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Emotional Development in People with High Capacities: Induction of Emotions through Pictorial Abstraction

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Abstract: The goal of this work was to help the researcher that studies emotions in people with high capacities (HCs) to understand and intervene in the socio-emotional aspects of this group, considering the features of their profile that present a certain specificity. The International Affective Picture System (IAPS) developed by Lang, and based on the dimensional theory of emotions, was applied using abstract works by Kandinsky and Mondrian as emotional stimuli. The study was conducted with university students not classified as HC, to represent the normative group and enable the establishment of comparisons, to verify the existence of social-emotional mismatches in the individuals considered HC. The results indicate that the stimuli used elicit emotional states with valence and medium-high arousal that are free of connotations derived from figurative representation and correspond only to the sensory properties of the stimulus (colour, shape, etc.), which facilitate the study of traits such as emotional intensity and sensitivity.

Keywords: induction of emotions; high capacities; abstract works

1. Introduction

In 1991, the Columbus Group, chaired by Silverman, defined high abilities (HA) as the result of an asynchronous development in which advanced cognitive capacity and hyper-emotional intensity combine to give rise to personal experiences and perceptions of the world that are qualitatively different from those of the normative group to which the person belongs. According to this definition, to achieve optimal development that maximizes the qualities of people with HA, aspects of cognitive development and especially emotional development must be taken care of in the school environment as well as in the family. Eren et al. [1–3] suggested that gifted children are at risk with respect to mental health. Therefore, to become biopsychosocially healthy adults, identifying this status at an early age is important for the future of gifted children, so that they can receive appropriate education, support and counselling for emotional needs, and for parents and teachers to be fully informed. Thirty years later, emotion is still a determining element in the development of high capacities (HCs) people.

Asynchronous development consists of a time lag that, in the case of HC individuals, occurs between cognitive skills (which are at an advanced stage of development) and motor and social-emotional skills (which are usually at an earlier stage of development). Terrassier [4] defined the term asynchrony syndrome to explain this disparity by establishing two types of asynchrony: internal (of the subject with themselves) and external or social (established in relation to the environment). Internal asynchrony refers to aspects of intellectual, psychomotor, linguistic, and affective-emotional development. External asynchrony corresponds to the imbalance between the person and the environment (school, family, or both), which is due to the received stimuli not satisfying the perceived needs. This gap in development (asynchrony) presented by HC people is defined as a discordance

between the mental and chronological age, a discordance that results in difficulties that are not presented by those whose evolutionary development is harmonious. However, the asynchrony presented does not suppose, as the evidence shows [5,6], that there is a common profile of socio-emotional (or cognitive) features to all HC; rather, the variability of traits is wide. The background to the study of asynchrony and, in general, all research on the social-emotional profile of HC, is based on the concept of over-excitability in Dabrowski's theory of positive disintegration [7], which establishes the five types of psychic over-excitability: psychomotor, sensory, intellectual, imaginative, and emotional.

As a consequence of the research derived from Dabrowski's approach, several researchers [8–12] proposed the existence of a set of features that, without constituting a defined profile and maintaining the variability observed in socio-emotional manifestations, are common to HC, among others: emotional intensity and sensitivity, perfectionism, high empathy and emotional awareness, rebelliousness, altruism, etc. Of these social-emotional traits, emotional sensitivity and intensity are highlighted, since they were investigated under the prism of Dabrowski's theory of emotional development, which means that the interpretation of the results moves away from considering HC people as misfits, but as ordinary people. In relation to the normative group, they present high variability [10,13–19], and because a wide set of characteristics are included within the concept of emotional sensitivity, such as aesthetic sensitivity, sense of justice, altruism, idealism, sense of humor, emotional intensity, perfectionism, etc. [20] The high emotional sensitivity leads to an increase in the depth of external information processing, resulting in an over-stimulation that affects attention, stress, and empathy (perception of the emotional state of others). All these traits can generate imbalances that lead to feelings of mismatch with the group to which they belong.

Art is a language of communication and emotional expression based on the ability to communicate the experience through its works, whether narrative, plastic, dance, painting, musical, etc., with aesthetic sensitivity being an inherent property of this medium. The methodological distance between psychological and artistic research [21] has contributed to artistic manifestations rarely being considered in analysis of emotions despite genuinely representing aesthetic sensitivity, understood as a subjective characteristic of emotion from the perspective of Schachter and Singer's theory [22]. This work interprets artistic language as a means of transmitting information that allows us to study in depth the social-emotional competences defined in Mayer and Salovey's model of emotional intelligence as the ability to control and regulate one's own and other people's emotions [23].

Emotional induction allows moods to be artificially provoked in controlled environments, making it possible to determine the relationship between emotion, cognition, and behavior in real life [24], so, as mood induction procedures (MIPs) deepen our knowledge of emotions and their relationships with other psychological, environmental, and social variables. There are many different MIPs, such as reading self-referenced sentences, autobiographical memory, manipulating facial expressions, listening to specific pieces of music, and watching film clips [25]. The proposal presented in this paper is similar to the intern affective picture system (IAPS), a standardized set of slides grouped into different semantic categories, based on the dimensional theory of emotion [1,2], replacing the stimuli to be subjected to calibration, with images of abstract paintings, in which there is no figurative element to prevent the induced emotions from being influenced by similar images.

The bioformational model [26–29] maintains that emotions are experienced and processed according to three dimensions of judgment: valence, activation (arousal), and dominance. Valence refers to the pleasantness or unpleasantness of the stimulus (object or situation that can be internally or externally produced), which drives the individual closer or further away. It is the motivational component of emotion [30,31]. Activation (arousal) is the strength of the emotional response, which is related to the intensity of the illusionary stimulus. Dominance refers to the degree of control that the person perceives over their emotional response, and it functions to interrupt or continue the behavioral response [32]. Representation of emotional space is carried out in terms of a Cartesian plane, with two axes, valence (direction) and activation (emotional intensity), which are sufficient to measure and

determinate emotional responses. Dominance, on the other hand, is not considered in the affective space, because recent studies have not shown consistent effects [33].

Emotions are defined as multidimensional phenomena that include, in an explicit and interrelated manner, three manifestations of the stimulus that triggers them: cognitive processes, physiological changes, and the accompanying behavior [1]. Most authors agree that emotion is a multidimensional phenomenon that refers to a triggering stimulus and a triple response system involving thought, the psychophysiological state of the organism, and expressive reaction [30].

Previous works [34,35] have evaluated the objective emotional response by measuring the skin conductance responses (SCRs) to the same Kandinsky and Mondrian paintings used in this work. The results are similar to those obtained in Gatti, Calzolari, Maggioni, Obrist, 2018 [36], and indicate that viewing the paintings under study produces alterations in the conductance of the skin, i.e., an emotion is produced, which allows us to state that the stimuli studied elicited emotions. As the selected paintings elicited emotions, in this study, we analyzed the subjective characteristics of the emotional response to Kandinsky and Mondrian painting using the self-assessment manikin (SAM) [20] and the IAPS methodology, since this type of stimulus evokes emotions that strictly depend on the sensory qualities (color, shape, and texture) of the stimuli, and not on their representational character.

As such, the aim of this work was essentially to offer the researcher a set of emotional stimuli, as proposed by Lang et al. [27], which allow the precise selection of the stimuli according to their position in the affective space, defined by the dimensions of valence, activation, and dominance.

2. Materials and Methods

2.1. Design

This was a quasi-experimental design without the randomization of subjects.

2.2. Participants

A total of 92 people participated, all of whom were master's and/or PhD university students. Half of them belonged to the Department of History of Art, and the other half to different departments of the National University of Distance Education (UNED, Madrid, Spain). The sample was obtained by means of snowball sampling. The sample size was set to guarantee a power in the statistical analysis of 0.80 and an effect size of 0.30. Five were eliminated due to technical problems in the development of the session. The average age of the participants was 26.2 years, with a standard deviation of 7.7 years (maximum 54 and minimum 18 years); 43.75% were men and 56.5% were women.

2.3. Stimuli

A total of 28 slides, corresponding to 12 works by Kandinsky and 12 by Mondrian, and 4 that constituted the test stimuli (Appendix A lists the images used in the research and Appendix B shows 4 paintings by each author used as examples). Two criteria were considered for the selection. The first was the public availability of the images, for which the website Wikiart.org was used, whose copyright policy is governed by European law. From the works in the public domain on the aforementioned website, a wide range of works were selected, the 28 works used in the research were chosen, whose relevance was assessed by prestigious experts (UNED art professors and staff from private galleries), on the basis of both knowledge and representativeness of each author's work. Four training test stimuli were selected because their valence and arousal values were known from the work of Campos-Bueno et al. [37], which allowed us to assess the functioning of our stimulus presentation design. These stimuli were: The Scream, Edvard Munch 1893; Lena in interior; Theo van Doesburg, 1917; Full Fathom Five, Pollock-Triond, Vassarely, 1973.

2.4. Test

SAM is a standardized test that assesses the three dimensions: valence, arousal, and dominance. It is a pictographic measure, usually used in pencil and paper or computer format. The test consists of three series of humanoid figures, each representing one of the dimensions of the emotion and graduated in terms of intensity. The participant selects the figure whose numerical rating coincides with their personal rating.

2.5. Procedure

The sample was selected using snowball sampling, considering the proportionality between women and men. All participants evaluated each of the paintings that composed the series of stimuli. The dependent variable was the affective evaluations obtained through the SAM in the three dimensions: arousal, valence, and control.

All the recommendations for the procedure provided by Lang et al. [27] were followed, concerning: the exposure time of the stimuli (6 s,) the randomization of the presentation of both the tables and the scales that evaluate each dimension, luminosity, noise, etc. For the projection of the slides, a screen was used (LG Model: 28MT47T-PZ). The screen was connected to a laptop Lenovo IdeaPad Z500 (Intel Core i7-3612QM, 8 GB de RAM, Disco HDD de 1 TB, NVIDIA GeForce GT635M 2 GB) that controlled all the parameters for the definition of the stimulus series. The sessions were developed in a laboratory of the Faculty of Psychology of UNED, maintaining constant conditions of luminosity, noise, and distance between the screen and the experimental subject. At the beginning of the section, the participant was welcomed, thanked for their participation, and provided a brief explanation of the experience, and was asked to sign an informed consent form.

2.6. Presentation of the Stimuli

The presentation was provided using E-PRIME (Psychology Software Tools, Inc. Pittsburgh, PA, USA) program for the design of computerized experiments, data collection, and analysis.

Each experimental session consisted of two phases. In the first one, the instructions were presented, following the scheme presented in Figure 1.

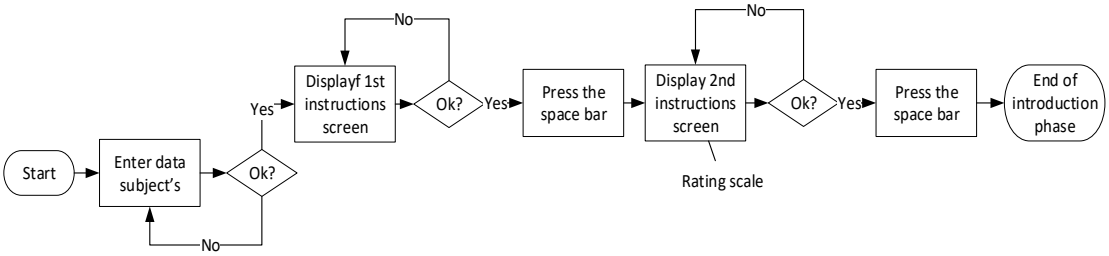

Figure 1. First phase: Instructions presentation.

In the second phase, 4 preliminary training tests were conducted, and then the series of stimuli to be evaluated began. The scheme of the test development is shown in Figure 2. A first screen in black for 5 s, followed a red cross appeared in the center upon which the participant fixated for 0.5 s, and the stimulus to be evaluated was displayed and remained visible for 6 s, followed by the appearance of the random sequence of responses to the SAM. Clicking on the response turned the screen black and the process began for the second stimulus, and so on, until stimulus 24.

The responses to the SAM and the corresponding reaction times were recorded in a file that also contained age, sex, manual dominance, session, participant number, and random sequence corresponding to the presentation of stimuli and responses.

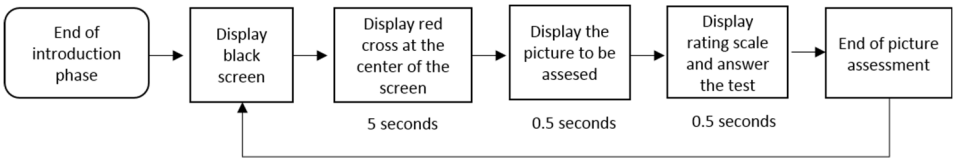

Figure 2. Second phase: Stimulus presentation.

3. Results

The reliability of the SAM for the work sample was analyzed to determine if the change in the type of reagents affected psychometric properties. Cronbach's α for the total test was 0.74, the test as a whole 0.76 for the arousal, 0.68 for the valence, and 0.56 for dominance within the range of usual values.

Tables 1–6 show the mean values and standard deviations of the assessments in the three dimensions evaluated with SAM (activation, affective valence, and dominance) for each of the authors studied.

Table 1. Arousal evaluations for Kandinsky.

	K-1	K-10	K-11	K.12	K-2	K-3	K-4	K-5	K-6	K-7	K-8	K-9
Mean	5.86	5.18	5.39	5.38	5.58	6.25	5.50	5.30	6.68	5.48	4.99	5.31
SD	2.25	2.31	2.24	2.42	2.29	2.17	2.28	2.45	2.02	2.29	2.34	2.89
Range	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

Table 2. Arousal evaluations for Mondrian.

	M-1	M-10	M-11	M-12	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
Mean	4.69	4.41	5.85	6.24	3.71	4.00	4.88	3.54	4.49	3.55	3.43	4.23
SD	2.33	2.40	2.54	2.26	2.21	2.14	2.56	2.29	2.53	2.31	2.05	1.92
Range	8.00	8.00	8.00	8.00	7.00	8.00	8.00	8.00	8.00	8.00	7.00	8.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	9.00	9.00	9.00	9.00	8.00	9.00	9.00	9.00	9.00	9.00	8.00	9.00

Table 3. Valence evaluations for Kandinsky.

	K-1	K-10	K-11	K.12	K-2	K-3	K-4	K-5	K-6	K-7	K-8	K-9
Mean	6.83	6.74	6.01	6.45	6.81	6.03	5.74	6.94	5.25	6.78	6.28	7.00
SD	1.86	1.93	1.71	1.83	1.73	2.09	2.21	1.69	2.24	1.79	1.77	2.01
Range	8.00	8.00	8.00	8.00	6.00	8.00	8.00	7.00	8.00	8.00	8.00	8.00
Minimum	1.00	1.00	1.00	1.00	3.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00
Maximum	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

Table 4. Valence evaluations for Mondrian.

	M-1	M-10	M-11	M-12	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
Mean	6.01	4.75	5.05	5.94	5.61	5.74	5.95	5.06	5.34	4.88	5.13	5.81
SD	1.73	1.62	2.11	2.01	1.63	1.52	1.92	1.73	1.51	1.66	1.73	1.82
Range	8.00	8.00	8.00	8.00	7.00	6.00	8.00	8.00	8.00	8.00	8.00	6.00
Minimum	1.00	1.00	1.00	1.00	2.00	3.00	1.00	1.00	1.00	1.00	1.00	3.00
Maximum	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

Table 5. Dominance evaluations for Kandinsky.

	K-1	K-10	K-11	K.12	K-2	K-3	K-4	K-5	K-6	K-7	K-8	K-9
Mean	4.73	5.16	5.13	5.25	5.43	4.96	4.65	4.98	4.71	5.20	5.03	5.31
SD	2.14	2.02	2.04	2.32	1.99	2.02	2.16	2.10	2.24	1.84	2.20	2.64
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

Table 6. Dominance evaluations for Mondrian.

	M-1	M-10	M-11	M-12	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
Mean	4.86	4.55	5.03	5.28	5.08	4.88	5.10	5.01	4.73	4.58	5.11	4.61
SD	1.87	2.02	2.26	2.23	2.09	2.08	2.23	2.57	2.20	2.63	2.33	1.77
Range	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

Figure 3 shows the distribution of the 24 images in the two-dimensional space defined by the affective and arousal valence for the total sample. The ordinate axis reflects the position of each image in the valence dimension (1 = highly unpleasant, 5 = neutral, 9 = highly pleasant), whereas the horizontal axis reflects its position in the activation dimension (1 = calm, 5 = moderately activating, 9 = highly activating). Each point in this figure represents the average of the evaluations of the total participant.

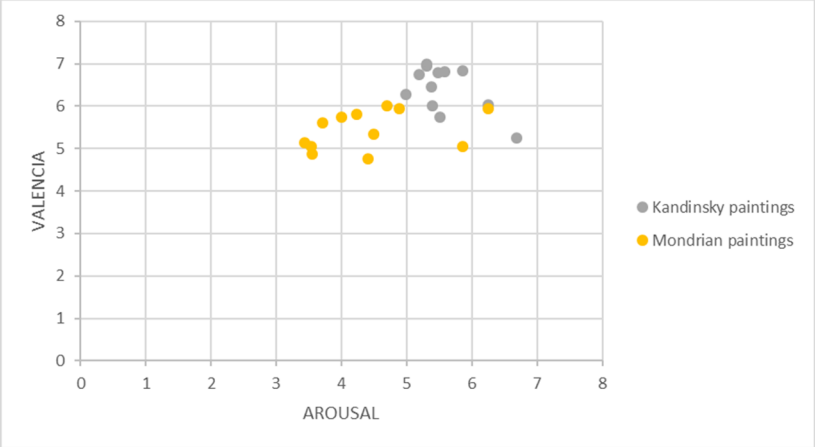

Figure 3. Distribution of images as a function of average estimates of total subjects (n = 82) in the dimensions of affective valence and activation.

4. Discussion

The main objective of this work was to present the normative values of a set of stimuli formed by the works by Kandinsky and Mondrian, to offer the researcher a set of reagents that are especially useful for working with HC people (especially children and young people) given the special relevance of aesthetic sensitivity as a factor that encompasses the sense of justice, altruism and idealism, sense of humor, emotional intensity, perfectionism, etc., which are especially present in this group [20].

The results indicated that all the selected stimuli present medium-high values in the dimensions of arousal and valence affective, indicating that they are capable of eliciting emotional responses. These states increase the depth of information processing resulting in over-stimulation, which affects the attention, stress, high emotional sensitivity, empathy, and emotional sensitivity, features that define the profile of HA people [6–10].

Using the set of proposed stimuli can improve our understanding of whether a specific social-emotional HC profile exists in comparison with that of ordinary people. The calibrated

stimuli induce a neutral emotional state in the sense that the emotion induced does not correspond to any of the so-called primary emotions (joy, sadness, anger, aversion, fear, and surprise).

Focusing on the behavior of the stimuli calibrated (Figure 3) and compared with the boomerang shape presented by the stimulus distributions of the IAPS, the set analyzed in this work lacks of neutral stimuli, which are responsible for the boomerang form, due to use of each author's work representativeness as a criterion for the selection. However, the images evaluated with the highest levels of liking and disliking also tended to obtain the highest scores in the activation dimension (Figure 3), agreeing with Bradley, M y Lang, P.J. [38,39].

One of the important applications derived from this work, once the validated methodological application was proposed, is the possibility to create a bank of calibrated pictorial works as affective stimuli, similar to IAPS, that can be used in research and intervention for both normative and HC groups.

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Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Kandinsky's works

K1. Study to "Composition II"" (1910)
K2. Composition IV (1911)
K3. Composition VI (1913)
K4. Pintura con borde blanco (1913)
K5. Black strokes I (Schwarze Linien) (1913)
K6. Composition VII (1913)
K7. Red Oval (1920)
K8. Blue Painting (1924)
K9. Several circles (1926)
K10. Composition IX (1936)
K11. Dominant curve (1936)
K12. Composition X (1939)

Mondrian's works

M1. Composition in Color A (1917).
M2. Composition with color planes and gray lines (1918)
M3. Composition with Gray and Light Brown (1918)
M4. Composition with Large Red Plane, Yellow, Black, Gray and Blue (1921)
M5. Composition with Red, Yellow and Blue (1922)
M6. Lozenge Composition with Red, Black, Blue and Yellow (1925)
M7. Composition with yellow patch (1930)
M8. Composition C (No.III) with Red, Yellow and Blue (1935)
M9. Composition with oval in color planes II (1914)
M10. Composition No.10 (1939–1942)
M11. New York City I (1942)
M12. Broadway Boogie Woogie (1942–1943)

Appendix B

Figure A1. K-6 Composition VII (1913).

Figure A2. K7. Red Oval (1920).

Figure A3. K8. Blue Painting (1924).

Figure A4. K10. Composition IX (1936).

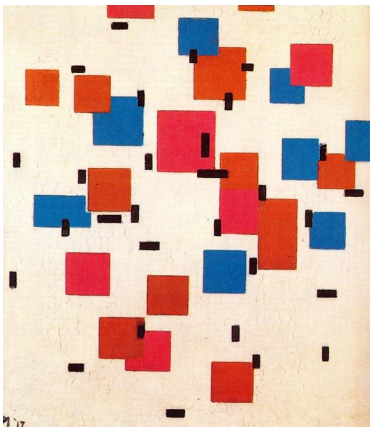

Figure A5. M1. Composition in Color A (1917).

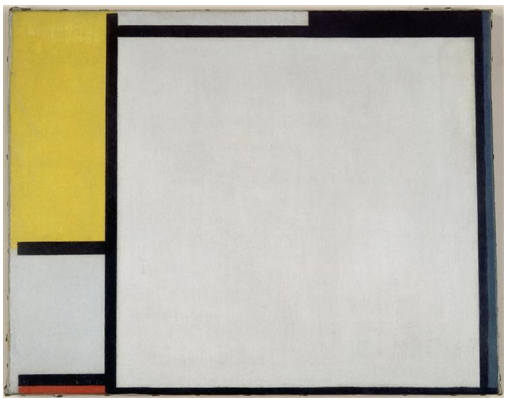

Figure A6. M7. Composition with yellow patch (1930).

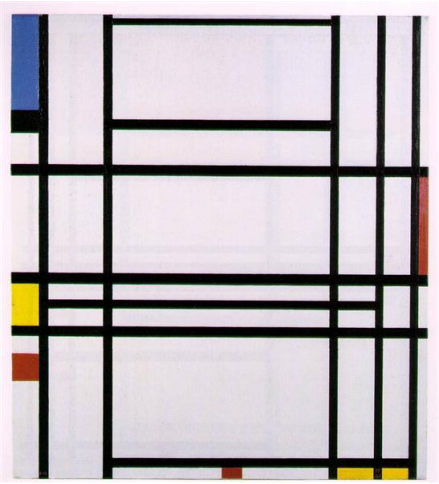

Figure A7. M10. Composition No. 10 (1939–1942).

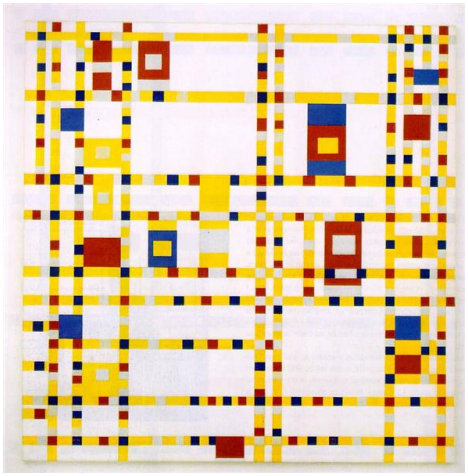

Figure A8. M12. Broadway Boogie Woogie (1942–1943).

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