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Poetry in Pandemic: A Multimodal Neuroaesthetic Study on the Emotional Reaction to the Divina Commedia Poem

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Abstract: Poetry elicits emotions, and emotion is a fundamental component of human ontogeny. Although neuroaesthetics is a rapidly developing field of research, few studies focus on poetry, and none address its different modalities of fruition (MOF) of universal cultural heritage works, such as the Divina Commedia (DC) poem. Moreover, alexithymia (AX) resulted in being a psychological risk factor during the COVID-19 pandemic. The present study aims to investigate the emotional response to poetry excerpts from different *cantica* (Inferno, Purgatorio, Paradiso) of DC with the dual objective of assessing the impact of both the structure of the poem and MOF and that of the characteristics of the acting voice in experts and non-experts, also considering AX. Online emotion facial coding biosignal (BS) techniques, self-reported and psychometric measures were applied to 131 literary (LS) and scientific (SS) university students. BS results show that LS globally manifest more JOY than SS in both reading and listening MOF and more FEAR towards Inferno. Furthermore, LS and SS present different results regarding NEUTRAL emotion about acting voice. AX influences listening in NEUTRAL and SURPRISE expressions. DC's structure affects DISGUST and SADNESS during listening, regardless of participant characteristics. PLEASANTNESS varies according to DC's structure and the acting voice, as well as AROUSAL, which is also correlated with AX. Results are discussed in light of recent findings in affective neuroscience and neuroaesthetics, suggesting the critical role of poetry and listening in supporting human emotional processing.

Keywords: neuroaesthetic; facial emotions recognition; poetry; multimodal; voice

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1. Introduction

Emotions are the essence of life, as colours are the essence of painting and notes the foundation of music. There is growing evidence that our human species has expressed itself in evolution and continues to express itself through colour, ornaments, and other symbolic meanings [1]. Moreover, all humans engage aesthetically with different forms of visual representation, music, dance, literature, architecture, and poetry, so much so that "humans are artists by nature, and the history of art begins with that of humanity" [2] (p. 109). We might add, humanity continues with the study of neuroaesthetics.

Neuroaesthetics, in fact, is often conceived as the study of the neural basis of the production and appreciation of artworks [3–8]. In a broader definition, Nadal and Pearce [9] use the term neuroaesthetics to encompass the study of the neural and evolutionary basis of the cognitive and affective processes enacted when an individual adopts an aesthetic or artistic approach to a work of art, a non-art object or a natural phenomenon. Moreover, an aesthetic experience has been defined as a psychological state determined by interaction with an object to which we intend to attribute qualities according to perceptual, cognitive, affective, or cultural criteria [10]. On the affective aspect, Charles Darwin [11] defended the argument that emotional expressions are involved and adaptive and serve an essential communicative function. In science, emotions can be described as the mental states experienced by humans and are associated with feelings and a degree of pleasure or displeasure [12]; moreover, according to Damasio [13] (p. 84), "the term of emotion should be rightfully used to designate a collection of responses triggered from parts of the brain to the body, and from parts of the brain to others parts of the brain, using both neural and humoral routes". Different theories have been developed to identify, explain, and categorize emotions [14]. According to the discrete emotion model [15], separate neural systems are responsible for different basic emotions: joy, fear, disgust, anger, surprise, sadness, and neutrality that could be recognized cross-culturally [16–18]. The dimensional model suggests that emotion derives from two neurophysiological systems that can be represented in a two-dimensional structure: arousal and valence. The former concerns the subjective perception of perceived energy intensity (high-low), while valence corresponds to the level of perceived positivity/negativity [19].

Language provides an amazingly versatile and potent means to induce emotions in real life [20]. In addition to communicating information, we use language to make each other feel emotions [21]. Literature makes no exception, as it prompts powerful emotions about unreal events [22,23], which is obvious in poetry. Poetry stems from man's natural tendency to imitate through language, harmony and rhythm. Poetry is, in fact, defined as the art of creating verbal compositions in which sound and rhythm, i.e., the 'musical' dimension of language, take on paramount importance. Initially, and for a very long time, poetry was therefore associated with orality, with transmission by voice. As Plato states in the Republic, while painting is made for sight, poetry is born to be spoken and intended for the ears. Dating back some 43000 years, written poetry is the most ancient record of human literature, and the fact that poetry has accompanied human kind over such a long period, suggests a firm grip on human cognition and emotion [24]. In fact, from the beginning to the present, poetry and emotions are inextricably linked [21]. Furthermore, poetry can generally be understood as inherently concerned with expressing and eliciting affective meaning and emotions [25]. Readers often judge a poetic text by the emotions it conveys; however, empirical research still, as only a few discover how poetry elicits emotions, and only over the last decade have the emotional responses to poetry finally come into focus [26]. However, the emotional impact of poetic language and the associated aesthetic pleasure have yet to be widely investigated with the neuroscientific approach [24]. Some studies [27,28] have shown how literary patterns such as metre and rhythm influence emotions, but, as Pitur and Miu point out [21], empirical research still has a lot to discover about how poetry elicits emotions.

A previous study by our research group [29] investigated, focusing precisely on these literary patterns, the cognitive and emotional neurophysiological reaction to the poem Divina Commedia (DC), a pillar of world culture, written by the Tuscan poet Dante Alighieri (1265–1321). Its repetitive structure is based on the number 3:3 hendecasyllables form a triplet of 33 syllables, the 3 *cantica* (Inferno, Purgatorio, Paradiso) each of 33 *canti* add up to 99 *canti* that with a supernumerary as a proem reach together the perfect number 100 [30]. The work's structural regularity, the density of historical, philosophical, political and psychological themes, and its unquestionable aesthetic value make it a perfect stimulus for scientific investigations in neuroaesthetics.

How poetry elicits emotions depends on several factors. Among them, the different modalities of fruition (written text, listening to recitation) have always been questioned. While on the one hand, "Cognitive Poetics"—where cognition is to do with the mental processes involved in reading, and poetics concerns the craft of literature—is all about reading literature [31] from a historical perspective, poetic practices throughout the world initially occurred in the form of song and musical, multimedia performance [32–34]. Furthermore, poetry was once only spoken; non-literate cultures still recite it (see, e.g., [23,35]).

As Wagner pointed out [36], readers can experience different emotions in response to the same poem and some reading characteristics, such as the reading experience and psychological traits, can also influence emotions [21]. Studies observe that non-expert readers tend to evaluate poems differently than expert readers [37]. Moreover, alexithymia (AX)—a term that refers to the limitation of emotional function (identifying and describing subjective feelings) [38,39]— might also be interpreted as a dispositional tendency not to express emotions [40]. It is worth noting that the main feature of alexithymia is a deficiency in emotional processing, including atypical eye gaze behaviour, abnormal emotion recognition and emotion processing [41–43] and, differences in the way the brain processes emotions conveyed through the voice [44]. Finally, considering the various psychological situations that emerged in pandemics in young people and adults (see, e.g., [45–47]), evidence shows that among psychological dimensions that mediate the relationship between stressors and mental health outcomes during lockdowns for the COVID-19 pandemic, an important role is played by AX [48].

With the development of advanced and affordable sensor technologies, investigations into emotion recognition have become increasingly popular among affective computing researchers, and recently, there has been a rising trend in research to improve emotion recognition systems with the ability to detect, process and respond to people's emotional states [49].

In the task of emotion detection, various biosignals or physiological signals—those signals that can provide details about the physiological states and their associated dynamics in the body of a human being [50]—can be used to classify emotions. Recently experiments were conducted using electroencephalography (EEG), GSR (galvanic skin response) [51] electrocardiogram (ECG) [52], electromyogram (EMG) [53], pupillometry [54], (see [55,56] for reviews on emotion recognition based on physiological signals) and physical microexpressions (ME). ME are spontaneous, subtle, and rapid (1/25 to 1/3 s) facial movements reacting to an emotional stimulus [57,58]. The study of ME provides the ability to expose genuine emotions that occur briefly and unintentionally, even when true emotions are deliberately masked [59,60] for a review on ME recognition). Ekman's research group over the years specified universal facial expressions in terms of the Facial Action Coding System (FACS) [61], describing sets of facial action units (AUs) specific to prototypical expressions [62]. Finally, facial expression bio-signals figure prominently in research on almost every aspect of emotions, including psychophysiology, neural bases, perception, social process, emotion disorder (see [63] for further details) and art appreciation like poetry [24], and music [64].

In light of the scientific evidence on the different neuroaesthetic and cognitive reactions between experts and non-experts in response to different artistic stimuli [29], [65], the cross-modality in neuroaesthetic response [66] and that emotions from different senses interact at multiple levels [67,68], considering that the experimental protocol was conducted during a period of confinement for COVID-19 that did not allow direct contact between people, the present study has two connected and innovative aims:

I To investigate the different emotional responses (assessed using biosignal-based and self-report subjective measures) according to the structure (*cantica*) and the different modalities of fruition (read/listened to) of Dante Alighieri's Divina Commedia between literature-skilled and non-literature-skilled students and the possible association with the presence of alexithymia during COVID confinement.

II To investigate whether, while listening to Dante's poem, the coded emotions and self-reported perception vary according to the poem's structure, the qualitative characteristics of the acting voice and the listener's characteristics.

2. Materials and Methods

2.1. Experimental Sample

Before the start of the protocol, a sample of 131 healthy university students was contacted on a voluntary basis through personal networks and social media. The required sample size was calculated a priori using G*Power [69] to ensure that the desired level of power and significant results were able to be achieved. Based on the G*Power output, a sample size of n = 32 was required to detect the effect with a power of 95% and a two-sided significance level of 5%. Finally, 84 healthy participants (18 literature students-LS and 66 non-literature students-SS, mean age 25 years) were included in the study; they did not receive any compensation for participating in the research. All participants were notified of the study and provided digital informed consent before participation. Data was handled following standard practices and in compliance with the GDPR and the European Code of Ethics for Research, and the university's ethical committee approved it. The experiment was also performed in accord with the principles outlined in the Declaration of Helsinki of 1975, as revised in 2000. The project identification code is RM11916B5ADDCB0B.

2.2. Stimuli and Experimental Protocol

The protocol's stimuli consisted of emblematic excerpts from three *canti*, each belonging to the three *cantica* of Dante Alighieri's "Divina Commedia" and were chosen by expert Dante academics. The selected *canti* were, respectively, *canto* V from Inferno (Hell), verses (vv.) 127–138; *canto* XXX from Purgatorio (Purgatory), vv. 67–78 and *canto* XXXIII from Paradiso (Paradise), vv. 133–145 (see Appendix A with the original Italian version by Sapegno [70] and English translation by Longfellow [71]).

The chosen verses were proposed in the modality of reading the text on the screen and listening modality through the acting of two professional Italian actors (male and female). The average duration of the recitation was 42.66 s (sec), and that of the reading (assessed through a pre-test on a sample of ten students outside the research group) was 30 s. At the end of each stimulus presentation, participants were asked to indicate via a Visual Analogue Scale (VAS) [72,73] the arousal (in terms of intensity), pleasantness and positive/negative valence (self-reported perception data) perceived during the stimulation. They were also asked to complete a short questionnaire on recognizing the stimuli and their content (self-declared recall) and a psychological questionnaire to measure alexithymia. After receiving details with an online link, participants were also given calibration instructions to ensure they met the technical requirements of the study. See Figure 1 for a synthetic illustration of the protocol.

2.3. Measures

Biosignals data: The online platform Sticky by Tobii for advanced quantitative research "https://www.tobii.com/products/software/online-marketing-research/sticky (accessed on 6 March 2023)" (already used in published studies [74,75], was adopted to measure emotional expression manifested by the participants (FEAR, SADNESS, JOY, SURPRISE, DISGUST, ANGER, and NEUTRAL see [76]) during the stimulation through Sticky by Tobii Emotion Analysis facial expression recognition tool.

Psychological data: Alexithymia was assessed through the 20 items Toronto Alexithymia Scale (TAS 20) [77]). Each item is scored from 1 (strongly disagree) to 5 (strongly agree) for a maximum total of 100, and it includes three subscales: (a) difficulty in identifying feelings (DIF, difficulty in identifying feelings and distinguishing between emotional feelings and the bodily sensations of emotional arousal); (b) difficulty in describing feelings (DCF; difficulty finding words to express feelings to other); (c) EOT (externally oriented

style). TAS 20 values were collected for each participant, and scoring was performed according to the published literature.

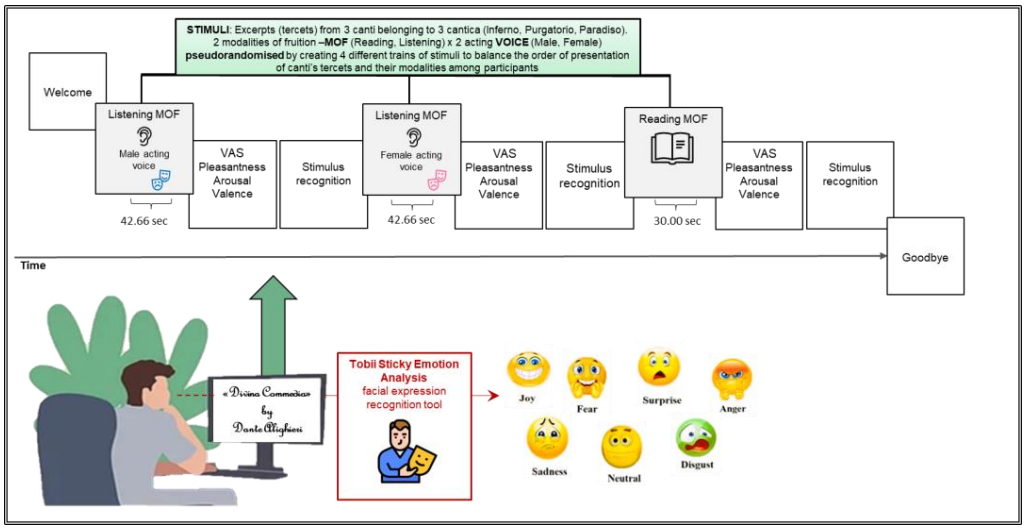

Figure 1. The figure shows the experimental protocol.

Self-reported recall and perception data: each subject's written statement on the recollection of the passages heard and read during the protocol was analysed by authors with experience in literary education to identify whether or not the participant had recognized the verses. Data were collected and analysed together with data on subjective appreciation in terms of perceived pleasantness, arousal and valence.

Online survey Software Qualtrics "https://www.qualtrics.com/it/ (accessed on 8 March 2023)" was used to collect self-reported perception subjective data and psychological alexithymia assessment.

2.4. Statistical Analysis

After checking the normality of each data distribution with the Shapiro–Wilk test [78], independent *t*-tests were used to compare the effects of independent variables EXPERTISE (Literary student (LS); Scientific student (SS) and ALEXITHYMIA (diagnosis of AX or presence of alexithymic traits (AOT)); absence of AX (NA) on dependent variables: seven EMOTIONS (puzzlement, fear, sadness, joy, surprise, neutral, disgust); three SELF-REPORTED PERCEPTION (intensity, pleasantness, positivity) encoded during average listening modality of fruition (MOF) between male voice (M) and female voice (F) and reading MOF.

Subsequently, a factorial analysis of variance (ANOVA) was performed for each facial emotion detected and for each self-reported measure concerning subjective perceptions of pleasantness, intensity (arousal) and positivity (valence). In particular, about poetry pieces considering the factors: CANTICA (three levels: Inferno, Purgatorio, Paradiso), MODALITY of fruition (two levels: listening, reading), VOICE (two levels VM, VF) and GROUPS (LS, SS); (AOT, NA). Moreover, Fisher's exact test [79] was performed on behavioural data (recognition) comparing the two groups (L and S), while Pearson's Chi-squared test (Chi^2 [80] was performed to compare *cantica* (Inferno, Purgatorio, Paradiso). Furthermore, Duncan's post hoc test [81] was used to investigate statistically significant results of ANOVA tests; partial eta squared (η_p^2) [82,83] were computed as measures of the effect size for each dependent variable. Finally, Pearson's Correlation Analysis (r, [84]) was performed to explore the correlation between study variables, while Simple regression analysis was employed to investigate possible directionality between them. p values equal to or inferior to 0.05 were considered statistically significant.

3. Results

3.1. How Expertise and Alexithymia Impact Encoded Emotions and Self-Reported Perceptions in Relation to MOF (Listening/Reading) of the Divina Commedia

3.1.1. Impact on Emotions

Concerning the impact of expertise and alexithymia on the emotions detected during the fruition of Divina Commedia proposed in the two MOFs, the results of the *t*-test showed that concerning reading MOF, the LS expressed more JOY than the SS (t = −0.2834, $p = 0.006$ (Figure 2), while in the listening MOF, the AOTs participants expressed more NEUTRAL emotion than the NAs (t = 2.055, $p = 0.043$) (Figure 3).

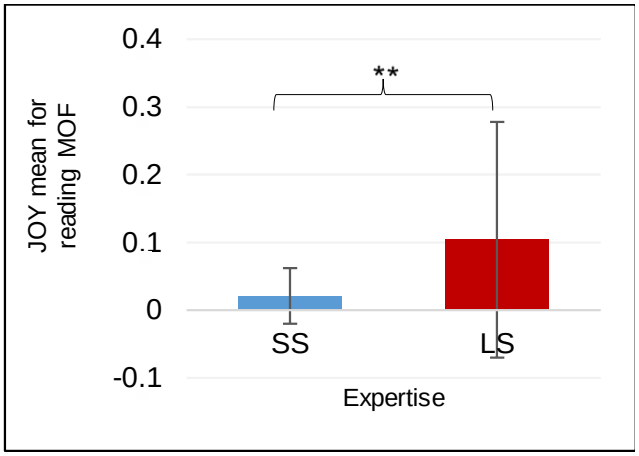

Figure 2. Graph representing the significant difference between Literature (LS) and Scientific (SS) students for JOY emotion resulting from the *t*-test for independent groups analysis. ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

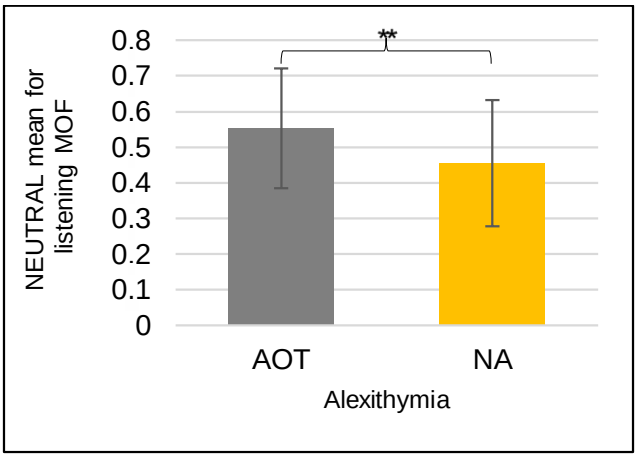

Figure 3. Graph representing the significant difference between participants with alexithymia or alexithymia traits (AOT) and non-alexithymic (NA) students for NEUTRAL emotion during listening modality of fruition (MOF) resulting from the *t*-test for independent groups analysis. ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

3.1.2. Impact on Self-Reported Perception

Concerning subjective perception data about reading MOF, the LS expressed more POSITIVITY than the SS group (t = −2.263, $p = 0.027$, Bonferroni adjusted p value = 0.054) [85] (Figure 4). Furthermore, AOTs perceived more INTENSITY towards the listening modality t =2.589, $p = 0.012$, Bonferroni adjusted p value = 0.036 [85] than NAs (Figure 5).

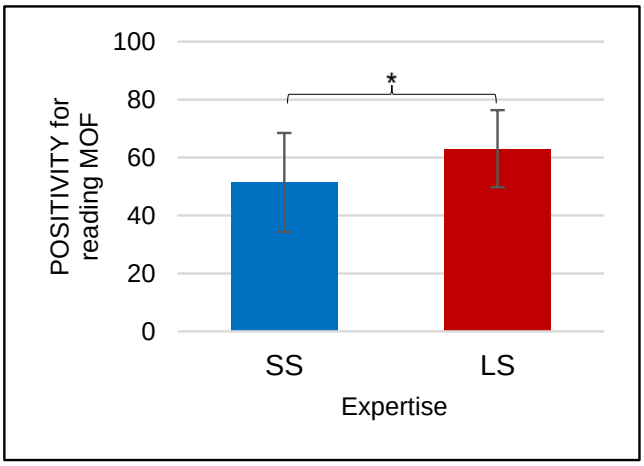

Figure 4. Graph representing the statistically significant difference between literature (LS) and scientific (SS) students for POSITIVITY self-reported subjective perceptions during reading modality of fruition (MOF) resulting from the *t*-test for independent groups analysis. * $p \leq 0.05$. Bars describe means, and error bars describe standard deviations.

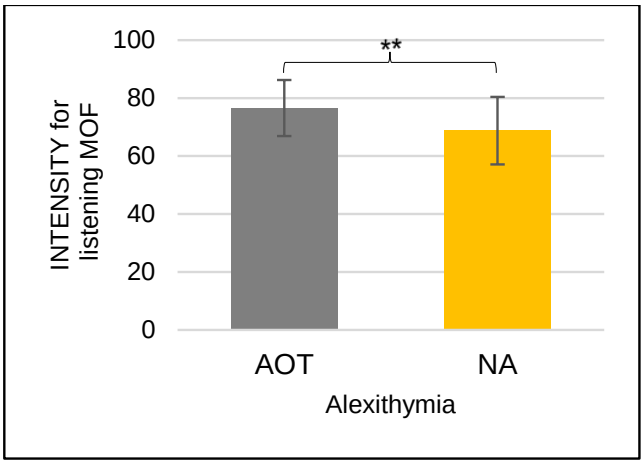

Figure 5. Graph representing the statistically significant difference between participants with alexithymia or alexithymic traits (AOT) and non-alexithymic (NA) for arousal INTENSITY self-reported perception during listening modality of fruition (MOF) resulting from the *t*-test for independent groups analysis. ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

Pearson's correlations analysis showed a positive relationship between the level of alexithymia and both perceived pleasantness (r = 0.28, $p = 0.05$) and intensity (r = 0.39, $p = 0.001$) during the listening MOF. Finally, Simple regression analysis used to determine the causal relationship between independent and dependent variables showed that in our experimental sample, the level of alexithymia is a moderate predictor of the intensity when listening to the divine comedy (R = 0.329, $R^2 = 0.108$, $p = 0.012$) (Figure 6).

3.2. How Encoded Emotions and Self-Reported Perception Vary between Groups According to the Structure (Cantica) and the MOF (Listening/Reading) of the Divine Comedy

3.2.1. Emotions Variations

Investigation of interactions between CANTICA × MOF × GROUPS on FEAR by ANOVA analysis revealed a statistically significant interaction among CANTICA and EXPERTISE variables (F (2,72) = 3.868, $p = 0.024$, $\eta_p^2 = 0.097$). Duncan's post hoc showed that, only within the LS group, Inferno revealed statistically significant greater FEAR than Purgatorio ($p = 0.025$) and Paradiso ($p = 0.010$) (Figure 7).

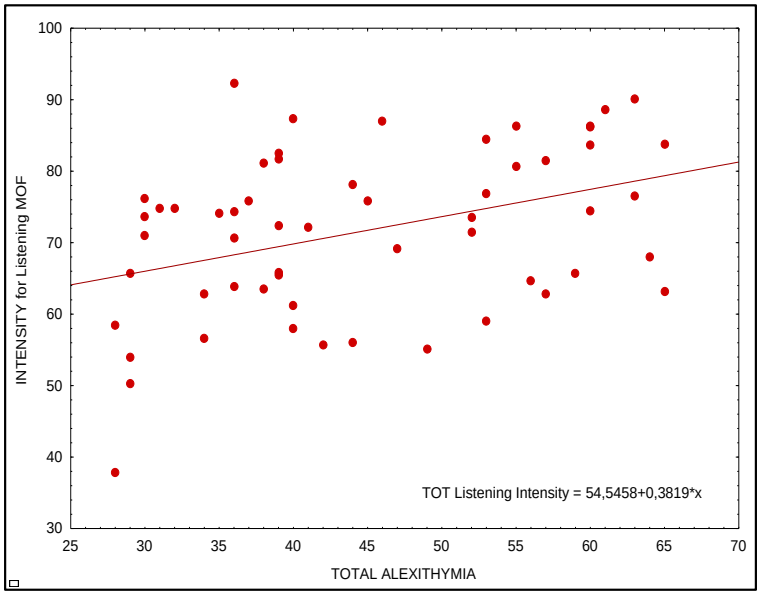

Figure 6. Scatterplot of arousal INTENSITY during listening MOF as predicted by alexithymia.

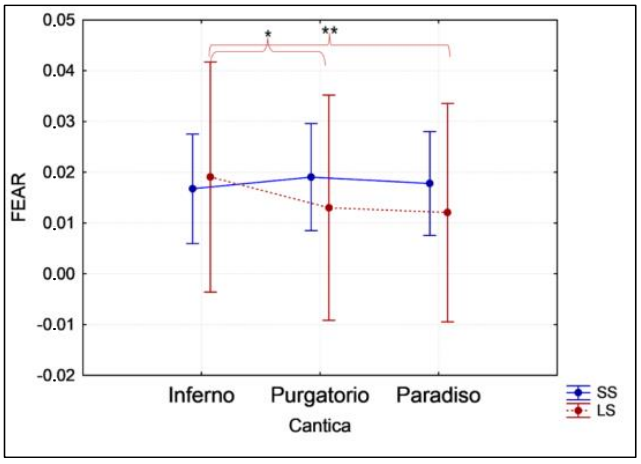

Figure 7. Graph representing the interaction between the factors CANTICA (Inferno, Purgatorio, Paradiso) and EXPERTISE resulting from the ANOVA analysis for FEAR. Vertical bars denote a 0.95 confidence interval. * $p \leq 0.05$; ** $p \leq 0.01$.

Concerning JOY, CANTICA × MOF × EXPERTISE, ANOVA results showed that exposure to listening versus reading MOF elicits greater JOY overall (F (1,24) = 5.6645, $p = 0.025$, $\eta_p^2 = 0.190$) (Figure 8). Duncan's post hoc on the statistically significant interaction in ANOVA among MOF and EXPERTISE variables (F (1,24) = 6.5001, $p = 0.017$, $\eta_p^2 = 0.213$) showed that LS manifest greater JOY for listening MOF in both within and between L/S groups ($0.002 < p < 0.016$) (Figure 9).

3.2.2. Self-Reported Perception Variations

Considering the subjective perception data, ANOVA conducted on PLEASANTNESS showed a statistically significant difference for the CANTICA variable (F (2,110) = 4.200, $p = 0.017$, $\eta_p^2 = 0.070$), from post hoc analysis it emerged that Inferno was considered more pleasant than Purgatorio ($p = 0.001$) (Figure 10).

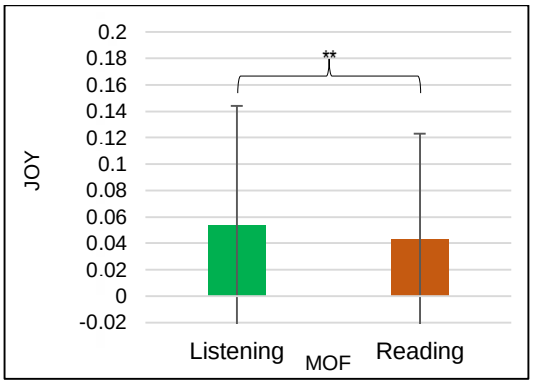

Figure 8. Graph representing the statistically significant difference between listening and reading modality of fruition (MOF) for CANTICA × MOF × EXPERTISE ANOVA for JOY ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

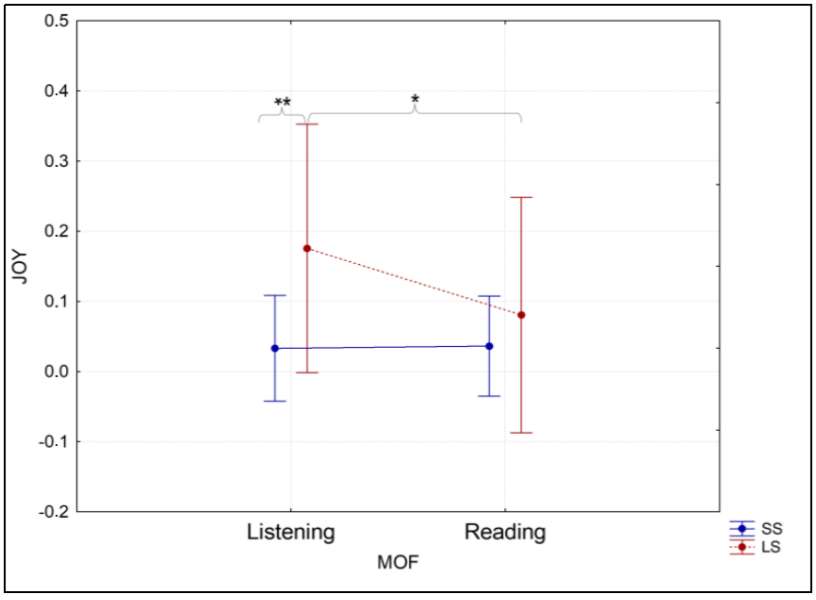

Figure 9. Graph representing the significant interactions among the factors modality of fruition (MOF) and EXPERTISE (Scientific student-SS; Literature student-LS) resulting from the CANTICA × MOF × EXPERTISE ANOVA analysis for JOY. * $p \leq 0.05$; ** $p \leq 0.01$. Vertical bars denote a 0.95 confidence interval.

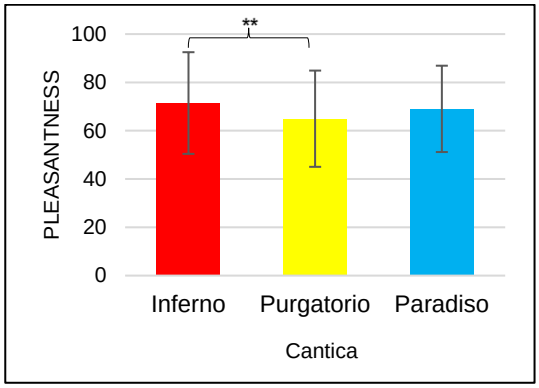

Figure 10. Graph representing the statistically significant difference between the CANTICA variables (Inferno, Purgatorio, Paradiso) resulting from the ANOVA analysis for PLEASANTNESS self-reported perception.** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

The ANOVA test concerning POSITIVITY showed a statistically significant interaction among MOF and EXPERTISE (F (1,55) = 4.5897, $p = 0.036$, $\eta_p^2 = 0.077$). Duncan's post hoc revealed that LSs judge more positively valenced the reading than listening MOF both within ($p = 0.023$) and between ($p = 0.042$; $p = 0.017$) SS/LS groups (Figure 11).

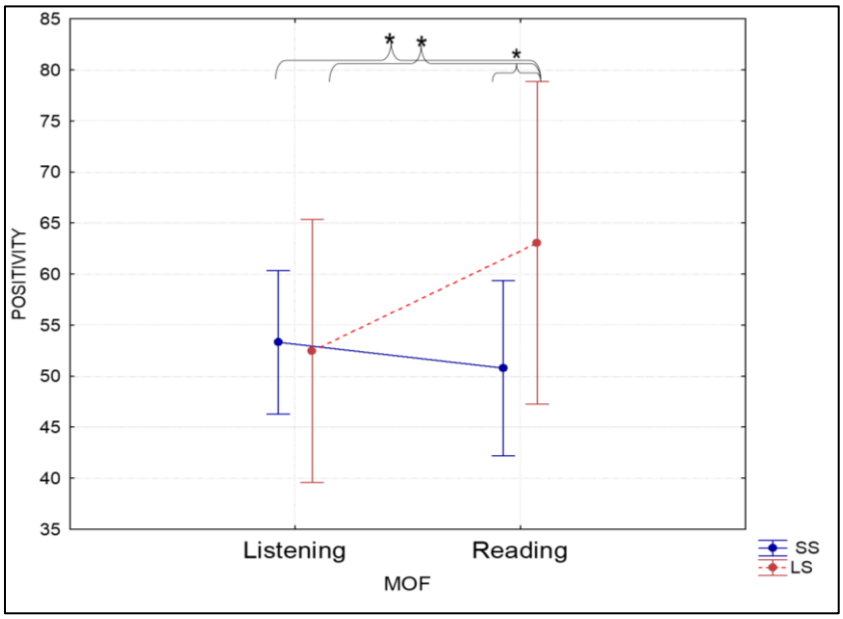

Figure 11. Graph representing the significant interaction among the factors mode of fruition (MOF) and EXPERTISE (Scientific student-SS; Literature student-LS) resulting from the CANTICA × MOF × EXPERTISE ANOVA analysis for valence POSITIVITY self-reported perception. Vertical bars denote a 0.95 confidence interval. * $p \leq 0.05$.

Finally, CANTICA × MOF × group ANOVA for INTENSITY revealed a statistically significant difference for CANTICA (F (2,110) = 4.539, $p = 0.012$, $\eta_p^2 = 0.076$); the Duncan post hoc showed that Paradiso was judged to be less intense than Purgatorio ($p = 0.007$) and Inferno ($p = 0.007$) (Figure 12).

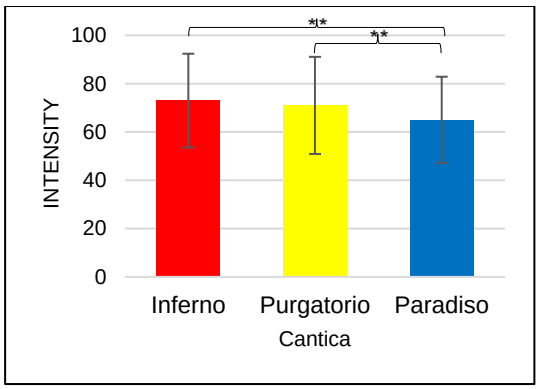

Figure 12. Graph representing the significant difference between the CANTICA variables (Inferno, Purgatorio, Paradiso) resulting from the CANTICA × MOF × EXPERTISE ANOVA analysis for arousal INTENSITY subjective perception. ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

Listening was overall the MOF that conveyed greater arousal intensity to all participants (F (1,55) = 4.874, $p = 0.031$, $\eta_p^2 = 0.081$) (Figure 13).

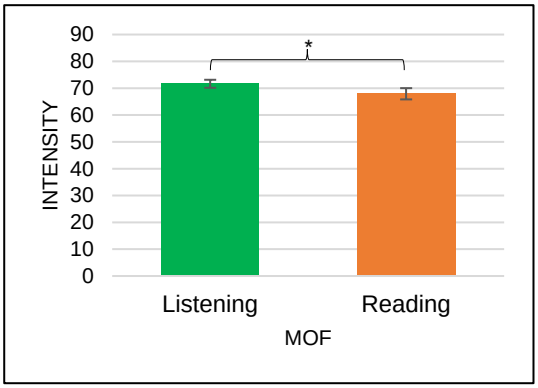

Figure 13. Graph representing the statistically significant difference between modalities of fruition (MOF) resulting from the CANTICA × MOF × EXPERTISE ANOVA analysis for arousal INTENSITY self-reported perception. * $p \leq 0.05$. Bars describe means, and error bars describe standard deviations.

Moreover, the post hoc conducted on ANOVA's significant interaction between MOF × CANTICA (F (2.110) = 4.5011, $p = 0.132$, $\eta_p^2 = 0.075$) showed that listening to Inferno condition, has been perceived to be more intensively arousing than all other conditions (all $p < 0.001$) except for listening to Purgatorio ($p = 0.353$).

3.3. Behavioural Outcomes: Recall

Statistical analysis through Pearson's Chi^2 test, showed a different frequency distribution on the content recall between Cantica: in particular with higher recall rates for Inferno ($Chi^2 = 29.80$, $p < 0.001$).

3.4. How the Characteristics of the Reciting Voice Influence the Expression of Emotions and Self-Reported Subjective Perception between Groups

3.4.1. Influence on Emotions

The results of the *t*-tests showed that when listening to the Divine Comedy performed by an actor and an actress, AOTs expressed greater SURPRISE compared to NAs for the female voice for Inferno (t = 2.135, $p = 0.038$), Purgatorio (t = 2.094, $p = 0.042$), Paradiso (t = 2.045, $p = 0.046$) (Figure 14).

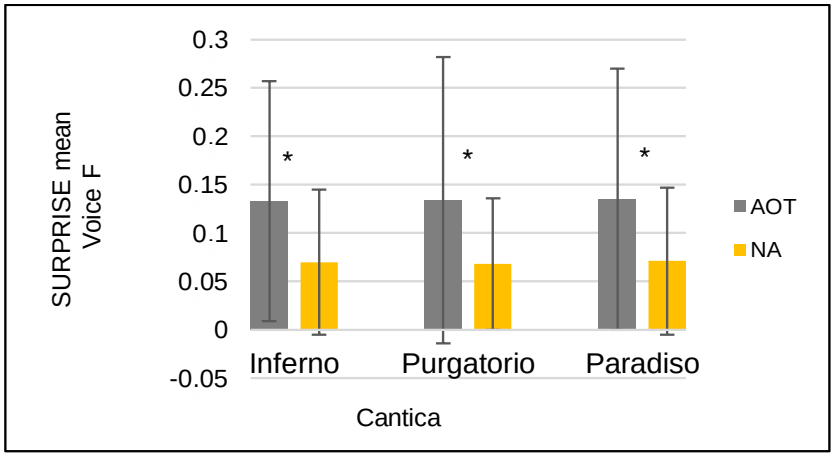

Figure 14. Graph representing the significant differences between participants with alexithymia or alexithymia traits (AOT) and non-alexithymic (NA) for SURPRISE during listening modality of fruition (MOF) for each cantica (Inferno, Purgatorio, Paradiso) resulting from the *t*-tests for independent groups analysis. * $p \leq 0.05$. Bars describe means, and error bars describe standard deviations.

Overall, CANTICA × VOICE × ALEXITHYMIA ANOVA confirmed that AOT perceived statistically significantly more SURPRISE during the overall listening F(1,24) = 7.2531, $p = 0.012$, $\eta_p^2 = 0.232$). (Figure 15).

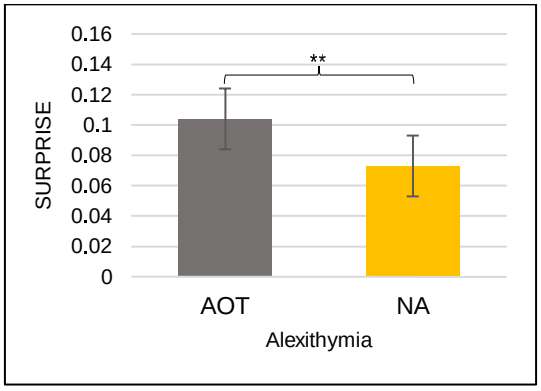

Figure 15. Graph representing the statistically significant difference between alexithymic (AOT) and non-alexithymic (NA) students for SURPRISE emerging from VOICE × CANTICA × ALEXITHYMIA ANOVA analysis. ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

Considering the interaction between CANTICA recited by the two VOICEs and groups, the results of the ANOVA conducted for JOY showed a significant difference between cantica (F (2,48) = 4.251, $p = 0.019$, $\eta_p^2 = 0.150$) and significant interactions among both Cantica × Voice (F (2,48) = 3.270, $p = 0.046$, $\eta_p^2 = 0.119$) and Cantica × Expertise (F (2,48)=3.953, p=0.0257, 0.141). The post hoc on the last interaction shows that Ls manifested significantly more JOY towards Inferno than either Purgatorio ($p = 0.001$) or Paradiso ($p = 0.0024$) (Figure 16).

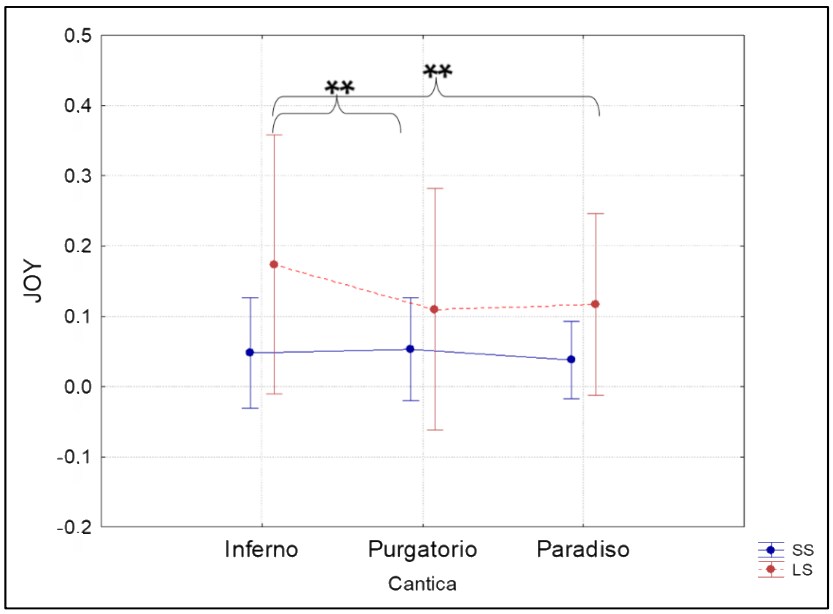

Figure 16. Graph representing the significant interactions among the factors CANTICA (Inferno, Purgatorio, Paradiso) and EXPERTISE (Literature: literature students; Scientific: scientific students) resulting from the CANTICA × VOICE × EXPERTISE ANOVA analysis for JOY. ** $p \leq 0.01$. Vertical bars denote a 0.95 confidence interval.

Regarding NEUTRAL emotion, ANOVA results showed a statistically significant interaction among CANTICA × VOICE × EXPERTISE, (F (2,48) = 3.377, $p = 0.044$, $\eta_p^2 = 0.121$). Duncan's post hoc results (significant only within the L group) are shown in Figure 17.

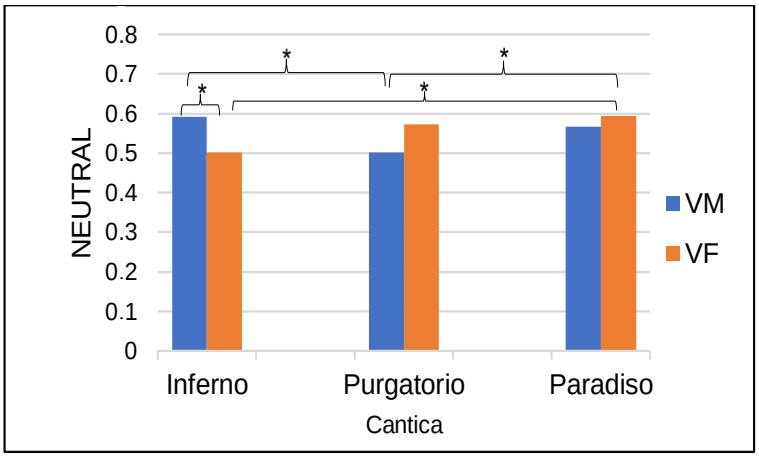

Figure 17. Graph representing the within L students group Duncan's Post hoc results calculated on the statistically significant interaction among the factors CANTICA (Inferno, Purgatorio, Paradiso), VOICE (F: Female; M: Male) and EXPERTISE (L: Literature students; S: Scientific students) resulting from the ANOVA analysis for NEUTRAL. * $p \leq 0.05$; Bars describe means, and error bars describe standard deviations.

Concerning DISGUST, the ANOVA performed on the CANTICA × VOICE × EXPERTISE showed a statistically significant difference between Cantica (F (2,48) = 4.289, $p = 0.019$, $\eta_p^2 = 0.151$). Duncan's Post hoc revealed that Purgatorio is more disgusting than Paradiso regardless of the group ($p = 0.039$) (Figure 18).

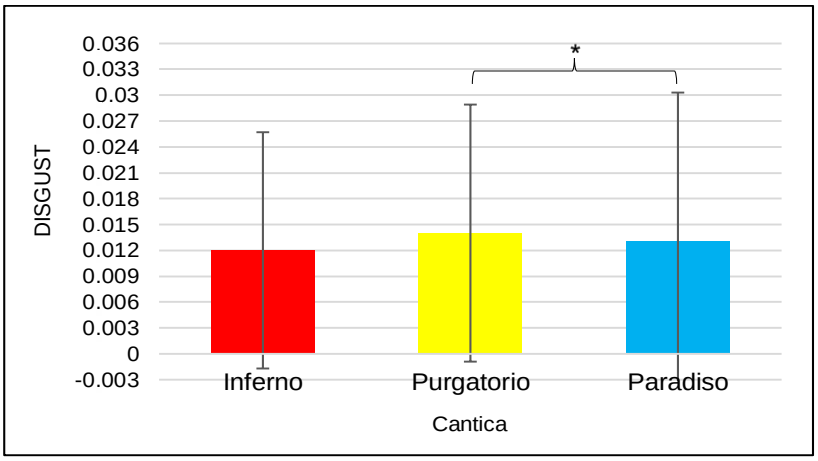

Figure 18. Graph representing the statistically significant difference among the levels of the variable CANTICA (Inferno, Purgatorio, Paradiso) resulting from the CANTICA × VOICE × EXPERTISE ANOVA analysis for DISGUST. * $p \leq 0.05$. Bars describe means, and error bars describe standard deviations.

Concerning SADNESS, the CANTICA × VOICE × ALEXITHYMIA showed a statistically significant difference between cantica (F (2,48) = 5.439, $p = 0.007$). Post hoc showed that overall, Inferno is less sad than Purgatorio ($p = 0.041$) and Paradiso ($p < 0.001$) (Figure 19).

3.4.2. Influence on Self-Reported Perception

Concerning subjective perception data, the ANOVA CANTICA × VOICE × EXPERTISE results for PLEASANTNESS showed a statistically significant difference between the cantica factor (F (2,110) = 5.053, $p = 0.007$, $\eta_p^2 = 0.084$). Duncan's post hoc revealed that Inferno was more liked than Purgatorio ($p = 0.009$) (Figure 20).

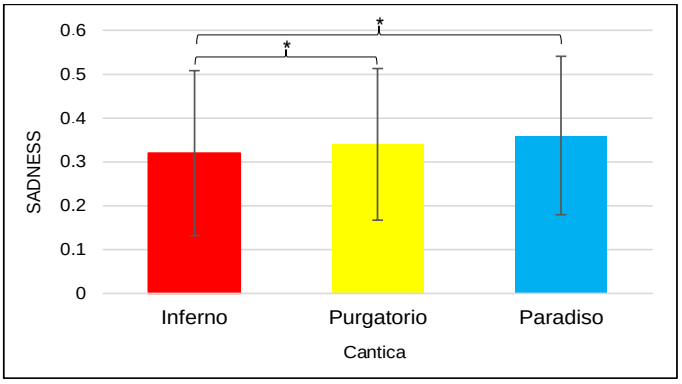

Figure 19. Graph representing the statistically significant differences among the levels of the variable CANTICA (Inferno, Purgatorio, Paradiso) resulting from the CANTICA × VOICE × ALEXITHYMIA ANOVA analysis for SADNESS. * $p \leq 0.05$. Bars describe means, and error bars describe standard deviations.

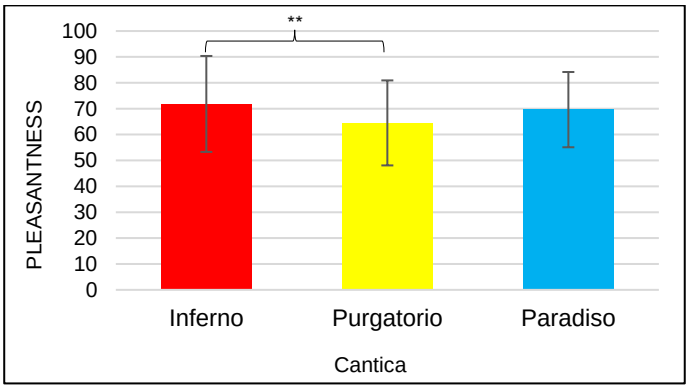

Figure 20. Graph representing the statistically significant difference between variable CANTICA (Inferno, Purgatorio, Paradiso) resulting from the CANTICA × VOICE × EXPERTISE ANOVA analysis for PLEASANTNESS self-reported perception. ** $p \leq 0.01$. Bars describe means, and error bars describe standard deviations.

On the other hand, the post hoc performed on the significant CANTICA × VOICE interaction (F (2,110) = 7.8006, $p = 0.0006$, $\eta_p^2 = 0.124$) showed that Purgatorio recited by a female voice is rated less pleasant compared to all the other conditions ($0.001 > p < 0.02$). At the same time, Paradiso was preferred when recited by a female voice ($p = 0.048$) compared to a male voice. Inferno appeared the only cantica that did not differentiate pleasantness in listening according to the gender of the narrating voice ($p = 0.933$) (Figure 21).

Regarding the perceived arousal INTENSITY, the CANTICA × VOICE × EXPERTISE ANOVA showed that the female voice is overall perceived statistically significantly more intensely than the male voice (F (1,55) = 31.514, $p < 0.0001$, $\eta_p^2 = 0.364$) (Figure 22 left).

Moreover, post hoc calculated on the statistically significant difference between Cantica (F (2,110) = 13.164, $p < 0.0001$) showed that Paradiso is perceived as less intense than other cantica ($p < 0.0001$, $\eta_p^2 = 0.193$) (Figure 22 right).

While post hoc conducted on CANTICA × VOICE significant interactions (F (2,110) = 8.979, $p = 0.0002$, $\eta_p^2 = 0.140$) showed that globally, Inferno recited by a female voice is perceived statistically more intensely than the other cantica and voices ($p < 0.001$). On the other hand, Paradiso recited by a male voice was perceived statistically less intensely than the different cantica–voice combinations ($p < 0.001$).

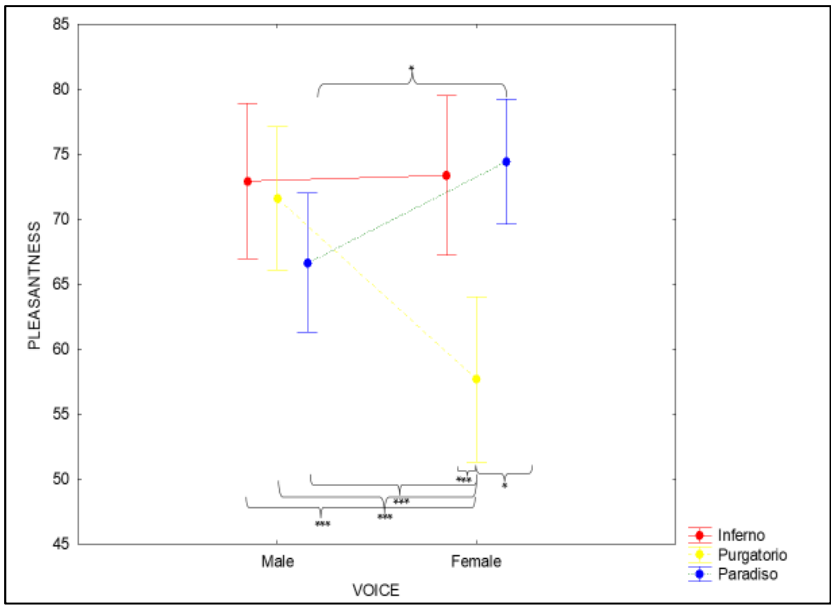

Figure 21. Graph representing the statistically significant interaction among the factors CANTICA (Inferno, Purgatorio, Paradiso), VOICE (Female; Male) resulting from the CANTICA × VOICE × EXPERTISE ANOVA analysis for PLEASANTNESS self-reported perception. * $p \leq 0.05$; *** $p \leq 0.001$. Vertical bars denote a 0.95 confidence interval.

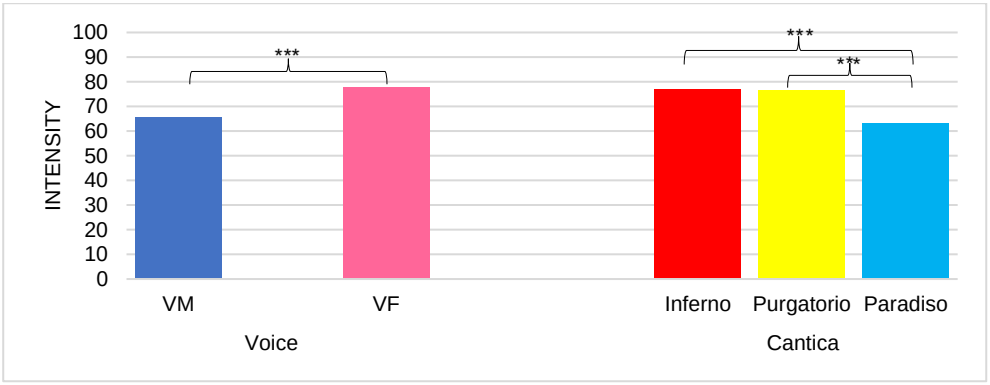

Figure 22. Graph representing results from the CANTICA × VOICE × EXPERTISE ANOVA analysis for arousal INTENSITY self-reported perception. On the left, the statistically significant difference between variable VOICE (VM: Voice Male; VF: Voice Female); on the right, the significant differences between variable CANTICA(Inferno, Purgatorio, Paradiso) *** $p \leq 0.001$. Bars describe means, and error bars represent standard deviations.

4. Discussion

Observing the general comparison according to expertise, it becomes clear that LS manifest more JOY and POSITIVITY towards the reading MOF than SS (Figures 2 and 4). This could be due to the generally greater familiarity with the artistic stimulus (Divina Commedia) in this group based on the expertise, which could lead to less detachment towards the text as suggested from a purely literary perspective by Nabokov [86], who observes that "Curiously enough, one cannot read a book; one can only re-read it. A good reader, a major reader, and an active and creative reader is a re-reader. I shall tell you why. When we read a book for the first time, the very process of laboriously moving our eyes from left to right, line after line, page after page, this complicated physical work upon the book, this stands between us and artistic appreciation". From a cognitive perspective, Nabokov's interpretation is ideally in line with the 'mere exposure effect' whereby repeated exposure to a stimulus results in more favourable evaluations [87,88],

probably due to the greater fluency the perceiver can process an object [89]. To address this possible explanation of expertise effects in our biosignal data for positive emotion (JOY) and positive valence (POSITIVITY), we can refer to the study of Winkielman and Cacioppo [90]. These researchers assessed participants' affective responses to fluent stimuli with facial electromyography (EMG). The EMG is based on the observation that positive affective responses increase activity in the region of the zygomaticus major ('smile muscle'), while negative affective responses increase activity in the area of the corrugator supercilium ('frown muscle'), e.g., [91,92]. As expected, high fluency was associated with increased activity of the zygomatic region (indicative of a positive effect) but not with the movement of the corrugator region (indicative of a negative affect). Presumably, considering our data, L students perceive the positive affect transmitted by the fluency of processing text as their response to Dante's tercets, resulting in more positive evaluations decoded here as JOY and POSITIVITY. Opposite results and interpretations are found in the study conducted by Leder and colleagues [93] investigating through self-reported measures and facial electromyography (EMG) how art expertise modulates the effect of positive and negative works of art on aesthetic and emotional responses in art and non-art students. Authors observe that expertise in emotional response to aesthetic stimuli favours a mode of detachment that attenuates the impact of emotional content on aesthetic evaluation and its physiological correlates. Cartocci and co-workers [29], in line with Leder, in a study investigating different cognitive and emotional neurophysiological responses via biosensors (EEG, GSR) to listening to extracts from the Divine Comedy in literate and non-literate students, suggest an expertise-specific emotional attenuation in the experts towards exposure to poetry. However, such findings were circumscribed to the listening to the acting voice and not in the processing of reading the text, laying the foundation for the present study.

In the comparison, based on the presence of AX, on the other hand, it emerges that in the most unexpected condition (listening to the Divina Commedia as opposed to reading), the AOT group tended to manifest significantly more NEUTRAL emotion (Figure 3) than the NA group, possibly indicating a lack of emotional response [94]. This could be due to the tendency of alexithymic subjects to use expressive suppression as an emotional regulation strategy, possibly stemming from a lack of understanding of their emotions [95]. Furthermore, the higher perceived arousal INTENSITY during listening compared to NA (Figure 5) would seem to be in line with the theory of hyperarousal in alexithymia, which posits that alexithymia is related to higher tonic levels of sympathetic activity and sympathetic reactivity [96], in practice a higher emotional reactivity [97]. Empirical studies have found support for this hypothesis in the visual [98], olfactory [99] and haptic [100] perception of emotions. Our results could provide a contribution to the hyperarousal theory in the auditory modality. Such a hypothesis was supported by our correlation and regression analysis results (Figure 6), showing that the level of alexithymia during listening may predict the intensity the participant manifests. From an art-therapeutic perspective, we could also hypothesize that listening to poetry can, unlike the text, make the alexithymic subject perceive more intensity, and this poetry pattern can be evaluated positively within an art therapy treatment for alexithymia (for art therapy in alexithymia see [101,102]).

In fact, considering that experiential avoidance may be the mechanism (mediating variable) by which alexithymia influences emotion dysregulation [103], one could structure a sort of exposure therapy intervention [104] on listening to poetry to assess a modulation in both self-reported and neurophysiological response. Or, extracts from the Divina Commedia, could be used as part of both individual and group psychotherapeutic poetry interventions [105,106]. Clearly, this interpretative hypothesis should be confirmed by physiological data on the activation of the sympathetic system during a randomized controlled trial combined with additional psychodiagnostic assessments.

FEAR has been one of the most influential emotions in humanity's history [107] and received more scientific attention than any other emotion [108]. Ethologists define fear as a motivational state aroused by specific stimuli that gives rise to defensive behaviour or

escape [109]. Already Darwin, at the end of the 19th century, identified fear by defining it as 'states of mind' that we have inherited from our mammalian ancestors by virtue of having inherited certain characteristics of their nervous system [11]. Five centuries before Darwin, Dante Alighieri drew on at least twenty Italian words and expressions to refer to fear. In the Divina Commedia, the word fear appears, in fact 18 times in Inferno, 9 in Purgatorio and 3 in Paradiso. The frequency of use and its numerology indicate that Dante intentionally chooses fear throughout the poem [110]. Especially in Inferno cantica, therefore, the supreme poet's intent seems to be to trigger fear in the reader, an intent captured and made manifest by L students who show more fear for Inferno than for Purgatorio and Paradiso. In contrast, for S students, no significant differences emerge for this emotion (Figure 7). Following the path of experience, therefore, it is always the in-depth knowledge of the text that allows us to grasp the poet's emotional communicative intent and what he first experienced since, as Rea reports [111], Dante's salvific journey begins precisely through fear. In fact, everything begins with the fear experienced in the forest at the beginning of Inferno. For Dante, recounting his extraordinary otherworldly experience means, before anything else, to relive that anguish (Inf. 1.4-6: "*Ahi quanto a dir qual era' cosa dura/esta selva selvaggia e aspra e forte,/che nel pensier rinova la paura*" (Ah, it is hard to speak of what it was/that savage forest dense and difficult/which even in recall renews my fear). Additionally, we would add, make it come vividly alive for the most passionate readers. Moreover, it is interesting to observe how fear is not modulated by the mode of fruition but only by the structure of the Divina Commedia. This latter aspect does not appear on the other hand, from the results that emerged for the emotion JOY, which is overall manifested in the participants more during the listening than during the reading MOF (Figure 8), whereas, considering the expertise, L students express significantly more JOY towards listening than reading the text both within and between L/S groups (Figure 9).

JOY is often used interchangeably with happiness [112]. Experiences of positive emotion are central to human nature and contribute richly to the quality of people's lives [113,114]. Although JOY appears to be essential to the human condition [115] and despite the apparent importance of JOY, it seems to be the least studied of the positive emotions [116], although research on emotions has grown in recent decades [117]. The latest emotion studied but the first to appear if we consider that some experimental data [118,119] indicate that infants smile—and perhaps feel JOY—in the first few days of life. Moreover, within the first few days of life, human neonates can distinguish between expressions of happiness, sadness, and surprise [120], as Panksepp notes [121], supported by evidence showing that the capacity for human laughter preceded the capacity for speech during the evolution of the brain [122], neural circuits for laughter (and so of joy) exist in very ancient regions of the brain. Moreover, behavioural studies have demonstrated that new-born infants prefer human voices to non-vocal auditory stimuli [123], and when presented with vocal expressions with a range of emotional prosodies (happy, angry, sad, neutral), new-borns showed an increase in physiological responses following happy prosody [124]. The evidence described so far would seem to lend support to the ancestral capacity of eliciting greater joy during listening than reading MOF. This hypothesis could be further supported by considering the theory of the oral origin of poetry [32,125]. One might speculate that the greatest joy shown in listening to the Divina Commedia might be due to an innate human emotional reaction, sensitivity to vocal auditory stimuli and the oral transmission present at the origins of Western poetry (e.g., [35]). This sensitivity to vocal interpretation may be more pronounced in Ls than in Ss again because of their previous exposure to the artistic stimulus. One could hypothesize that exposure to the text, and prior knowledge in one sensory modality, may increase neuroaesthetic perception towards the same stimulus expressed in another sensory modality as a kind of non-contingent cross-modal emotional correspondence according to the characteristics of the groups (see for details on cross-modal correspondence [126]). However, this interpretative hypothesis needs further investigation to be confirmed, especially in learning.

Considering the subjective value attributed to the verses, the results obtained for the VALENCE and INTENSITY attributed to Dante's terzas show that expertise only influences the first variable. In fact, the Ls attribute more positive valence to the reading than to the listening mode both within and between groups (Figure 11). It is a predictable result and in line with the JOY expressed in response to the text by Ls, given that joy is considered a specific and distinct positive emotion [115].

Focusing on arousal (intensity), it is interesting to note that this does not seem to depend on experience but on the structure of the work and the MOF. Indeed, Inferno is perceived more intensely than Purgatorio and Paradiso (Figure 12). This could be due to the greater recognition of the *cantica* in all participants and the theme of the proposed verses that vividly describe the tormented love between Lancelot and Guinevere. Furthermore, the significantly higher declared intensity for listening than reading (Figure 13) could result from the predisposition to listen to the human voice, a critical skill for survival and social communication [123,127,128]. Finally, the preference for recited Inferno and the predisposition to listen to the human voice seem to be synthesized in the self-report evaluation. In fact, listening to Inferno is perceived as the most intense concerning the other cantica and MOFs except for recited Purgatorio, where no differences are observed. This could be due to the appearance of Beatrice and the force of her direct exclamation, "*Guardaci ben! Ben son, ben son Beatrice*!" ("Look here! For I am Beatrice, I am!"), and the poet's subsequent shame.

Results, moreover, suggest that Inferno is significantly more PLEASANT than Purgatorio, while there is no difference with Paradiso both in the analysis comparing MOFs and, in the analysis comparing acting voices (Figure 10). This lack of differences with Paradiso could be due precisely to the peculiarity of the last canto of Divina Commedia. Here, it is Dante himself who is unable to understand, who strives to find a rational explanation for the mystery of the incarnation in the divine and tells the reader how he lacks the strength to continue to understand and how divine love has appeased his will to know " . . . *.l'amor che move il sole e l'altre stelle*" (" . . . the Love that moves the sun and the other stars"). Perhaps it is precisely the incomprehension that Dante conveys to the reader that makes paradise non-comparable in terms of self-reported perceptions because the reader/listener fully experiences the 'aesthetic trance' [129] of the supreme poet. Moreover, in line with previous work of the group [29], the greater appreciation of Inferno compared to Purgatorio can be read in the light of the theory of fluency in aesthetics that predicts higher liking linked to higher recognition of the stimulus [130].

Let us now focus more on voice acting characteristics' effect on the manifestation of emotions and perception in the experts or alexithymic listeners.

Considering the 7 emotions analysed, it emerges that for JOY, listening to Inferno elicits a more significant reaction than listening to Purgatorio and Inferno within the L group (Figure 16). This result perfectly aligns with the first analysis showing that L manifests significantly more joy for listening than for the text (Figure 9) both within and between expertise groups. These results specifically maintain a pattern of appreciation in listening to the Cantica, showing that listening to Inferno induces greater joy than Purgatorio and Paradiso.

The emotion of DISGUST has frequently been implicated in the social context—it appears to serve as an affective mechanism for tracking instances of negative social value, eliciting revulsion and desires for social distance [131,132], outlined the role of disgust in shrinking the moral circle.

Our results showing that the participants manifest more DISGUST towards Purgatory than towards Paradiso (Figure 18) may be due to a social detachment on the part of the listener from what is /declaimed or written in Purgatorio's terzas. The verses in question concern, once again, Beatrice's improvers to Dante for not recognising her. It almost seems as if the listener, more involved in listening to the inferno where the love story between Lancelot and Guinevere is described, or rapt in the contemplative detachment of Paradiso, becomes disgusted with Dante's attitude towards Beatrice, inhibiting the

listener's mentalization of the poet. Mentalizing refers to the processes by which we perceive an agent as possessing a mind [133]. Moreover, is the process by which we make sense of each other and ourselves, implicitly and explicitly, in terms of subjective states and mental processes [134]. Thus, one might hypothesise that in listening to Purgatory, the participants detach themselves from the mental interaction that the Poet manages to create with the work user.

Voice characteristics seem to significantly influence NEUTRAL emotion towards auditory stimulation (Figure 17). In fact, Inferno recited by a female voice is less neutral than the male recitation. This result can be explained considering that it is more common to hear Inferno recited by a male voice "https://www.raiplay.it/collezioni/dantealighieri/divina-commedia/divina-commedia (accessed on 6 March 2023)" and by results showing that the Inferno is overall the most recognized cantica. Furthermore, the results show that the female recitation of Paradiso elicits more neutrality than Inferno's and the male recitation of Purgatorio. It could be assumed that as the canto of Paradiso is the least recognised among the participants (and the least studied in schools), the uncommon female recitation makes it almost cathartic, beyond the identifiable earthly emotions. It is interesting to note that the modulation dynamic of neutrality between voice characteristics and cantica only occurs within the L experts, who, again, seem to be more sensitive to the sensory attributes of the auditory poetic stimulus from the perspective of an acquired sensitivity due to the experience of processing the poem.

Curiously, about the different perceived PLEASANTNESS between the cantica according to the acting voice, Paradiso recited by a female voice appears to be the most appreciated among the participants (Figure 21), whereas Paradiso in relation to the other cantica does not differ if the characteristic of the reciting voice is not considered (Figure 20). This is perhaps due to an unconscious transport of the listener who is accompanied through the cathartic tercets of the last canto by a female voice. Just as Dante, in parallel, has been accompanied and protected throughout his journey by Beatrice, with whom he can overcome his fear of hell until he discovers the beauty of *vero amore* (real love) [135]. It is the female voice (like the maternal voice in growing) that guides Dante/the listener through the adversities of the Divina Commedia/Life (for an extended exploration of the female figure of Beatrice, see [136,137]). Speculating again, as mentioned before, we could say that the less pleasantness found in response to Purgatorio recited by a female voice compared to the male recitation could be due precisely to the direct criticism that the Woman makes to Dante/listener. This interpretation could also be supported by the significantly greater INTENSITY expressed in general towards the female voice (Figure 22 left) and the greater INTENSITY perceived towards the female performance of Inferno and Purgatorio compared to the male interpretations, while considering the recitation in general, without the characteristics of the acting voice, listening to Paradiso verses is the least intense perceived compared to the other verses (Figure 22 right). It seems that the preference towards Inferno, already widely discussed, is intensified by the interpretation of the female voice. We do not find these differences in Purgatorio, where, as mentioned, Beatrice criticizes Dante, and the listener could withdraw from identifying with the protagonist indifferently.

The results also show that, overall, Paradiso elicits more extraordinary SADNESS in the listener than Purgatorio and Inferno (Figure 19). This climax between cantiche could be explained by the listener's lack of understanding of an ethereal, non-concrete and ultimately unattainable reality (if we consider that Inferno and Purgatorio are more descriptive cantiche anyway). It could be argued that this data shows the listener's lack of liking for Paradiso. In fact, intuitively, positive aesthetic evaluation and the emotional classification of artworks as joyful or affectively positive seem very closely related [138]. However, movies, music, and poems with sad, (i.e., affectively negative content) have repeatedly been reported to be highly appreciated aesthetically. Likewise, Oliver and Bartsch [139] (p. 31) suggested that the "experience of appreciation is often thought to be tied more closely with sad than joyful affect." Many, if not most, poems are "sad" in terms of their emotional content; readers do not just cognitively decode the emotional

context and decipher the emotional expression of poetry, but apparently also genuinely feel the sadness by way of empathy, emotional contagion, identification, or other means of emotional transfer [53,140]. Notably, a rating study of the perception of sad and joyful music excerpts found a significant positive correlation between perceived sadness and perceived beauty [141]. Finally, what Brattico and colleagues effectively propose [142] (p. 2), "tears and joy might co-occur during music listening", we might also imagine applies to the poetry of the Divina Commedia.

While SURPRISE is a common emotion in everyday life, some fundamental characteristics still need to be clarified [143]. Surprise is an emotion arising from a mismatch between an expectation and what is actually observed or experienced in the environment [144]. An expectation is usually thought of as a mental representation of a stimulus or event aroused by some cue or set of cues that has regularly preceded that stimulus or event in the past [145]. Surprise can be seen as an interruption mechanism [146] and motivating people to pay attention to the unexpected stimulus [143].

Previous research into the neural basis of AX has focused chiefly on processing visual emotional stimuli, such as facial or bodily expressions of emotions or emotional pictures and videos. Surprisingly, the impact of alexithymia on the perception of emotional prosody (the melody of speech) has received little attention despite its importance in conveying emotion through the voice in daily conversation [44]. Moreover, a reduced sensitivity to emotional speech prosody in alexithymia was confirmed in a physiological study, in which we additionally observed that alexithymia did not only affect the explicit but also the implicit perception of emotional prosody qualities [147].

It is widely acknowledged that emotions can be communicated through the prosodic features of speech [148], that is, any nonverbal feature, such as pitch, loudness, or rate. For linguists and non-linguists alike, the pitch is the most intuitive and salient gender difference in the voice [149], and gender differences in the agent form the backdrop for much research in phonetics broadly [150].

The anatomy–physiological sexual dimorphism in the vocal apparatus of females and males [151] results in several acoustical differences between female–male adults speakers' voices and, in particular, the mean fundamental frequency of phonation (F0) [152,153]. F0 represents the oscillatory frequency of the vocal cords expressed in Hertz (Hz) and is closely related to *pitch*, defined as our perception of fundamental frequency [154]. Typically, fundamental frequencies lie roughly in the 80 to 450 Hz range, where males have lower voices than females [155]. Interesting studies on the vocal processing of emotions using acoustic parametric biosignals such as F0, show, anger, fear and happiness have all been linked to a high F0 mean and variability [156]. What has been reported so far could be an interpretative support of our data concerning surprise.

In fact, the results show significant differences exclusively during vocal fruition of the Divina Commedia and related to the presence of alexithymia or alexithymic traits. The specific overall AOT shows greater surprise both during the listening (regardless of voice characteristics) of the verses (Figure 15) and during the female interpretation of all canti than NAs (Figure 14). Considering that the Divina Commedia is narrated in the first person by a *male* (Dante Alighieri) and that male audio and video poem's interpretations are generally more common ("https://www.raiplay.it/collezioni/dantealighieri/divina-commedia/divina-commedia (accessed on 6 March 2023)", hearing a *female* voice decanting the poem could, on average be perceived as a bizarre, unexpected event. However, it could be hypothesized that such an unexpected event elicits surprise only in the AOT group. Contrary to reduced sensitivity to prosodic emotional in alexithymics [147], in our experimental sample the opposite seems to be the case. In fact, NAs do not present any surprise concerning the gender of the acting voice. Two interpretative hypotheses could be put forward:

(i) AOTs show greater attention to the signifier than to the meaning of the poem (ii) listening to Dante's poem, especially if interpreted by a female voice, succeeds in dis-

tracting alexithymics from the emotional detachment and reduced capacities for emotionalising they may manifest [157,158], offering a sort of art-therapy for emotional disorders.

Clearly, all these interpretative hypotheses should be tested in specific clinical studies. However, these results suggest that listening to poetry affects individuals with deficits in processing and expressing emotions differently.

5. Conclusions and Limits

Based on the experimental objectives outlined at the end of the introduction, the conclusions are summarised below:

I The comparison between MOF and the structure of the Divina Commedia concerning the groups (LS-SS; AOT-NA) shows how the participants' expertise influences the emotions of JOY and FEAR: LSs show more JOY and FEAR towards the poem. Whereas AOTs express more NEUTRALITY towards listening than NAs. In general, listening to MOF is considered more INTENSE, while PLEASANTNESS is not influenced by the mode but by the structure of the work. POSITIVITY is modulated by expertise, while arousal INTENSITY is by the alexithymic factor.

II Considering only auditory stimulation and voice characteristics, besides the greater JOY for listening and NEUTRALITY towards the male voice expressed by LSs, SURPRISE is modulated by alexithymia, whereas the structure of the poem modulates DISGUST and SADNESS. Subjectively, when listening, the female acting voice is perceived as more PLEASANT as well as being considered of greatest arousal INTENSITY.

Our study shows how expertise and difficulties in processing emotions play an important role in the enjoyment of poetic art, suggesting that prior knowledge of the artistic work enables a deeper emotional experience with it by assuming learning support. On the other hand, listening to poetry seems to be capable of vibrating the soul strings of subjects with alexithymic traits, offering hints for possible art-therapeutic paths.

Although the work offers significant results, they should be further investigated on a larger sample and through physiological techniques such as electroencephalography and HR-GSR combination, accompanied by additional psychodiagnostic tests.

Concluding, the present study, unique in its use of modern emotional facial recognition technology, demonstrates the emotional impact of ancient and universal poetry on current students during complicated times such as the pandemic.

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Appendix A

Inferno *canto* V Excerpts (vv. 127–138)	**English Translation**
Noi leggiavamo un giorno per diletto	One day we reading were for our delight
di Lanciallotto come amor lo strinse:	Of Launcelot, how Love did him enthrall.
soli eravamo e sanza alcun sospetto	Alone we were and without any fear.
Per più fiate li occhi ci sospinse	Full many a time our eyes together drew
quella lettura, e scolorocci il viso;	That reading, and drove the color from our faces;
ma solo un punto fu quel che ci vinse	But one point only was it that o'ercame us.
Quando leggemmo il disiato riso	When as we read of the much longed-for smile
esser baciato da cotanto amante,	Being by such a noble lover kissed,
questi, che mai da me non fia diviso	This one, who ne'er from me shall be divided
la bocca mi baciò tutto tremante.	Kissed me upon the mouth all palpitating.
Galeotto fu il libro e chi lo scrisse:	Galeotto was the book and he who wrote it.
quel giorno più non vi leggemmo avante	That day no farther did we read therein.
Purgatorio *canto* XXX excerpts (vv. 67–78)	**English translation**
Tutto che 'l vel che le scendea di testa,	Although the veil, that from her head descended,
cerchiato delle fronde di Minerva,	Encircled with the foliage of Minerva,
non la lasciasse parer manifesta,	Did not permit her to appear distinctly,
regalmente nell'atto ancor proterva	In attitude still royally majestic
continuò come colui che dice	Continued she, like unto one who speaks,
e 'l più caldo parlar dietro reserva:	And keeps his warmest utterance in reserve:
-Guardaci ben! Ben son, ben son Beatrice.	"Look at me well; in sooth I'm Beatrice!
Come degnasti d'accedere al monte?	How didst thou deign to come unto the Mountain?
non sapei tu che qui è l'uom felice?-	Didst thou not know that man is happy here?"
Li occhi mi cadder giù nel chiaro fonte;	Mine eyes fell downward into the clear fountain,
ma veggendomi in esso, i trassi all'erba,	But, seeing myself therein, I sought the grass,
tanta vergogna mi gravò la fronte.	So great a shame did weigh my forehead down
Paradiso *canto* XXXIII excerpts (vv. 133–145)	**English translation**
Qual è 'l geomètra che tutto s'affige	As the geometrician, who endeavours
per misurar lo cerchio, e non ritrova,	To square the circle, and discovers not,
pensando, quel principio ond'elli indige,	By taking thought, the principle he wants,
tal era io a quella vista nova:	Even such was I at that new apparition;
veder volea come si convenne	I wished to see how the image to the circle
l'imago al cerchio e come vi s'indova;	Conformed itself, and how it there finds place;
ma non eran da ciò le proprie penne:	But my own wings were not enough for this,
se non che la mia mente fu percossa	Had it not been that then my mind there smote
da un fulgore in che sua voglia venne.	A flash of lightning, wherein came its wish.
All'alta fantasia qui mancò possa;	Here vigour failed the lofty fantasy:
ma già volgeva il mio disio e 'l velle,	But now was turning my desire and will,
sì come rota ch'igualmente è mossa,	Even as a wheel that equally is moved,
l'amor che move il sole e l'altre stelle.	The Love which moves the sun and the other stars.

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