



NEUROAESTHETIC, A BIBLIOMETRIC ANALYSIS

Neuroscience

Arman Yurisaldi
Saleh

Department of Neurology Faculty of Medicine UPN Veteran Jakarta

ABSTRACT

Therapy in the field of neurobehavior is developing rapidly. A new field has emerged that affects the quality of life of patients. The literature review continues to grow. The purpose of this study was to conduct a bibliometric analysis to determine the position of the neuroaesthetic field and the potential for research related to keywords. The method used consists of five steps. This field has the potential to be developed continuously because it has entered into discussions related to behavior and behavior therapy. It is necessary to carry out a bibliometric analysis to broaden a better picture of the neuroaesthetic position. This makes it easier to find topics that are still under-researched.

KEYWORDS

aesthetic, neuroscience, psychology, bibliometric, vosviewer, biblioshiny

INTRODUCTION

Neuroaesthetic is a term that only emerged in 1991. This field is a blend of art with cognitive neuroscience. (Boccia, Barbetti, & Piccardi, 2015; Brattico & Pearce, 2013; Brattico & Varankaitė, 2019; Cattaneo, 2018; Chan, Derby, & Hui, 2017; Journal; Chatterjee, 2006; Chatterjee & Vartanian, 2016; Julia F. Christensen & Gomila, 2018; Chu, Huang, & Ouyang, 2018; Coles, Harrison, & Todd, 2019) There have been many studies related to this. Studies include the effects of artistic activities or performing art assessments on the brain, neurotransmitters related to pleasure that arise during artistic activities, electroencephalography during artistic activities, clinical improvement in neurology and psychiatry case art therapy. (Boccia et al., 2015; Brattico & Pearce, 2013; Brattico & Varankaitė, 2019; Cattaneo, 2018; Chan et al., 2017; Journal; Chatterjee, 2006; Chatterjee & Vartanian, 2016; Julia F. Christensen & Gomila, 2018; Chu et al., 2018; Coles et al., 2019; Fish, 2019; Igaya, P.O'Doherty, & Starr, 2020; Jacobs, 2017; Jiang, Chen, & Xie, 2020; Kandel, 2013; H. Kao, Lam, & Kao, 2018; H. Kao, Zhu, & Chao, 2014; H. S. R. Kao, Xu, & Kao, 2021; Kwok, Bai, & Kao, 2011; Milovanović & Medić-Simić, 2021; Nadal & Skov, 2013, 2015; Nalbantian, 2013; P.Kirsch, Drommelschmidt, & S.Cross, 2013; Sun, Han, & Jiang, 2020; Trojanao, Grossia, & Flashc, 2009; C.-M. Wang & Chen, 2020; T. Wang, Mo, & Ce Mo, 2015; Wassiliwizky, Koelsch, Wagner, & Jacobsen, 2017; Xu, Kao, & Zhang, 2013; Zaidel, 2017) This field is growing, as research by Qiuling Luo et al. showed that the part of the brain that is active when judging works of art is the same part that is active when judging good deeds. (Luo & Yu, 2018)

Even neuroaesthetics has also been related to neuromarketing, meaning that this field is becoming increasingly important and related to industries that produce products that are produced on a large scale. It is necessary to conduct a large-scale exploration in the form of research related to neuroaesthetics. For this purpose, it is necessary to carry out a bibliometric analysis with the keyword "neuroaesthetic".

Through bibliometric analysis, it can be known many things, namely the most researchers in a field, the number of researcher citations, and journals containing research conducted by the most prominent researchers. Cooperation between researchers and the position of a field based on keywords in related fields. The above can help researchers find rare research themes. (Boccia et al., 2015)

Bibliometric analyzes of neuroaesthetics are rare. Anglada – Tort M and Skov M conducted a bibliometric study related to the relationship between aesthetics in science by conducting a study on the website of sciences in the form of 27,159 papers, 45,832 authors and 121 countries. Visualization and bibliometric analysis investigated publication growth, citation analysis, productivity and collaboration increase in aesthetic research, especially in recent years.

The keywords written by the bibliometric writer in this document are aesthetic, bibliometric, neuroscience, psychology and web of science. We performed a bibliometric analysis on the Scopus site because it is a reputable, accurate and wide-ranging database. To our knowledge there has been no bibliometric research conducted on the field of neuroaesthetic. Initial search, found 293 documents. The term neuroaesthetics first appears in the following document.

Table of neuroaesthetics terms appears first in the document.

Writer	Title	Source	Publication Year
Ten Houten	into the wild blue yonder : On the emergence of the ethnonerologies the social science - based neurologies and the philosophy – based neurologies	Journal of Social and Biological Systems, Volume 4, Issue 4, Pages 381 - 408	1991

The purpose of this research is to answer the following questions:

- RQ 1 : How is the trend of neuroaesthetics research based on the number of publications per year.
 RQ 2 : What journals publish the most neuroaesthetics themes?
 RQ 3 : Who is the author of the most published neuroaesthetics.
 RQ 4 : What are the subject areas that contribute to neuroaesthetics.
 RQ 5 : What are the main topics in the field of neuroaesthetics.
 RQ 6 : What are the potential topics in the field of neuroaesthetics.
 RQ 7 : Which country contributes the most research in the field of neuroaesthetics?
 RQ 8 : Which article is the most influential based on the number of citations in the field of neuroaesthetics.
 RQ 9 : How is the thematic map related to neuroaesthetics research.

RESEARCH METHOD

Bibliometric analysis is carried out based on the following steps :

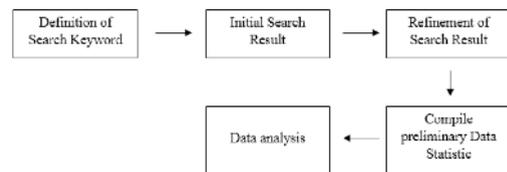


Figure 1 : Five phase of Bibliometric analysis (Garda-Reyes 2015)

Defining the search keyword

This research was conducted on December 2, 2021 using the keyword: neuroaesthetic on the Scopus search engine..

Initial Search Result

Found 289 documents from 1991 – 2021.

Table of Refinement of Search Result

Search Keyword	Number of Scopus documents
(TITTLE-ABS-KEY ("Neuroaesthetics") AND (LIMIT-TO)LANGUAGE, "English"))	293

Refinement of Search Result

After obtaining the initial results, screening was carried out based on the inclusion criteria, namely only English-language documents, then 274 documents were obtained and stored in files with bib and csv extensions. We choose only documents that use English because we don't need to translate

Compile Preliminary Data Statistic

The data obtained were compiled in Mendeley's reference manage software (RMS). Furthermore, the data is analyzed and classified based on the year of publication, author and subject area.

Research trends based on the number of publications per year (Rq1)

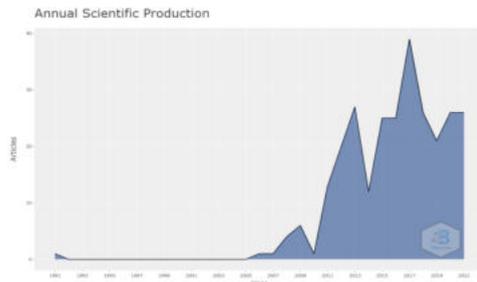


Figure 1. trends in neuroaesthetic research around the world

Publication in the field of neuroaesthetics began in 1991 and then the number of documents decreased. In 2006 there was an increase in 1 document until 2007. There was an increase in 2008 with 4 documents, but it fell again in 2010 (1 document). Furthermore, there were fluctuations with an increasing trend, namely 2011 (13 documents), 2013 (27 documents), 2014 (12 documents), 2015 (25 documents), 2016 (25 documents), 2017 (35 documents), 2018 (26 documents), 2019 (22 documents), 2020 (26 documents), 2021 (29 documents).

From the graph above (figure 1), it appears that the field of neuroaesthetics is an area of interest and research in this field can still be explored in the future.

The journal that publishes the most neuroaesthetics topics (Rq2)

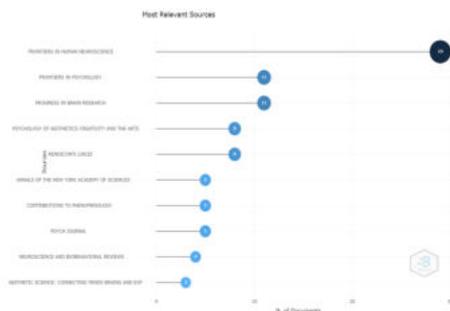


Figure 2. Top ten journals with the most publications in the neuroaesthetic area

The journal that publishes the most neuroaesthetic topics is : Frontiers In Human Neuroscience, Frontiers In Psychology, Progress In Brain Research, Psychology Of Aesthetics Creativity And The Arts, and Rendiconti Lincei (figure 2).

The Journal of Frontiers in Human Neuroscience has so far published 29 documents related to neuroaesthetics. This journal has an H-index of 114, courtesy of Universities and research institutions, Switzerland. Subject areas include medicine (psychiatry and mental health), neuroscience (behavioral neuroscience, biological psychiatry, neurology) and psychology (neuropsychology and physiological psychology), with Publisher media Frontier S.A. This journal is in Q1 with SJR Year 2020 1,13.

In the second place, Frontiers In Psychology has an H-index of 110, with the subject area of psychology at Universities and research institutions, Switzerland, with Publisher media Frontier S.A. this journal level is Q2 with SJR 2020 0.95.

In 3rd place is the Progress In Brain Research Journal with an H-index of 144, located at Universities and research institutions, Netherland. Subject area is neuroscience, publisher Elsevier, this journal has a Q2 level with SJR 1.23 in 2020.

In 4th place is Psychology Of Aesthetics Creativity And The Arts with

an H-index of 51, with the subject areas of arts and humanities (visual arts and performing arts), and psychology (applied psychology, developmental and educational psychology). This journal is at Universities and research institutions, United States, publisher of the American Psychological Association, this journal has a Q1 level with SJR 1.28 in 2020.

In 5th place is P Rendiconti Lincei. has an H-index of 26, with the subject areas of agricultural and biological science, earth and planetary sciences, and environmental science. This journal is located at Universities and research institutions, Italy, with the publisher Springer – Verlog Italia, this journal has a Q2 level with SJR 0.37 in 2020.

Most authors in neuroaesthetics research (Rq3)

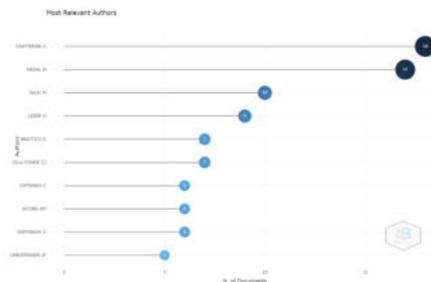


Figure 3. Most authors in the area of neuroaesthetics

The authors of the most neuroaesthetic topics are : Chatterjee A with 18 documents, Nadal M with 17 documents, Skov M with 10 documents, Leder H with 9 documents, and Brattico E with 7 documents (figure 3). The author of most documents related to neuroaesthetics is Chatterjee A, affiliated with the University of Pennsylvania, the documents written by Chatterjee are widely published in the Journal of the Annals of the New Yorik Academy of Sciences.

Next is Nadal M affiliated with the University of The Balearic Islands. Many of the documents written by Nadal are published in the Journal of Frontiers in Human Neuroscience.

The next author is Leder H, affiliated with the University of Vienna, with the dominant document published by Frontiers in Human Neuroscience.

The next author is Jacobs AM, affiliated with Freie Universitt Berlin, whose documents are widely published in the Journal of Frontiers in Human Neuroscience.

The authors in the last 5 are Cela – Conde CJ, affiliated with the University of The Balearic Islands, whose documents are widely published Journal of Rendiconti Lincei

Subject areas or disciplines contributing to neuroaesthetic research (Rq4)

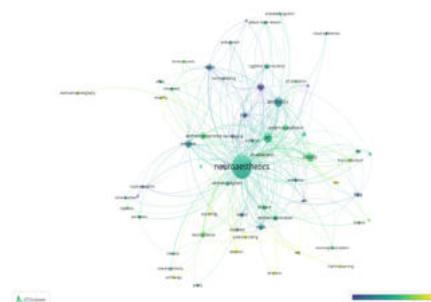


Figure 4. neuroaesthetic subject area by publication

Based on the picture above (figure 4), it appears that the large field of neuroaesthetics is related to fields related to aesthetics, art, beauty, fMRI, emotion, neuroscience, dance, brain, music, and empirical aesthetics. This shows the research journals that have been done. Areas symbolized by smaller circles indicate areas with less research.

Main topics in the research stream in neuroaesthetics (Rq5)

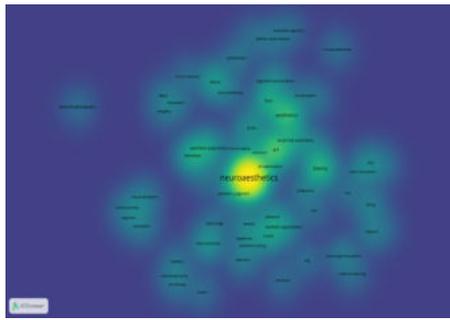


Figure 5. density visualization of scopus. Database using vosviewer

Based on density visualization (figure 5), it appears that areas that can still be developed for research related to neuroaesthetics are: poetry, interdisciplinary, art therapy, neurocognitive poetics, tdcx brain stimulation, electrocnchepalography, neuromarketing, machine learning, visual perception, affect empathy, and visual preferences. These areas appear with a less clear density picture.

Potential topics in the area of neuroaesthetics for future research (Rq6)

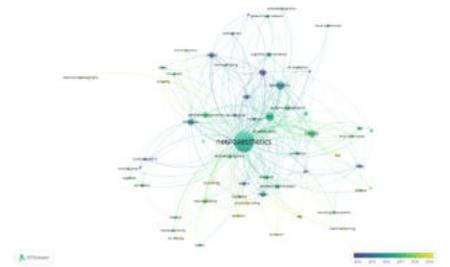


Figure 6. Overlay visualization of scopus. Database using vosviewer

Based on the Overlay visualization image (figure 6), it appears that areas that have an increasing trend related to neuroaesthetics in research in 2018 – 2019 are: TMS, machine learning, eeg, emotions, predictive coding, attention, psychology, empathy, and art therapy.

Table the Result of cluster Analysis

Hal	Cluster	Most Frequent Word	Keyword
1	Cluster 1	Art (33) FMRI (16) Dance (13)	Art (33) FMRI (16) Brain (10) Dance (13) Neuroimaging (5) Default mode network (4) Embodiment (4) Embodied cognition (3) Visual (3)
2	Cluster 2	Neuroaesthetic (173) Neuroscience (11) Attention (5)	Neuroaesthetic (173) Neuroscience (11) Attention (5) Psychology (3) Art therapy (3) Memory (3) Interdisciplinary (3) Poetry (3)
3 3	Cluster 3	Emotions (18) Music (12) Aesthetic appreciation (9)	Emotions (18) Music (12) Aesthetic appreciation (9) Pleasure (7) Reward (6) Preference (5) Predictive coding (3) Dopamine (3)

4	Cluster 4	Beauty (25) Liking (6) Brain stimulation (5)	Beauty (25) Liking (6) Brain stimulation (5) tdcs (5) Medial prefrontal cortex (4) tms (3)
5	Cluster 5	Perception (5) Experimental aesthetic (4) Visual perception (4)	Perception (5) Experimental aesthetic (4) Visual perception (4) Visual art (3) Consciousness (3) Cognition (3)
6	Cluster 6	Aesthetic (29) Empirical Aesthetic (11) Cognitive neuroscience (8)	Aesthetic (29) Empirical Aesthetic (11) Cognitive neuroscience (8) Art perception (3) Vision (3) Visual preferences (3)
7	Cluster 7	Empathy (4) Movement (4) Affect (4)	Empathy (4) Movement (4) Affect (4) Emotion (3) Neuromarketing (3)
8	Cluster 8	Aesthetic experience (14) Aesthetic judgement (6) Aesthetic emotion (3)	Aesthetic experience (14) Aesthetic judgement (6) Aesthetic emotion (3) Mirror neurons (3)
9	Cluster 9	Art appreciation (9) Creativity (6) Evolution (5)	Art appreciation (9) Creativity (6) Evolution (5) Golden ratio (3)
10	Cluster 10	Balance (4) Arts (3) Complexity (3)	Balance (4) Arts (3) Complexity (3)
11	Cluster 11	Neurocognitive poetics (5) Eeg (3) Machine learning (3)	Neurocognitive poetics (5) Eeg (3) Machine learning (3)
12	Cluster 12	Electroencephalography (3)	Electroencephalography (3)

In cluster 1 with the most common words art, FMRI, and dance, the topics discussed are related to neurodevelopmental, aesthetic brain formation, aesthetics related to moving bodies, mechanisms when viewing dances, physical ability on dance perception, FMRI studies when viewing dances, and sensorimotor related aesthetics. while doing artistic activities. (B.Calvo-Merino, C.Jola, & D.E.Glaser, 2008; Cross, Kirsch, & Ticini, 2011; Jang & Pollick, 2011; Miura, Sugiura, & Takahashi, 2010; P.Kirsch, CosimoUrgesia, & S.Cross, 2016; Paterson, 2015; Sumanapala, Kirsch, & Walbrin, 2018)

In cluster 2 the most common words are neuroaesthetics, neuroscience, attention, the topics discussed include: aesthetic marketing, emotions and expressions related to faces, related to music, neuroscience of beauty, tdcx related to increasing creativity, the relationship between art and the brain, neural and biobehavioral functions of human dance, neuroimaging evidence, and art and cognitive neuroscience of vision. (Aldouby, 2019; Brattico & Jacobsen, 2009; Chatterjee & Vartanian, 2014; Julia F Christensen, Cela-Conde, & Gomila, 2017; Conway & Rehding, 2013; F.Christensen & AntoniGomila, 2018; Lucchiari, Sala, & Vanutelli, 2018 ; Pollick, Vicary, & Noble, 2018; Proverbio, Camporeale, & Brusa, 2020 ; Reybrouck, Vuust, & Brattico, 2018; Seduikienė, 2020; Seeley, 2006; S. Wang, Xu, & Xiao, 2021 ; Zangemeister & Privitera, 2020)

In cluster 3, the most common words are emotions, music and aesthetic appreciation, topics discussed for example the effects of music on emotions and social adaptation to the COVID-19 pandemic, aesthetic experiences of music and poetry, appreciation of music rhythms related to increased promotion activities, and related music history. cultural heritage.(Goffin, 2014; Hills, 2006; Hove, Martinez, & Stupacher, 2019; Kim, Mueller, & Lepsien, 2019; Kornysheva, Cramon, & Jacobsen, 2010; Margulis & Levine, 2017; Proverbio, Orlandi, & Pisanu, 2016; Robinson, 2010; Sarasso, Ronga, & Neppi-

Modona, 2021; Shen, 2014; Taylor, 2009; Vuoskoski & Eerola, 2017; Vuoskoski, Thompson, & Mcilwain, 2012; Yi-Bo, 2016)

In cluster 4, the most words are beauty, liking and brain stimulation, the topics discussed are, for example, increasing beauty experience with brain stimulation.(Cattaneo, Lega, & Flexas, 2014)

In cluster 5 with the most words: perception, experimental aesthetics, and visual perception, the topics discussed were preference studies, aesthetic stimulation, computational related visual aesthetics, verbal and non-verbal measurements on experimental aesthetics.(Augustin, Leder, & Hutzler, 2008; Berlyne, 1973; Brachmann & Redies, 2017 ; Gao & Soranzo, 2020; Harasawa, Sawahata, & Miyashita, 2021; Holmes & Zanker, 2013 ; Moore & Schwitzgebel, 2018; Munar, Nadal, & Castellanos, 2012; Redies, Brachmann, & Wagemans, 2017; Rolke, Seibold, & Stepper, 2019)

In cluster 6 the most words are aesthetics, empirical aesthetics, and cognitive neuroscience, the topics discussed include the benefits of art, art theory for neuroscientists, beauty and the brain from a cultural perspective, history and differences in individual aesthetic appreciation.(Jacobsen, 2010; Langer, 2016; Pearce, Zaidel, & Vartanian, 2016; Rodway & Kirkham, 2016 ; Sherman & Morrissey, 2018 ; Skov & Nadal, 2017)

In cluster 7, the most used words are empathy, movement and affect, topics discussed include cognitive therapy, audiovisual affect recognition, design and evaluation, of affective interactive art, group psychotherapy, and the joys of helping. (Barry, 2007; Bialoskorski & Westerink, 2009; Buckley, 2009; Goodsell, 1997; Parrell, Goldstein, & Lee, 2014; Strack, 2021)

In the cluster of 8 the most words are aesthetic experience, aesthetic judgment, and aesthetic emotion, topics discussed for example critical art, artist disability change the aesthetic experience, aesthetic experience in nature - based tourism, aesthetic response to music and their underlying neural and psychological mechanisms, models of aesthetic appreciation and aesthetic judgments.(Brattico, Bogert, & Jacobsen, 2013; Gartus & Leder, 2014; Hosoya, 2019; Leder, Belke, & Oeberst, 2004; Leder & Nadal, 2014; Nieminen & Istók, 2011; Szubielska & Imbir, 2021; Szubielska, Imbir, & Fudali-Czyż, 2020; Szubielska, Imbir, & Szymańska, 2021; Vasilyeva & Lin, 2011; Yeh & Peng, 2018; Yeha, Hsu, & Li, 2018; Zhanga & Xu, 2020)

In the 9th cluster, the most words are art appreciation, creativity and evolution, topics discussed for example neuroaesthetics, the state of the domain in 2017.(Kozbelt, 2017)

In the cluster of 10, the most common words are balance, arts and complexity, topics discussed for example neuroaesthetic evolution variables in photographic painting during the renaissance, and adults and infants preferences of original art.(Aleem, Correa-Herran, & Grzywacz, 2017 ; Correa-Herran, Aleem, & Grzywacz, 2020; Krentz & Earl, 2013)

In the 11th cluster, the most words were neurocognitive poetics, eeg and machine learning. Topics discussed, for example, poetry mentally engages in experts and non-experts.(Cartocci, Rossi, & Modica, 2021) n cluster 12 there is only 1 word, namely electroencephalography. Topics discussed include implicit aesthetic preference in ERP study, neurocognitive study of the emotional impact of geometrical criteria of architectural space, multimodal recognition of emotions, music and facial expressions and electrophysiology of aesthetic processing.(Beudt & Jacobsen, 2015; Cinzia & Vittorio, 2009; Gollob, Mayer, & Braumann, 2021; Grobman & Shemesh, 2015; Herrera-Arcos & Tamez-Duque, 2017; Hoenen, Lübke, & Pause, 2017; Jacobs, 2015; Jacobsen, 2013; Liu, Lughofer, & Zeng, 2017; Maglione, Brizi, & Vecchiato, 2017; Obermeier, Kotz, & Jessen, 2016; Sarasso, Ronga, & Forte, 2019; Sarasso, Ronga, & Kobau, 2020; Shemesh, Leisman, & Bar, 2021)

Countries that have developed the most research in the field of neuroaesthetics are : United Kingdom with 829 documents, Canada with 821 documents, Germany with 672 documents, USA with 668 documents, and Austria with 577 documents (figure 7).

The country that publishes the most documents related to neuroaesthetics is the United States, with the lead author being

Chatterje with affiliation to the University of Pennsylvania. The 2nd country with the most documents written by the author Nadal M with affiliation to the University of Balearic Island. The 3rd country is Denmark with the most documents written by the author Skov M, affiliated with the University of Vienna. The 5th country is Germany, the author of the most documents Jacobs AM, with the affiliation of Freie Universitt Berlin.

Countries that have developed the most research in the field of neuroaesthetics (Rq7)

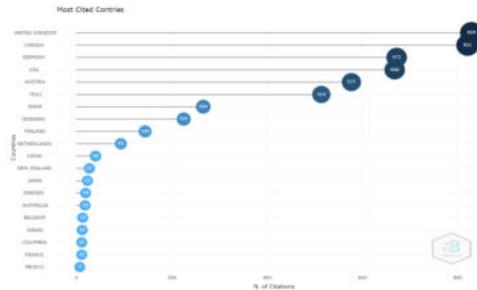


Figure 7. Most Cited Countries

The most influential articles by number of citations (Rq8)

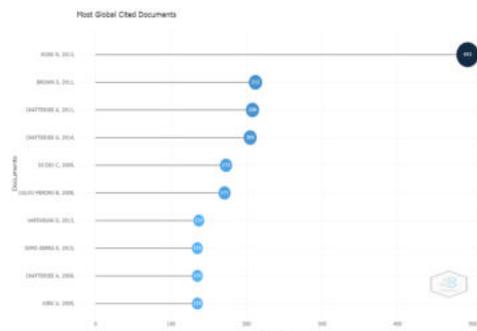


Figure 8. Most Global Cited Document

The author of the most cited articles is : Rose N (2013) with 493 documents, Brown S (2011) with 212 documents, Chatterjee A (2011) with 208 documents, Chatterjee A (2014) with 205 documents, and Di Dio C (2009) with 173 documents (figure 8).

Thematic folders related to neuroaesthetics (Rq8)

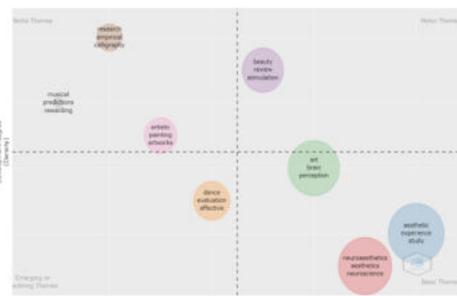


Figure 9. Thematic Map

Based on thematics (figure 9), it appears that niche themes are research that has begun to be widely studied, including research empirical calligraphy, musical predictions rewarding and artistic painting artworks. Calligraphy research related to neuroaesthetics is the use of Chinese characters as a therapy for various neuro-psychiatry disorders. By starting this research, it is hoped that the potential of calligraphy as a therapy will also appear in calligraphy in other areas in various parts of the world.(Chan et al., 2017Journal ; Chu et al., 2018 ; H. Kao et al., 2018; H. Kao et al., 2014; Kwok et al., 2011; Min Xu & Kao, 2013)

CONCLUSION

Based on bibliometric studies using vosviewer and biblioshiny, it

appears that fields related to aesthetic psychology, and neuroscience since 2005-2021 show an increasing number of documents and there are areas that can still be developed in many future researches.

It appears that neuroaesthetic keywords as keywords that often appear together with aesthetic, neuroscience, and psychology keywords, are areas that have the potential to be developed in future research. Because the appearance on the search is still rare. Research trends that can be developed are neuroaesthetic with neuromarketing, neuroaesthetic with emotion, neuroaesthetic with aesthetic experience, neuroaesthetic with brain and neuroaesthetic with creativity.

AVAILABILITY OF DATA AND MATERIALS

All data sources described in this study are directed at the corresponding author

DECLARATIONS

- Ethics approval and consent to participate
Nothing to declare

- Consent for publication

I, the undersigned, give my consent for the publication of identifiable details, which can include figures, tables and details within the text "NEUROAESTHETIC, A BIBLIOMETRIC ANALYSIS" to be published in the above Journal and Article.

- Competing interests

Nothing to declare

- Funding

Nothing to declare

- Authors' contributions

A.Y.S. carried out the literature, analyzed the data, and wrote the manuscript. Conveniently, by having only one author, there were no decisions to make regarding author order or corresponding authorship.

- Acknowledgements

Nothing to declare

- Authors' information

Departemen Neurology UPN Veteran Medical Faculty Jakarta

REFERENCES

- Aldouby, H. (2019). Balancing on shifting ground: Migratory aesthetics and recuperation of presence in Ori Gersht's video installation *On Reflection*. *Journal of Migration & Culture*, 10(2), 161-181.
- Aleem, H., Correa-Herran, I., & Grzywacz, N. M. (2017). Inferring Master Painters' Esthetic Biases from the Statistics of Portraits. *Frontiers in Human Neuroscience*.
- Augustin, M. D., Leder, H., & Hutzler, F. (2008). Style follows content: on the microgenesis of art perception. *Acta Psychologica*, 128(1), 127-138.
- B. Calvo-Merino, C. Jola, & D.E. Glaser. (2008). Towards a sensorimotor aesthetics of performing art. *Consciousness and Cognition*, 17(3), 911-922.
- Barry, B. (2007). In Search of an Ending: Reframing Mahler's Contexts of Closure. *Journal of Musicological Research*, 26(1), 55-68.
- Berlyne, D. E. (1973). Interrelations of verbal and nonverbal measures used in experimental aesthetics. *Scandinavian Journal of Psychology*, 14(3), 177-184.
- Beudt, S., & Jacobsen, T. (2015). On the Role of Mentalizing Processes in Aesthetic Appreciation: An ERP Study. *Frontiers in Human Neuroscience*.
- Bialoskorski, L. S. S., & Westerink, J. (2009). Mood Swings: Design and evaluation of affective interactive art. *New Review in Hypermedia and Multimedia*, 15(2), 179-191.
- Boccia, M., Barbeti, S., & Piccardi, L. (2015). Where does brain neural activation in aesthetic responses to visual art occur? Meta-analytic evidence from neuroimaging studies. *Italy*.
- Brachmann, A., & Redies, C. (2017). Computational and Experimental Approaches to Visual Aesthetics. *Frontiers in Computational Neuroscience*.
- Brattico, E., Bogert, B., & Jacobsen, T. (2013). Toward a neural chronometry for the aesthetic experience of music. *Frontiers in Psychology*.
- Brattico, E., & Jacobsen, T. (2009). Subjective Appraisal of Music Neuroimaging Evidence. *Annals of the New York Academy of Sciences*, 1169(1), 308-307.
- Brattico, E., & Pearce, M. (2013). The Neuroaesthetics of Music. *Psychology of Aesthetics, Creativity, and the Arts*, 7(1), 48-61.
- Brattico, E., & Varankaitė, U. (2019). Aesthetic empowerment through music. *Musicae Scientiae*, 23(3), 285-303.
- Buckley, M. (2009). Eloquent action: The body and meaning in early commedia dell'arte. *Theatre Survey*, 5(2).
- Cartocci, G., Rossi, D., & Modica, E. (2021). NeuroDante: Poetry Mentally Engages More Experts but Moves More Non-Experts, and for Both the Cerebral Approach Trendency Goes Hand in Hand with the Cerebral Effort. *Brain Sciences*, 11(3), 281.
- Cattaneo, Z. (2018). Noninvasive Brain Stimulation: An Overview of Available Approaches for Research in Neuroaesthetics. *Empirical Studies of the Arts*, 0(0), 1-19.
- Cattaneo, Z., Lega, C., & Flexas, A. (2014). The world can look better: enhancing beauty experience with brain stimulation. *Social Cognitive and Affective Neuroscience*, 9(11).
- Chan, S. C. C., Derbie, A. Y., & Hui, I. (2017). Chinese Calligraphy Writing for Augmenting Attentional Control and Working Memory of Older Adults at Risk of Mild Cognitive Impairment: A Randomized Controlled Trial. *Journal of Alzheimer's disease*, 58(3), 1-12.
- Chatterjee, A. (2006). *The Neuropsychology Of Visual Art: Conferring Capacity*.

- International Review of Neurobiology, 74, 39-49.
- Chatterjee, A., & Vartanian, O. (2014). Neuroaesthetics. *Trends in Cognitive Sciences*, 18(7), 370-375.
- Chatterjee, A., & Vartanian, O. (2016). Neuroscience of aesthetics. *Annals of the New York Academy of Sciences*, 172-194.
- Christensen, J. F., Cela-Conde, C. J., & Gomila, A. (2017). Not all about sex: neural and biobehavioral functions of human dance. *Annals of the New York Academy of Sciences*.
- Christensen, J. F., & Gomila, A. (2018). Art and the brain: From pleasure to well-being. *Progress in Brain Research*, 237, xxvii-xxvi.
- Chu, K.-Y., Huang, C.-Y., & Ouyang, W.-C. (2018). Does Chinese calligraphy therapy reduce neuropsychiatric symptoms: a systematic review and meta-analysis. *BMC Psychiatry*.
- Cinzia, D. D., & Vittorio, G. (2009). Neuroaesthetics: a review. *Current Opinion in Neurobiology*, 19(6), 682-687.
- Coles, A., Harrison, F., & Todd, S. (2019). Flexing the frame: therapist experiences of museum-based group art psychotherapy for adults with complex mental health difficulties. *International Journal of Art Therapy*.
- Conway, B. R., & Rehding, A. (2013). Neuroaesthetics and the Trouble with Beauty. *Plos Biology*, 11(3).
- Correa-Herran, Aleem, H., & Grzywacz, N. M. (2020). Evolution of Neuroaesthetic Variables in Portrait Paintings Throughout the Renaissance. *Entropy*.
- Cross, E. S., Kirsch, L., & Ticini, L. F. (2011). The impact of aesthetic evaluation and physical ability on dance perception. *Frontiers in Human Neuroscience*.
- F. Christensen, J., & Antoni Gomila. (2018). Introduction: Art and the brain: From pleasure to well-being. *Progress in Brain Research*, 237, 373-397
- Fish, B. J. (2019). Response Art in Art Therapy: Historical and Contemporary Overview. *Journal of the American Art Therapy Association*.
- Gao, J., & Soranzo, A. (2020). Applying Q-Methodology to Investigate People's Preferences for Multivariate Stimuli. *Frontiers in Psychology*.
- Gartus, A., & Leder, H. (2014). The white cube of the museum versus the gray cube of the street: The role of context in aesthetic evaluations. *Psychology of Aesthetics Creativity and the Arts*, 8(3), 311-320.
- Goffin, K. (2014). Music feels like moods feel. *Frontiers in Psychology*.
- Gollob, E., Mayer, M., & Braumann, J. (2021). Using Robotics and A.I. to Physically Explore a Space of Aesthetic Possibilities: Defining a Physical Aesthetic Experience by the Targeted EEG Feedback of the Perceiver. *TEI '21: Proceedings of the Fifteenth International Conference on Tangible, Embedded, and Embodied*.
- Goodsell, C. T. (1997). Administration as ritual. *International Journal of Public Administration*, 20(4-5), 939-961.
- Grobman, J. Y., & Shemesh, A. (2015). Space and Human Perception – Exploring Our Reaction to Different Geometries of Spaces. Conference: 20th International Conference of the Association of Computer-Aided Architectural Design Research in Asia CAADRIA 2015.
- Harasawa, M., Sawahata, Y., & Miyashita, Y. (2021). A study on preference of physical size of motion pictures by methods of experimental psychology. *Proceedings of the International Display Workshops*, 539-542.
- Herrera-Arcos, G., & Tamez-Duque, J. (2017). Modulation of Neural Activity during Guided Viewing of Visual Art. *Frontiers in Human Neuroscience*.
- Hills, H. o. T. c. a. t. p. o. D. (2006). Heritage of Tibetan culture among the people of Darjeeling Hills. *Social Change*, 36(2).
- Hoenen, M., Lübke, K. T., & Pause, B. M. (2017). Sensitivity of the human mirror neuron system for abstract traces of actions: An EEG-study. *Biological Psychology*, 124, 57-64.
- Holmes, T., & Zanker, J. M. (2013). Investigating preferences for color-shape combinations with gaze driven optimization method based on evolutionary algorithms. *Frontiers in Psychology*.
- Hosoya, G. (2019). The Artwork and the Beholder: A Probabilistic Model for the Joint Scaling of Persons and Objects. *Psychology of Aesthetics Creativity and the Arts*.
- Hove, M. J., Martinez, S. A., & Stupacher, J. (2019). Feel the bass: Music presented to tactile and auditory modalities increases aesthetic appreciation and body movement. *Journal of Experimental Psychology: General*.
- Igaya, K., P.O'Doherty, J., & Starr, G. (2020). Progress and Promise in Neuroaesthetics. *Neuron*, 108(4), 594-596.
- Jacobs, A. M. (2015). Neurocognitive poetics: methods and models for investigating the neuronal and cognitive-affective bases of literature reception. *Frontiers in Human Neuroscience*.
- Jacobs, A. M. (2017). Quantifying the Beauty of Words: A Neurocognitive Poetics Perspective. *Frontiers in Psychology*.
- Jacobsen, T. (2010). Beauty and the brain: culture, history and individual differences in aesthetic appreciation. *Journal of Anatomy*.
- Jacobsen, T. (2013). On the electrophysiology of aesthetic processing. *Progress in Brain Research*.
- Jang, S. H., & Pollock, F. E. (2011). Experience Influences Brain Mechanisms of Watching Dance. *Dance Research*, 29(2), 352-377.
- Jiang, X.-H., Chen, X.-J., & Xie, Q.-Q. (2020). Effects of art therapy in cancer care: A systematic review and meta-analysis. *Eur J Cancer Care*.
- Kandel, E. R. (2013). Two Modernist Approaches to Linking Art and Science. *American Imago*, 70.
- Kao, H., Lam, S. P., & Kao, T. T. (2018). Chinese calligraphy handwriting (CCH): A case of rehabilitative awakening of a coma patient after stroke. *Neuropsychiatric Disease and Treatment*, 14, 407-417.
- Kao, H., Zhu, L., & Chao, A. A. (2014). Calligraphy and meditation for stress reduction: An experimental comparison. *Psychology Research and Behavior Management*, 47-52.
- Kao, H. S. R., Xu, M., & Kao, T. T. (2021). Calligraphy, Psychology and the Confucian Literati Personality. *Psychology & Developing Societies*, 33(5).
- Kim, S.-G., Mueller, K., & Lepsien, J. (2019). Brain networks underlying aesthetic appreciation as modulated by interaction of the spectral and temporal organizations of music. *Scientific Reports*.
- Kornysheva, K., Cramon, D. Y. v., & Jacobsen, T. (2010). Tuning-in to the beat: Aesthetic appreciation of musical rhythms correlates with a premotor activity boost. *Human Brain Mapping*, 31(1), 48-64.
- Kozbelt, A. (2017). Neuroaesthetics: The State of the Domain in 2017. *Evolutionary Studies in Imaginative Culture*, 1(1), 181.
- Krentz, U., & Earl, R. K. (2013). The Baby as Beholder: Adults and Infants Have Common Preferences for Original Art. *Psychology of Aesthetics Creativity and the Arts*, 7(2), 181.
- Kwok, T. C. Y., Bai, X., & Kao, H. (2011). Cognitive effects of calligraphy therapy for older people: a randomized controlled trial in Hong Kong. *Clinical Interventions in Aging*, 6(1), 269-273.
- Langer, F. (2016). Art Theory for (Neuro)Scientists: Bridging the Gap. *Poetics Today*, 37(4), 497-516.
- Leder, H., Belke, B., & Oeberst, A. (2004). A model of aesthetic appreciation and aesthetic judgments. *British Journal of Psychology*, 489-508.

64. Leder, H., & Nadal, M. (2014). Ten years of a model of aesthetic appreciation and aesthetic judgments: The aesthetic episode - Developments and challenges in empirical aesthetics. *British Journal of Psychology*, 105(4), 443-464.
65. Liu, J., Lughofer, E., & Zeng, X. (2017). Toward Model Building for Visual Aesthetic Perception. *Computational Intelligence and Neuroscience*.
66. Lucchiarri, C., Sala, P. M., & Vanutelli, M. E. (2018). Promoting Creativity Through Transcranial Direct Current Stimulation (tDCS). A Critical Review. *Frontiers in Human Neuroscience*.
67. Luo, Q., & Yu, M. (2018). The neural correlates of integrated aesthetics between moral and facial beauty. *Scientific Reports*.
68. Maglione, A. G., Brizi, A., & Vecchiato, G. (2017). A Neuroelectrical Brain Imaging Study on the Perception of Figurative Paintings against Only their Color or Shape Contents. *Frontiers in Human Neuroscience*.
69. Margulis, E. H., & Levine, W. H. (2017). Expressive intent, ambiguity, and aesthetic experiences of music and poetry. *PLoS ONE*.
70. Milovanović, M., & Medić-Simić, G. (2021). Aesthetic criterion in art and science. *Neural Computing and Applications*.
71. Min Xu, & Kao, H. S. R. (2013). Cognitive-Neural Effects of Brush Writing of Chinese Characters: Cortical Excitation of Theta Rhythm. Evidence-based Complementary and Alternative Medicine.
72. Miura, N., Sugiura, M., & Takahashi, M. (2010). Effect of motion smoothness on brain activity while observing a dance: An fMRI study using a humanoid robot. *Social Neuroscience*, 5(1), 40-58.
73. Moore, A. T., & Schwitzgebel, E. (2018). The experience of reading. *Consciousness and Cognition*, 62, 57-68.
74. Munar, E., Nadal, M., & Castellanos, N. P. (2012). Aesthetic appreciation: event-related field and time-frequency analyses. *Frontiers in Computational Neuroscience*.
75. Nadal, M., & Skov, M. (2013). Introduction to the Special Issue: Toward an Interdisciplinary Neuroaesthetics. *Psychology of Aesthetics, Creativity, and the Arts*, 7(1), 1-12.
76. Nadal, M., & Skov, M. (2015). Neuroaesthetics. *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)*, 2015, 656-663.
77. Nalbantian, S. (2013). Neuroaesthetics: neuroscientific theory and illustration from the arts. *Neuroscience: the humanities and arts*, 33(4), 357-368.
78. Nieminen, S., & Istók, E. (2011). The development of aesthetic responses to music and their underlying neural and psychological mechanisms. *Cortex*, 47(9), 1138-1146.
79. Obermeier, C., Kotz, S. A., & Jessen, S. (2016). Aesthetic appreciation of poetry correlates with ease of processing in event-related potentials. *Cognitive Affective & Behavioral Neuroscience*, 16(2).
80. P.Kirsch, L., Cosimo Urgesia, & S.Cross, E. (2016). Shaping and reshaping the aesthetic brain: Emerging perspectives on the neurobiology of embodied aesthetics. *Neuroscience & Biobehavioral Reviews*, 62, 56-68.
81. P.Kirsch, L., Drommelschmidt, K. A., & S.Cross, E. (2013). The impact of sensorimotor experience on affective evaluation of dance. *Frontiers in Human Neuroscience*, 7.
82. Parrell, B., Goldstein, L., & Lee, S. (2014). Spatiotemporal coupling between speech and manual motor actions. *Journal of Phonetics*, 42, 1-11.
83. Paterson, M. (2015). On Aisthēsis, 'Inner Touch' and the Aesthetics of the Moving Body. In *Geographical Aesthetics (pp. 35-51)*.
84. Pearce, M. T., Zaidel, D. W., & Vartanian, O. (2016). Neuroaesthetics: The Cognitive Neuroscience of Aesthetic Experience. *Perspectives on Psychological Science*, 11(2), 265-279.
85. Pollick, F. E., Vicary, S., & Noble, K. (2018). Exploring collective experience in watching dance through intersubject correlation and functional connectivity of fMRI brain activity. *Progress in Brain Research*, 237, 373-397.
86. Proverbio, A. M., Camporeale, E., & Brusa, A. (2020). Multimodal Recognition of Emotions in Music and Facial Expressions. *Frontiers in Human Neuroscience*.
87. Proverbio, A. M., Orlandi, A., & Pisanu, F. (2016). Brain processing of consonance/dissonance in musicians and controls: a hemispheric asymmetry revisited. *European Journal of Neuroscience*, 44(6), 2340-2356.
88. Redies, C., Brachmann, A., & Wagemans, J. (2017). High entropy of edge orientations characterizes visual artworks from diverse cultural backgrounds. *Vision Research*, 133, 130-144.
89. Reybrouck, M., Vuust, P., & Brattico, E. (2018). Brain Connectivity Networks and the Aesthetic Experience of Music. *Brain Sciences*, 8(6), 107.
90. Robinson, J. (2010). Emotional Responses to Music: What Are They? How Do They Work? And Are They Relevant to Aesthetic Appreciation? : *The Oxford Handbook of Philosophy of Emotion*.
91. Rodway, P., & Kirkham, J. (2016). The Development of Shared Liking of Representational but not Abstract Art in Primary School Children and Their Justifications for Liking. *Frontiers in Human Neuroscience*.
92. Rolke, B., Seibold, V., & Stepper, M. Y. (2019). Aesthetic Stimuli Attract Visual Spatial Attention. *Art & Perception*, 7(1), 1-30.
93. Sarasso, P., Ronga, I., & Forte, E. (2019). Aesthetic appreciation of musical intervals enhances behavioural and neurophysiological indexes of attentional engagement and motor inhibition. *Scientific Reports*.
94. Sarasso, P., Ronga, I., & Kobau, P. (2020). Beauty in mind: Aesthetic appreciation correlates with perceptual facilitation and attentional amplification. *Neuropsychologia*.
95. Sarasso, P., Ronga, I., & Neppi-Modona, M. (2021). The Role of Musical Aesthetic Emotions in Social Adaptation to the Covid-19 Pandemic. *Frontiers in Psychology*.
96. Šeduikienė, M. (2020). Tapping of Neurosciences into the Kingdom of Beauty. *LOGOS - A Journal of Religion, Philosophy, Comparative Cultural Studies and Art*(104), 215-222.
97. Seeley, W. P. (2006). Naturalizing aesthetics: art and the cognitive neuroscience of vision. *Journal of Visual Art Practice*, 5(3).
98. Shemesh, A., Leisman, G., & Bar, M. (2021). A neurocognitive study of the emotional impact of geometrical criteria of architectural space. *Architectural Science Review*, 394-407.
99. Shen, V. (2014). *Dao Companion to Classical Confucian Philosophy*: Springer, Dordrecht.
100. Sherman, A., & Morrissey, C. (2018). Response to: Commentary: What Is Art Good For? The Socio-Epistemic Value of Art. *Frontiers in Human Neuroscience*.
101. Skov, M., & Nadal, M. (2017). Commentary: What Is Art Good For? The Socio-Epistemic Value of Art. *Frontiers in Human Neuroscience*.
102. Strack, F. (2021). Bodies Underwater: Jean Painlevé and the Adventures of Interspecies Communication. *Environmental Humanities*, 13(1), 181-200.
103. Sumanapala, D. K., Kirsch, L., & Walbrin, J. (2018). Neurodevelopmental perspectives on dance learning: Insights from early adolescence and young adulthood. *Progress in Brain Research*.
104. Sun, M., Han, H., & Jiang, Q. (2020). Research on the application of neuroaesthetics in industrial design. *Materials Science and Engineering*.
105. Szubielska, M., & Imbir, K. (2021). The aesthetic experience of critical art: The effects of the context of an art gallery and the way of providing curatorial information. *PLoS ONE*.
106. Szubielska, M., Imbir, K., & Fudali-Czyż, A. (2020). How Does Knowledge About an Artist's Disability Change the Aesthetic Experience? *Advances in Cognitive Psychology*, 16(2), 150-159.
107. Szubielska, M., Imbir, K., & Szymańska, A. (2021). The influence of the physical context and knowledge of artworks on the aesthetic experience of interactive installations. *Current Psychology*.
108. Taylor, B. (2009). The Lost Chord: Sentimentality, Sincerity, and the Search for 'Emotional Depth' in 19th-Century Music. *International Review of the Aesthetics and Sociology of Music*, 40(2), 207-233.
109. Trojano, L., Grossia, D., & Flasch, T. (2009). Cognitive neuroscience of drawing: Contributions of neuropsychological, experimental and neurofunctional studies. *Cortex*, 45(3), 269-277.
110. Vasilyeva, O., & Lin, C.-H. (2011). A Theoretical Framework For Understanding Aesthetic Experiences In Relation To Website Design And Utilitarian Outcomes. *PACIS 2011*.
111. Vuoskoski, J. K., & Eerola, T. (2017). The Pleasure Evoked by Sad Music Is Mediated by Feelings of Being Moved. *Frontiers in Psychology*.
112. Vuoskoski, J. K., Thompson, W. F., & McIlwain, D. J. F. (2012). Who Enjoys Listening to Sad Music and Why? *Music Perception*, 29(3), 311-317.
113. Wang, C.-M., & Chen, Y.-C. (2020). Design of an Interactive Mind Calligraphy System by Affective Computing and Visualization Techniques for Real-Time Reflections of the Writer's Emotions. *Sensors (Basel)*.
114. Wang, S., Xu, C., & Xiao, L. (2021). The Implicit Aesthetic Preference for Mobile Marketing Interface Layout—An ERP Study. *Frontiers in Human Neuroscience*.
115. Wang, T., Mo, L., & Ce Mo. (2015). Is moral beauty different from facial beauty? Evidence from an fMRI study. *Social Cognitive and Affective Neuroscience*, 10(6), 814-823.
116. Wassiliwizky, E., Koelsch, S., Wagner, V., & Jacobsen, T. (2017). The emotional power of poetry: neural circuitry, psychophysiology, compositional principles. *Social Cognitive and Affective Neuroscience*, 12(8).
117. Xu, M., Kao, H., & Zhang, M. (2013). Cognitive-Neural Effects of Brush Writing of Chinese Characters: Cortical Excitation of Theta Rhythm. Evidence-based Complementary and Alternative Medicine.
118. Yeh, Y.-c., & Peng, Y.-Y. (2018). The Influences of Aesthetic Life Experience and Expertise on Aesthetic Judgement and Emotion in Mundane Arts. *International Journal of Art & Design Education*.
119. Yeha, Y.-c., Hsu, W.-C., & Li, P.-H. (2018). The modulation of personal traits in neural responses during the aesthetic experience of mundane art. *Trends in Neuroscience and Education*, 10, 8-18.
120. Yi-Bo, N. (2016). Music Appreciation Teaching Platform Design Based on B/S Structure. *International Journal of Simulation Systems, Science & Technology*, 17(8).
121. Zaidel, D. W. (2017). Braque and Kokoschka: Brain Tissue Injury and Preservation of Artistic Skill. *Behavioral Sciences*, 7(3), 56.
122. Zangemeister, W. H., & Privitera, C. M. (2020). What Your Eyes Tell Your Brain about Art: Insights from Neuroaesthetics and Scanpath Eye Movements: Nova Science Publishers.
123. Zhanga, Q., & Xu, H. (2020). Understanding aesthetic experiences in nature-based tourism: The important role of tourists' literary associations. *Journal of Destination Marketing & Management*, 16.