognition through writing, either due to its content or its structure [13]. Shakespeare often created his poetry from a functional change, changing a semantically adequate word for another syntactically inadequate one, using the noun as a verb [13]. This literary intention demands complex cognitive activity from the reader in order to reflect and assimilate the meanings of words [7].

Poetry contributes to the development of emotional intelligence by providing different ways of interpreting what is written [14], as well as sensitivity by positioning the reader in situations that resemble reality [8]. This can occur because the reader is encouraged to experience the different emotions described, considering that there is motivation to get involved with the work [11] and that the author uses poetic resources to attract the interest of the reader [8].

In this bias, Margulis et al (2017, pp. 1-16) [15] evaluated the individual perception of 118 people in the face of poetic experiences. The questions were related to emotions and aesthetic appreciation and the participants' responses suggested that empathy can be "transferred" from the poet to the reader, causing the latter to experience sensations related to the poet's intentions. However,

both emotional and cognitive responses generated by reading depend on each person's individual experiences, the reader being a kind of co-author of the presented content [16].

In the study by Wolters and Wijnen-Meijer (2012, pp. 42-49) [17] poetry was considered an important ally in building empathic capacity among medical students and their tutors, regardless of whether it is active (writing) or passive (reading). This data is corroborated by Shapiro and Stein (2005, pp. 278-292) [18], when they found that the creation of poems by medical students encouraged them to "listen" to patients and their families, as well as to "be in the other's shoes". This can work as a self-healing and healing mechanism for those involved (patients, family members and professionals), based on understanding one's own emotions and the emotions of others and cognitive exercise, increasing empathic ability [17, 18].

Literary expression-above all poetic-serves as an exploratory method by naming feelings and disseminating geopolitical issues [7, 38] a fact that favors the development of compassionate and empathetic traits, mainly due to dealing with different cultures and worldviews [19]. As an illustration of the artistic and human expression of poetry, by interweaving feeling and thinking, there is the verse of the Italian poet Dante Alighieri (1265-1321), which portrays a poetic vision of empathy, an interpretation illustrated by the Italian neuroscientist Vittorio Gallese, in the explanation of the Portuguese translator and writer Vasco Graça Moura (1942-2014): "enter you and you enter me, in thought" [20]. It is noted that poetry reading can promote empathy by encouraging emotional and cognitive activity in a peculiar way [21, 22]. However, for empathic development to occur, there are variables such as individual motivation for this purpose and, necessarily, cerebral structures that act in circuit, communicating cortical and subcortical regions of our brain.

Brain areas activated through poetry

Poetry presents itself to the brain as a system organized in temporal, rhythmic and linguistic strands that generate and integrate different information within the hierarchical brain organization [23]. The elements of rhyme, meter and rhythm brought by poetry associated with human values-beauty, truth and empathy -are assimilated by the brain as "pleasure caused by the verse" and therefore lead to emotional responses that activate the primary brain reward circuit [23-25].

This circuit, also known as the mesolimbic dopaminergic system, has structures functionally related to the areas of pleasure in the brain. Among its constituents, we can mention the cingulate gyrus, the insula, the caudate nucleus [25], the prefrontal cortex and the nucleus accumbens, located between the caudate nucleus and the putamen [26].

The aesthetic sense, essential in the processing of rewards by allowing the judgment of what is artistically pleasant or unpleasant, is strongly associated with the prefrontal cortex region [27]. This aesthetic experience combines different elements, both sensory, arising from the contemplation of beauty, and cognitive arising from memory, learning and decision-making to assess the positive

or negative emotions emanated by aesthetics [28]. This can be explained, as the prefrontal cortex harmonizes the extrinsic and intrinsic stimuli received by aesthetic observation, with cognitive and emotional actions, which include the occurrence of empathy when concentrating between one's own emotional state and the emotional state of the visualized object [29].

Furthermore, the emotional reactions generated by reading poetry can be expressed by physiological markers on the surface of the skin, causing chills and shivers, as a consequence of activation of the middle cingulate gyrus, the middle insula, and the body and tail of the caudate nucleus [25]. In this way, the poem implements a visualization of the world that motivates the reader to experience the protagonist's simple and complex emotions, promoting a new way of thinking about how other people perceive, understand and appropriate their space, encouraging empathy in the face of the reported situation and the real world [30,38].

It is known that the evolution of neuroscientific knowledge has associated the activation of neuronal structures with different behaviors, including the sharing of emotions, one of the facets of empathy [20]. In this sense, the discovery of mirror neurons in the pre-motor area of Rhesus monkeys by the Italian neuro-physiologist Giacomo Rizzolatti and his collaborators, at the end of the 1980s, when studying the motor system, reinforced this association and helped to understand the empathic experience when it was demonstrated that the brain interprets an emotion from the bodily representation "felt" by this emotion [31].

It is important to note that the frontal region of the mirror neuron system is responsible for higher cognitive processing, such as the planning of long-term motor acts and motivations; the parietal regions, on the other hand, are related to sensory functions and therefore are involved with independent sensorimotor processes [31]. This system has connections made with the insula and the amygdala, structures that are part of the limbic system or the emotional system of our brain. In an fMR study, the activity in these limbic structures, especially the amygdala, was found to be increased when participants imitated the emotional faces they observed [31].

For Richard Gerrig, professor and researcher interested in psycholinguistic issues, reading enables the reader's active participation in the story, as well as the sharing of emotional states that are individually generated [20]. This can be observed during poetry reading through the activation of brain areas of mirror neurons, such as the bilateral precentral gyrus, inferior frontal gyrus, right dorsolateral prefrontal gyrus, language areas that are more recruited when compared to the reading of prosaic texts [32]. In addition, the activation of the language processing and production area during the observation of the actions of others suggests the importance of communication in one of the components that permeate the empathic ability [31].

It is worth pointing out that hearing the vocalization of non-verbal expressions of emotions, such as laughter or screams of joy, and seeing happy faces, activates mirror neurons in the sensorimotor cortex of the left frontal and supplementary

regions, as if the person were performing the action, showing the auditory-motor interaction regarding empathy, when interpersonal emotional contagion occurs at an involuntarily way [33, 34]. On the other hand, empathy has voluntary emotional and cognitive processes that logically require conscious and intellectual analysis of information, such as in executive functions, emotion regulation, working memory or visuospatial processes [35].

We see that empathy behavior can occur in a relatively simple way, as we observe in the first reactions at birth, which involve the recognition of faces, the crying that spreads among children or in the first needs for affection, as well as in attitudes that require emotional and cognitive reflection in face of personal or collective situations. In this sense, it is important to realize that empathy behavior is likely to be developed throughout life and, therefore, it has cerebral bases and possibilities to be chosen to facilitate its development [36, 37].

Conclusion

The specific way in which poetry is constructed influences the intensity of the reader's emotional response, especially when associated with an intentionality associated with rhythm, rhyme and meter. In addition, the tone used at the time of poetic reading seems to play an important role in the ability to reflect on the feeling experienced by the writer or the protagonist of the poem, stimulating the ability to empathize with the other.

Empathic behavior has neural bases supported by cortical and subcortical structures, which allow the manifestation of emotional and cognitive aspects of empathy. The association between emotion and cognition provided by reading poetry is presented in an organized way to the brain and reinforces human values such as beauty and aesthetics, which activate the primary brain circuit of reward, related to pleasure. Brain areas that contain the so-called mirror neurons appear to be involved in understanding of emotions and thoughts of others, which are hallmarks of empathic behavior. Thus, empathy can be developed and improved through poetic reading as long as there is healthy functioning of brain circuits, as well as individual motivation for this purpose.

Acknowledgment

None.

Conflict of Interest

No conflict of interest.

References

- PRESTON Stephanie D, DE WAAL, Frans BM (2002) Empathy: Its ultimate and proximate bases. *Behavioral and brain sciences* 25(1): 1-20.
- STUEBER Karsten, Empathy (2017) *The Stanford Encyclopedia of Philosophy*.
- ZOLZER Friedo, ZOLZER Neysan (2020) Empathy as an ethical principle for environ-men-tal health. *Science of The Total Environment* vol 705: 35922.
- MARSH Abigail A (2018) The neuroscience of empathy. *Current Opinion in Behavioral Sci-ences* 19: 110-115.
- DECETY Jean (2015) The neural pathways, development and functions of empathy. *Current Opinion in Behavioral Sciences* 3: 1-6.
- KRZYNARIC Roman (2015) *The power of empathy: the art of putting yourself in someone else's shoes to transform the world*. Translation Maria Luiza X. by A. Borges. Rio de Janeiro: Zahar.
- CANDIDO Antonio, O direito a literature (2011) In: *Various Writings*. Rio de Janeiro: Gold over Blue p. 171-193.
- LEAL Lidyane Cristina Galdino (2014) The importance of poetry in the formation of readers. *Teaching Initiation Meeting at the State University of Paraíba*, vol: 5.
- TABARES, Omar Julian Alvarez (2013) Poetry, the poet and the poem. An approach to poetics as knowledge. *writings* 21(46): 223-242.
- MOREIRA H, CALEFFE LG (2008) *Research Methodology for the Research Professor*. (2nd edn.) Rio de Janeiro: Lamparina, 245 pp.
- JOHANSEN Jørgen Dines (2010) Feelings in literature. *Integrative psychological and behav-ioral science* 44(3): 185-196.
- PIANZOLA Federico, REBORA Simone, LAUER Gerhard (2020) Wattpad as a resource for literary studies. Quantitative and qualitative examples of the importance of digital social reading and readers' comments in the margins 15(1): e0226708.
- KEIDEL James L (2013) How Shakespeare tempests the brain: neuroimaging insights 49(4): 913-919.
- SILVA DA SILVA, Valmir Luis Saldanha (2019) Poetry reading and emotional intelligence: a discussion. *word wings* 16(2): 158-177.
- MARGULIS Elizabeth Hellmuth, et al. (2017) Expressive intent, ambiguity, and aesthetic ex-periences of music and poetry. *PLoS One* 12(7): e0179145.
- LARROZA Elenice Maria Jacques (2001) *Masters dissertation. Reading: Emotion, Pleasure*. Catholic University of Pelotas.
- WOLTERS Frank J, WIJNEN-MEIJER Marjo (2012) The role of poetry and prose in medi-cal education: the pen as mighty as the scalpel? *Perspectives on medical education* 1(1): 43-50.
- SHAPIRO Johanna, STEIN Howard (2005) Poetic License: Writing Poetry as a Way for Medical Students to Examine Their Professional Relational Systems. *Families, Systems, & Health* 23(3): 278.
- DOMEN Ronald E (2016) The Pathologist as Poet. *Academic Pathology* vol (3): 2374289516659078.
- ABRANTES Ana Margarida (2014) Narrative and empathy. Lessons from the brain and literature. *People and Cultures* 18: 195-207.
- ROZA Sarah Aline, GUIMARAES Sandra Regina Kirchner (2022) Relationships between reading and empathy: An integrative literature review. *Journal Psychology: Theory and Practice* 24(2): ePTPPE14051-ePTPPE14051.
- STEPIEN Kathy A, BAERNSTEIN Amy (2006) Educating for empathy. *Journal of general internal medicine* 21(5): 524-530.
- TURNER Frederick, POPPEL (1983) Ernst The neural lyre: Poetic meter, the brain, and time 142(5): 277-309.
- CARTOCCI Giulia (2021) NeuroDante: poetry mentally engages more experts but moves more non-experts, and for both the cerebral approach tendency goes hand in hand with the cerebral effort. *Brain Sciences* 11(3): 281.
- WASSILIWIZKY Eugen (2017) The emotional power of poetry: Neural circuitry, psy-chophysiology and compositional principles. *Social cognitive and affective neurosci-ence* 12(8): 1229-1240.
- MACHADO Angelo, HAERTEL, Lucia Machado (2014) *Functional Neuroanatomy*. (3rd edn.) São Paulo: Atheneu. PP: 344
- KAWABATA Hideaki, ZEKI Semir (2004) Neural correlates of beauty. *Journal of neuro-physiology* 91(4): 1699-1705.

28. LIGAYA Kiyohito, O DOHERTY, John P, STARR G Gabrielle (2020) Progress and promise in neuroaesthetics. *Neuron* 108(4): 594-596.
29. LIGHT Sharee N, et al. (2009) Empathy is associated with dynamic change in prefrontal brain electrical activity during positive emotion in children. *Child development* 80(4): 1210-1231.
30. JOHNSON-LAIRD, Philip N, OATLEY, Keith (2022) How poetry evokes emotions. *Acta Psychologica* 224: 103506.
31. IACOBONI Marco, La neuronas (2009) espejo: empatía, neuropolítica, autismo, imitación, o de cómo entendemos a los otros. Traducción: Isolda Rodríguez Villegas. Buenos Aires: Katz. pp :270.
32. SULLIVAN, Noreen (2015) "Shall I compare thee": The neural basis of literary awareness, and its benefits to cognition. *Cortex* 73: 144-157.
33. KROLAK-SALMON P, HÉNAFF MA, VIGHETTO A, BAUCHER F, BERTRAND O, et al. (2006) Experiencing and detecting happiness in humans: the role of the supplementary motor area. *Annals of Neurology* 49(1): 196-199.
34. WARREN JE, et al. (2006) Positive emotions preferentially engage an auditora-motor mirror system. *Journal of Neuroscience*, 26(50): 13067-13075.
35. DE WALL Frans, PRESTON, Stephanie (2017) Mammalian empathy: behavioral manifestations and neural basis. *Nature Review Neurosciences* 18(8): 498-509.
36. DECETY Jean, et al. (2012) A neurobehavioral evolutionary perspective on the mechanisms underlying empathy. *Progress in neurobiology* 98(1): 38-48.
37. EMPATHY (2021) In: ETYMONLINE.
38. PAIVA, Daniel (2020) Poetry as a resonant method for multi-sensory research. *Emotion, Space and Society* 34: 100655,