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The role of the imagination mechanism in the perception and representation of the cinematic image from a neuro-psychological perspective

Florin CONSTANTINESCU

Associate Professor, PhD, Department of Arts and Media, University of Craiova, Romania

Abstract
The present paper tackles the role of imagination in the perception and construction of the cognitive representation of the cinematic image, zooming in to what extent the complex cognitive mechanisms involved in the imaginative process contribute to the understanding/interpretation and completion of film images. While watching a cinematic film, each onlooker mentally builds distinct, unique pseudo-realities, using one's own imagination, knowledge and experiences, reconstructing for oneself a variant of the film narrative. Distinctive and original because the perception and interpretation of the visual and stylistic details of the image are different from one onlooker to another. Such differences are due, on the one hand, to neuro-psychic differences or to those related to the performance of the perception mechanism and, on the other hand, to quantitative and qualitative differences of the individual cultural background that directly influences the entire mechanism of imagination. Because imagination represents the mental capacity to construct cognitive representations, mental schemes or images, new ideas or scenarios, which are not perceived sensorially (see visual and/or auditory film)straight from the reality depicted by the images and sounds of the film, the outcome of the processes underlying this mechanism generate more or less similar constructions among individuals. Neurally speaking, this process involves complex interactions between multiple brain regions and operates by using cognitive resources shared with perception and memory.

Keywords: *film, image, imagination, the mechanism of imagination, image perception, cognitive representation*

Introduction

Imagination is the most important central process for the expression of creativity, originality and innovation, but also for solving immediate problems and tasks, and anticipating the future It plays a fundamental role in the process of understanding the surrounding world, being the essential element that transforms our raw sensory experiences into meaningful perceptions. Imagination allows our brain to interpret sensory stimuli not just in a mechanical way, but in a complex way, integrating previously accumulated information, emotions and knowledge. Thus, imagination not only gives coherence to our experiences, but amplifies their meaning, either through cultural conventions or through an innovative, creative and personalized approach. Although it seems like a purely abstract ability, it has solid roots in the workings of brain mechanisms. One of the fundamental roles of the imagination in relation to the cinematic film involves completing and interpreting the filmic narrative, respectively the construction of filmic spaces specific to various scenes. Films, due to time and structure constraints, do not provide all the details necessary for an exhaustive understanding of the story. Viewers must use their imagination to fill narrative gaps such as temporal ellipses or events not explicitly specified and that can only be intuited, assumed based on imagination.

The complex mechanism of imagination involves the activation of multiple neural networks, including those associated with memory, emotions, and executive functions. The main distinguishing feature of this mechanism is based on the ability to create virtual mental images by combining previously memorized perceptual information (existing in the individual's knowledge of the world) with new perceptual information (provided by reading the cinematic film). These two sets of information belong to and define spaces and situations that take place in different worlds, i.e. the real one - where we live, experience and accumulate knowledge daily, and a virtual one, with which we come into contact by watching the film. The first set is complete and perfectly defines the actions we take or interact with entities in our own material universe, while the second set, provided by watching a movie, is incomplete because the movie is a "compressed", lossy product of information from all points of view (chronological and spatial).

Basically, based on the information related to this subject coming from neuroscience in the last decades of research, we can speculate that the cognitive interpretation of movie scenes, through the intervention of the imagination mechanism, is done by mapping the information provided by the movie over the real information, previously memorized, comparing them, the extraction of similarities and the construction of distinct interpretations, unique to each individual viewer. In other words, imagination does not simply consist only in organizing, identifying and interpreting sensory information to represent and understand a film, but, rather, it is a constructive process that is based on a repertoire of images, concepts and autobiographical memories and leads to the creation (and continuous updating) of a personal world view that, in turn, provides a basis for the interpretation of the information offered to us, obtained through watching the film. In conclusion, we could understand (for the particular case of watching a movie) that, through imagination, the individual creates a new "mental world" that is shaped in accordance with the concepts, beliefs and knowledge of one's own inner world.

The two major neural networks are primarily involved in imaginative processes: the Default Mode Network (DMN) and the Executive Control Network or Frontoparietal Network (ECN or Frontoparietal Network, FPN) (Pearson et al., 2015).

DMN is active when the brain is in a state of relative rest and involved in introspective, self-reflective, and imaginative thinking. This network includes structures such as the posterior cingulate cortex, medial prefrontal cortex, and temporal lobes and facilitates the automatic generation of thoughts and scenarios, as well as access to information from memory.

The executive control network includes the prefrontal and parietal cortex and is involved in directing attention, monitoring and regulating imaginative activity. The executive control network adjusts the content of the imagination according to cognitive goals and the external environment. It is a large-scale neural network involved in higher cognitive functions such as maintaining and manipulating information in working memory, decision-making, and goal-oriented problem solving. The network's activity increases during demanding cognitive tasks, unlike other networks such as DMN, which reduces its activity in such contexts. The functioning of this network is essential for high-level cognitive processes such as reasoning, planning and problem solving. This plays a crucial role in working memory, allowing short-term information manipulation and integration. It is also fundamental for cognitive flexibility, enabling behavior to adapt to changes in the environment.

At the neural level, imagination is a phenomenon distributed in the depths of the brain, involving multiple other interconnected neural networks. Among the most important regions involved are:

- the prefrontal cortex, which plays an essential role in imaginative processes, being responsible for executive functions such as planning and control of attention. This region is involved in generating and maintaining imaginative scenarios and assessing their consequences (Passingham, 2021). At the same time, the ventral prefrontal cortex processes the associations between the objects in the visual field and determines the way in which they fundamentally interact (e.g. the choice of an object is conditioned by the presence of another object) (Frith C. and Dolan R., 1996, Passingham and Wise, 2000)
- the visual cortex (especially block V1) is fully activated during visual imagination, even when there is no external visual stimulus. Field-related research studies validated that the same regions that process visual stimuli in reality are also used at the moment when a person uses imagination. Correspondingly, while watching a film, the viewer may activate the same brain areas to both perceive the images and to imagine additional elements that help the brain solve the cognitive equation generated by watching a film (Kosslyn et al., 2001, Cichy et al., 2012; Slotnick et al., 2012; Pearson, 2007, Kosslyn, 1994).
- the parietal cortex, involved in spatial orientation and spatial representations, facilitates imaginative simulations of interaction with the environment (Rolls, 2023; Shomstein, 2012; Chen and Angelaki, 2013).
- memory networks and the hippocampus: the hippocampus, an essential structure for memory, plays a crucial role in the imagination, facilitating access to information stored in episodic memory[23] to generate future

[23] Episodic memory is a type of long-term memory that allows the storage and recollection of specific personal events, along with the temporal and spatial context in which they occurred. It is a component of autobiographical memory, which records unique life experiences, such as, for example, remembering the first day of school, a special vacation, or

scenarios. Memory networks in the temporal medial cortex interact with other regions to "reactivate" memories that are later remodeled and combined into new scenarios (Andrews-Hanna et al, 2014; Addis et al., 2007; Schacter, 2007).

Stephen Kosslyn argues that visual imagination is a crucial process for interpreting incomplete or ambiguous images, a central aspect in cinematic perception. The film does not explicitly provide all the visual and sound information necessary for a complete understanding; the viewer's imagination is absolutely necessary to fill in these gaps and create a coherent experience. For example, temporal ellipsis, a frequently used narrative device, requires the viewer to imagine events occurring during the time that is missing in the film's development to understand the logic of the story.

Even if the film provides a constant flow of visual information and corresponding auditory information, the reader must intensively use the imagination mechanism and the mental resources that supply this mechanism with information (calling on one's encyclopaedic knowledge from the long-term memory, as well as one's experience acquired via the cognitive representation mechanism), in order to understand, complete and reconstruct a narrative or a filmic universe. Imagination is essential in this process, it is precisely via imagination that the onlooker generates the *mental film*, i.e. the cognitive construction, unique to each individual. In other words a cognitive representation that corresponds to a personal interpretation of the elements of the film being watched (image, sound, editing) (Kosslyn, 1994).

David Bordwell argues that the viewer is not a passive receiver of visual information, but an active participant in the construction of meanings. The cognitive theory applied to film suggests that the viewer must use imaginative processes to fill in the gaps left by the narrative and to understand stylistic elements, means of visual expression, symbols, codes or visual metaphors. Bordwell suggested that viewers not only perceive the images presented on the screen, but also actively participate in building a narrative understanding through imagination and inference. The same author circulates the concept of "gap filling", a mechanism in which viewers use imagination to fill in the missing or implicit information presented in the film. Furthermore, Bordwell's theory circulates the concept of "schema theory", whereby viewers apply pre-existing cognitive schemes to organize the information presented in the film. Imagination plays a crucial role in activating these schemata, since the viewer shall interpret the images through the lens of her/his previous experiences and cultural expectations (Bordwell, 1985). In a complementary study, Noel Carroll, suggests that viewers use their imagination to navigate through complex narratives and visual symbolism, facilitating the understanding and interpretation of filmic experience (Carroll, 1996).

We no longer need to certify the fact that this mental film is unique for everyone: each of us noticed that, for example, in a group that watched the same film, we will encounter a multitude of different opinions, often diametrically opposed, different interpretations of some scenes, different portraying of the characters, but also a series of emotional experiences uniquely described by each individual. The mechanism of imagination is strongly conditioned by the quality and the volume of information contained in one's encyclopaedic knowledge, cultural background, and one's life-long experiences. Because these contents are extraordinarily different from one individual to another, obviously the construction of the mental film, built on one's own interpretation of visual and auditory information in compliance with his/her encyclopaedic knowledge, will also be different from one individual to another.

Imagination, a window to the inner world?

Michael Holly advocates that in the process of constructing the cognitive representation of the image in the consciousness of the onlooker, the film image is an information container that acts as an interface that contains a visual, intentional configuration of signs, symbols, and visual codes. The screen is a mediator, but also a catalyst of an alternative reality, which can be totally different from the perceptual reality of the image projected on the screen and is built imaginatively by the onlooker on the basis of a combinatorics in which the original (perceptual) visual cues undergo certain mutations, due to their association with certain symbols and/or aesthetic codes. With this, the original visual cues receive new attributes and have the ability to represent *something else* than the original (perceptual) visual cues (Holly, 1994).

Stephen Kosslyn argues that visual imagination is a crucial process for interpreting incomplete or ambiguous images, a central aspect in cinematic perception. A film does not always provide all the information and visual clues necessary for a complete understanding, and this is where the imagination of the onlooker in, absolutely necessary to fill these gaps and create a coherent experience (Kosslyn, 1994; Kosslyn, 2005). Murray

a very important conversation. Unlike semantic memory (which involves encyclopaedic knowledge), episodic memory is centered on particular events and includes details of "who", "what", "where" and "when".

Smith claims that the viewer's imagination is essential to understanding the motivations and emotions of the characters, thus allowing for deeper emotional and narrative involvement. Smith also introduces the concept of" imaginative engagement", whereby the viewer, through his imagination, engages in a form of empathy towards the characters. This empathy is not only emotional, but also cognitive, allowing the viewer to infer and complement the intentions of the characters, even when they are not explicitly presented. Thus, imagination becomes a mechanism by which the viewer can navigate in the narrative complexity of the film, interpreting what is not directly present (Smith, 1995).

For example, the temporal ellipsis, a frequently used narrative device, requires the viewer to imagine events occurring during the time that is missing in the film's development in order to understand the logic of the story (Speer et al, 2009; Zacks et al., 2005; Zacks et.al, 2007). The brain is able to fill in the "gaps" in the narrative and build a coherent story, relying on past experience, episodic memory and executive functions. To solve the problem of temporal ellipsis, the brain executes several processes, such as:

1. Event segmentation

The brain divides the continuous flow of information into a series of discrete events, a process called event segmentation, at the level of a film, it is segmentation into distinct scenes. This helps to organize and understand the narrative, allowing the viewer to clearly identify the beginning and end moments of each scene and all the information necessary to decrypt the scene in question. When a temporal ellipsis occurs, the brain detects a sudden change in narrative context (visual, temporal, or emotional) and marks that transition as a new event. This segmentation is supported by the activity of the prefrontal cortex and hippocampus.

2. Reactivation of episodic memory

To understand what happened during the ellipsis, the brain uses episodic memory to reactivate details from previous sequences of the story. This process allows the viewer to fill logical gaps. For example, if we have a cinematic shot in which a character has left the scene in a car, and in the next shot he/she is in the yard of the house and is just getting out of the car, the brain easily assumes the assumption that the character has traveled a distance by car to his/her home, in his/her yard. The hippocampus plays a crucial role in reactivating memories and combining them to generate a coherent image.

3. Experience-based inferences

The brain uses inferential logic to infer what might have happened during the omitted period. This process involves, on the one hand, the default mode network (DMN), which is active during reflection and imagination, helping to generate possible scenarios, and on the other hand, the medial prefrontal cortex, involved in evaluating the logic and coherence of scenarios (Buckner, 2008; Schacter, 2007). For example, if in one scene a character is poor and in the next scene he/she is rich, the brain can infer that he has won a large amount of money, even if this event is not explicitly presented either as an image or spoken text. For example, depending on the filmic context, which the brain has understood as such, the onlooker can imaginatively construct a scenario: we can imagine that wealth is a result of the character's hard work, an act of corruption (receiving a bribe), an illegal act (theft, robbery), winning a prize or lottery, an inheritance, etc. We note that the choice of one of the variants depends on the model of cognitive representation built by the brain and the previous experiences of the onlooker.

4. Visual and temporal context processing

A series of visual cues, such as changes in stage management or decor, atmosphere or ambiance, clothing, age, facial configuration - wrinkles, beard or mustache, etc.) and temporal (the moment of the day, transitions from day to night, changes in weather or seasons) help the brain to effectively interpret the duration of the ellipse. In such cases, the parietal cortex is involved in processing these spatial, form and temporal representations. The visual cortex, along with the superior parietal cortex, interpret visual changes to understand temporal transitions.

5. Integration and narrative reconstruction

At the end of the process, the brain can combine all available information (memory, visual context, inferences) to reconstruct the narrative thread and generate a coherent and consistent experience, in accordance with the previous experiences already remembered and used. This involves the lateral prefrontal cortex, which coordinates executive processes and checks consistency between scenes, but also the hippocampus, which connects new information with those already stored in memory. For example, if a character is seriously injured in one scene, and in the next scene appears healed, coming out of a hospital, the imaginative process will fill the missing time segment (which involves, for example, bringing the character to the hospital, medical intervention, the process of convalescence and recovery), deducing all exemplified actions from the missing time and action segment. Basically, we observe that this process relies heavily on information accumulated in memory from previous experiences and information accumulated about how society, medical services, etc. work, based on only a few limited but key images: an injured character, fallen to the ground, and the same character leaving the hospital.

Typically, imagination is shaped and influenced by one's own will, though not exclusively. The perception of the meanings of a film scene, starting with the fact that that action is continuous, coherent and spans a certain time interval, is conditioned by a certain mental state and a set of anthropological characteristics (beliefs, prejudices, perceptions of social, religious, political, material phenomena, etc.) specific to each individual. Imagination is not constrained by the truth-based dimension or scientific correctness, but can be used as a tool in the exploration of truth. Although the imagination frequently uses the same neural circuits, such as episodic memory, it has a greater freedom of reconstruction, since it is a process as flexible as possible, precisely because it is able to construct virtual situations, imaginary but possible, to a lesser or greater extent.

Imagination is not only a cognitive process, but also an affective one. Emotions are often generated and simulated during the imaginative process. For example, when we imagine an emotional scene based on information received through watching a movie scene, the cortex can activate the same neural circuits responsible for the actual emotional experience. In these cases, the limbic system, especially the amygdala and the cingulate cortex, plays a crucial role in associating mental images with the corresponding emotions. This explains why the vast majority of viewers have strong emotional reactions to imaginary thoughts or scenarios.

Imagination, as a process of constructing a situation, a virtual scene, or completing an existing situation or scene - as is the case when watching a movie, is strongly influenced by the presence of a motivational state, such as desire, emotion, belief, prejudice, previous experience, or other mental states specific to real situations. The imagination mechanism makes full use of previously memorized information in real situations and experiences, but adapts and combines it to solve a new, virtual problem, which it assists completely passively from a motor point of view. For example, if in a sequence of images we see a character who is going to leave the house and walk down the street to a store, and it is raining outside, the imagination quickly builds the appropriate response: the character must take an umbrella with him so as not to get wet from the rain. In contrast, in the same scene, with the difference that the character is about to go outside and quickly get into a car, although the images explicitly show that it is raining outside, the imaginative process eliminates the idea of using an umbrella.

The imagination mechanism works as a dynamic process of reactivating and reshaping past experiences to generate new scenarios that it also uses in the case of watching a movie. This process involves three main stages:

- reactivation of memories, a first stage that consists of reactivating episodic memory and information stored in the hippocampus and long-term memory. The brain accesses previous experiences and their specific elements, such as visual details, sounds, or sensations, and allocates them in the process of constructing the mental movie.

- creative recombination – is a second stage, which involves the creative recombination of recalled elements to form new mental images and scenarios to assemble the mental movie. At this stage, the prefrontal cortex plays an essential role, facilitating the evaluation and organization of information in a new imaginative context.

- projection into the future or other hypothetical scenarios, which is the last stage. At this point we are dealing with the projection of imagined scenarios in a hypothetical future or in an unreal situation. This involves assessing the plausibility and adaptability of the scenarios created, which can help with planning and decision making.

Because imagination plays an essential role in the creative process, allowing individuals to innovate and develop new solutions to complex problems, the imaginative construction of the mental film is made easier, because this construction is imaginary and not real, material, and as such, the individual does not encounter the complex problems posed by a real construction process, versus an imagined one. While watching a movie, the viewer engages in an active cognitive process, using imagination to create and manipulate mental images that correspond to those viewed on the screen, but are not integrated into the situation or action being watched.

According to Stephen Kosslyn, imagination is defined as a mental process that allows the formation of mental images and the simulation of experiences. This process is based on the correct functioning of several cognitive mechanisms, such as episodic memory, attention and anticipation. So one of the fundamental sub-processes of the imagination process is *mental simulation*. Mental simulation involves reactivating sensory and motor networks to recreate experiences without external stimulation (Kosslyn, 1994). For example, visual imagery uses the visual cortex to construct mental images, and motor imagery activates motor areas, allowing us to imagine movements before we perform them. Using mental simulations and combining information from memory makes it easier to creatively solve problems and adapt to new situations. Furthermore, the ability to imagine the future is an essential tool for making decisions and anticipating consequences, very important elements for the construction of the cognitive representation of the film.

This skill is essential for decision - making, planning and empathy. For example, through imagination, an individual can simulate a social interaction or a possible outcome of a decision, thus assessing its impact without having to experience it in reality. This simulation involves, at the neural level, the activation of circuits that reflect both perception and action. Mirror neurons[24], identified in the motor and parietal cortex, play an important role in the simulation of actions and in the empathic processing of the actions of others. These neurons activate not only when a person performs an action, but also when he/she imagines or sees someone else doing that action, thus supporting a form of mental simulation through imagination (Gallese and Goldman, 1998; Rizzolatti and Sinigaglia, 2016; Rizzolatti and Craighero, 2004). Another notable research study in the field of visual perception introduced the concept of "embodied simulation". The researchers suggest that the onlooker, through his/her imagination, simulates at the neural and bodily level the actions and emotions seen on the screen. This mental simulation, facilitated by the mirror neuron system, allows for deep emotional involvement, amplified by imaginative processes. In this sense, imagination not only complements visual perception, but also activates complex emotional responses (Gallese and Guerra, 2012).

Also, in this context, we must define two forms of organization of figurative visual information, very important in the performance of the imaginative process: the mental schema and the mental image. Practically, the activity of the mechanism of imagination and the mechanism of visual perception are based on accessing mental schemas, respectively mental images The construction of image meanings uses combinatorial algorithms in which, as input data, we find the information capsules defined by these two notions. Although it is not known exactly where mental schemas and images are stored (in which brain structure), it is certain that they are part of long-term memory, especially mental schemas, which are less volatile. In general, the mental scheme is represented by a set of information organized as a result of a rationalization strategy, in the form of a stable and coherent cognitive structure, which can define or evoke a class or category of entities (of a material, conceptual or phenomenological type).

Schemas and mental images have one important attribute in common, namely, adaptability. Thus, depending on the situation, mental schemes and images are used in an adapted way, for each specific case. Their malleability is necessary because the number of probable situations in which they are used is infinite, while the individual's experience (concretized by the number of memorized mental schemas and images) and memory capacity are finite. The fact that they are adaptable means that mental schemes and images endure certain mutations that are dictated by the conditions of the situation described by a film scene and the immediate needs (immediate tasks).

The cortex does not use these schemes and images in the raw form in which they were memorized, but modified on a case-by-case basis, depending on the visual, sound or textual descriptors of a film scene. Thus, specific conditions interact with the scheme and shape it, so that the scheme becomes valid for any situation, as long as the general definition of it does not change. If it were to take as an example the image where we see the silhouette of a tree. The essential attributes are clear: a roughly cylindrical trunk, of variable thickness, made of wood, which grows from the ground, with a specific texture, presents thinner branches at the upper end, also made of wood, and each branch presents other smaller branches and so on, leaves of the same type of various sizes are attached to each branch, the branches are elastic, it has chromaticity in various shades of gray, brown, green, etc. This is part of the information contained in the information capsule called the mental schema of a tree. We come to understand that the way of defining these attributes involves, through combinatorics, solutions in infinite number, although in the cortex only a simple set of information was memorized. Via adaptability, that is, varying one or more attributes at once, a single mental scheme (schema *tree*) can define an infinity of physical forms, practically all the species, types and varieties of trees that exist on the planet. We clearly observe that the amount of memory occupied for defining a shape that exists in billions of combinations is very small.

Mircea Deaca states that the mental schema is an accessory used in cognitive processes (both in Level I, in the recognition/categorization stages, and in Level II, that of cognitive representation), being organized as an algorithm used to pack in the form of a matrix of characteristics common to some expressions, being characterized

[24] Mirror neurons are a special type of neurons that also activate when a person performs an action, and when the person in question observes someone else performing the same action. Basically, this neural mechanism allows for a rapid and intuitive understanding of the actions of others. They were first discovered in monkeys by a team of Italian researchers led by Giacomo Rizzolatti, in the 1990s, at the University of Parma. Mirror neurons were initially identified in the premotor cortex and the lower parietal lobe of the brain. The mirror neurons of an individual help the brain understand and interpret the actions performed by the other people he/she is watching. For example, when you see someone reaching out to take an apple from a table, your mirror neurons activate in the same way as if you were doing this movement yourself.

primarily by *consistency*: "A schema is a superordered concept that specifies common elements or what several specific concepts have in common. Specific concepts are instantiations or schema elaborations. The difference between schema and elaboration lies in the degree of specificity, detail; the scheme is more abstract and is compatible with several possible options.

All human concepts are schematic to a different degree. Examples of the concepts relationship on the schematic axis can be: thing - > animal - > mammal - > rodent - > squirrel - > ground squirrel or motion - > make a move - > run - > sprint. The arrow -> indicates that the term on the left is "schematic for" and the one on the right is "an elaboration of". A schematic-based event occurs when the conceptualizer (the human subject) compares mental structures and perceives similarities between them. The act of comparison is asymmetric since we compare a target structure to a standard. The degree of recognition of the standard in the target is a parameter of differentiation between comparisons. The relationship can be entirely schematic (A -> B) when all features of the standard are preserved in the target, or of partial schematic or extension (A-> B) when there is an omission, contravention or distortion of the standard specifications. If a mental comparison and judgment of this kind is repeated, a facilitation of the relationship reactivation occurs. Hence a rooting will take place and the relationship becomes conventional. Consequently, the non-linguistic cognitive structure becomes linguistic, if this structure is used as part of a phonological or semantic (or expressive) structure. (Deaca, 2013)

Edward Branigan defines the mental schema as being composed of the totality of information of any type that the individual's memory has stored, information that is associated or connected in coherent, stable and definable forms (Branigan, 2006), and R. Langacker defines this phenomena as “patterns of activity abstracted from everyday bodily experience and pertaining to vision, space, movement, and force... they are “pre-conceptual” structures that give rise to more elaborate and abstract conceptions (or provide their organizing skeleton) through metaphorical combination and projections” (Langacker, 2008). We note that mental schemes are the basis of conceptualization, these are actually the bricks with which a concept is built that will be used by the imaginative process.

The mental scheme should not be confused with the mental image which, according to M. Miclea, is an information matrix used in the process of representation, being organized as a cognitive representation that contains all the visual information about the spatial configuration and attributes or physical characteristics of a form, in the absence of any kinesthetic actions. This image is completely devoid of syntax because it does not affirm or deny anything (Miclea, 2003). In comparison with the mental schema, the mental image is a cognitive product that has a great advantage, since it helps the representation mechanism to skip some of the operations. In other words, we do not need complicated analytical and chronograph processes to obtain a cognitive representation of the image, since the mechanisms capitalise on ready-compiled information that they use as such.

In contrast, the mental image manifests two drawbacks, i.e. since it requires large amounts of memory to be stored (we are talking about a huge number of such images memorized throughout life) it is volatile, the cortex erases this information if not used often. In fact, to be as rigorous as possible, science has not yet definitively answered whether the brain actually deletes these mental images or just stores them in other areas that are not yet identified and cannot be accessed so easily. This theory is endorsed by countless experiments involving, for example, hypnosis, through which certain mental images are accessed, even though they were considered permanently lost.. The second disadvantage of the mental image is that the algorithm by which it is constructed does not present adaptability, therefore it cannot be used as a "root" for the construction of different concepts. The mental image is a capsule of previously processed but closed visual information.

The T_01 test verifies the power of constructing a complex cognitive representation based on an extremely simple scheme, with minimal visual cues, monochromatic, devoid of textures, three-dimensionality and, very importantly, of an environmental context. 40 subjects with a test-based average encyclopaedic knowledge background were selected. The age of the subjects was between 20-25 years and the male/female ratio was 1:1. The 40 subjects were divided into two groups of 20 individuals as follows: in Group 1 were distributed 20 subjects who did not have a relevant background of religious knowledge, and in Group 2 were included 20 subjects who had average knowledge of religion (we did not check whether they were atheists or theists, but all 40 subjects belonged to the Orthodox or Catholic religion). The images were presented in HD resolution (1920X1080PX) and were projected 20 seconds for each subject, on a 22-inch color monitor, positioned at a distance of approx. 60cm of subject.

In the first stage of the test, the 40 subjects were presented with the image in Figure 1A and were asked to identify a potential symbolic representation (without suggesting any kind of response or association with a particular domain).

In the second stage of the test, the subjects analyzed the image illustrated in Figure. 1B. Image 1B is identical to the image in Figure 1A, with the difference that in image 1B the halos specific to the characters in the visual representations with religious subjects appear minimalistic.

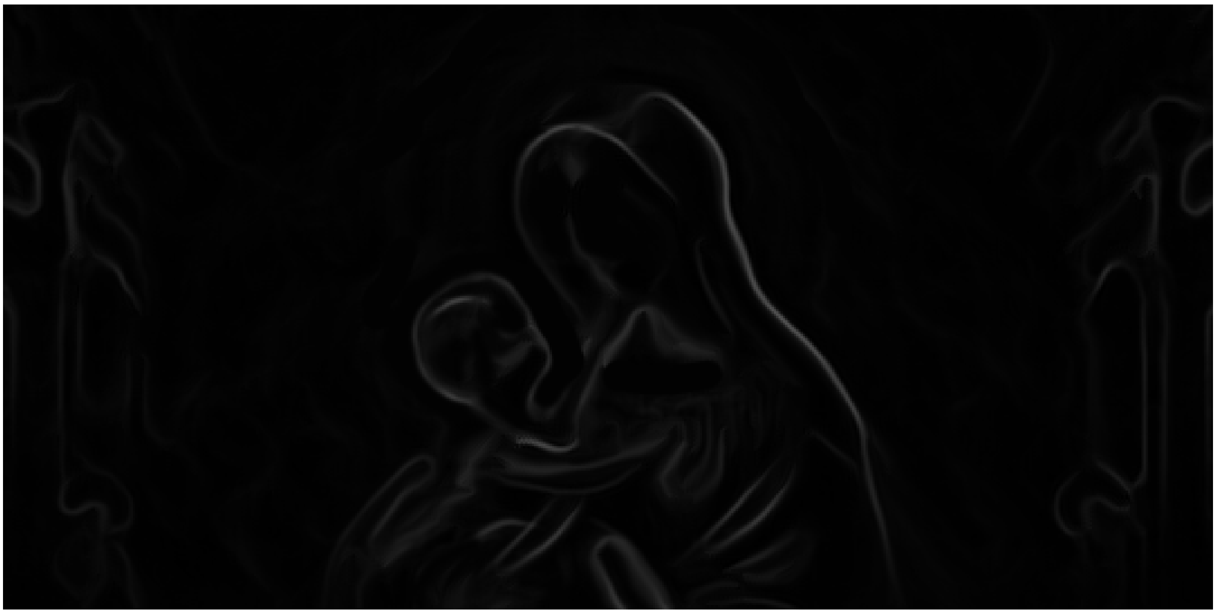
Following the test analysis Table 1 below indicates the results obtained folowing our test analysis.

- In stage 1 of the test, in Group 1, only 3 subjects out of 20 (15%) identified a vague resemblance to the reference image, while, in Group 2, 15 subjects out of 20 (75%) identified such a resemblance to the image of the Mother Mary with Child Jesus.

- In stage 1 of the test, we find that the number of subjects who identified a possible similarity with the religious subject the Mother Mary with Child Jesus increased to 35%, only by adding a minor schematic element (the circular contours around the "heads"), but extremely important for typical religious representations. For Group 2, the results are obvious (95% recognized the scene), because a large part of the group's subjects had also initially recognized the representation of the religious subject, and we recorded that even of the remaining 5 subjects who did not initially recognize the scene, 4 identified the religious scene.

Thus, it is worth taking into consideration that compared to the reference image represented in Figure 2B, the images of the T_01 test are much simpler, because almost all visual elements and clues are missing (all human forms, the stage design in the background, with all geometric definition, textures, colors, respectively the action of light, etc.). However, subjects who had knowledge about this type of religious visual representations correctly identified the represented subject, based on an extremely simple scheme, even though the reference images viewed by subjects in the form of painted icons, paintings, church wall paintings or in various books, leaflets, etc. or images viewed in recent decades on the internet) are very complicated.

A



B

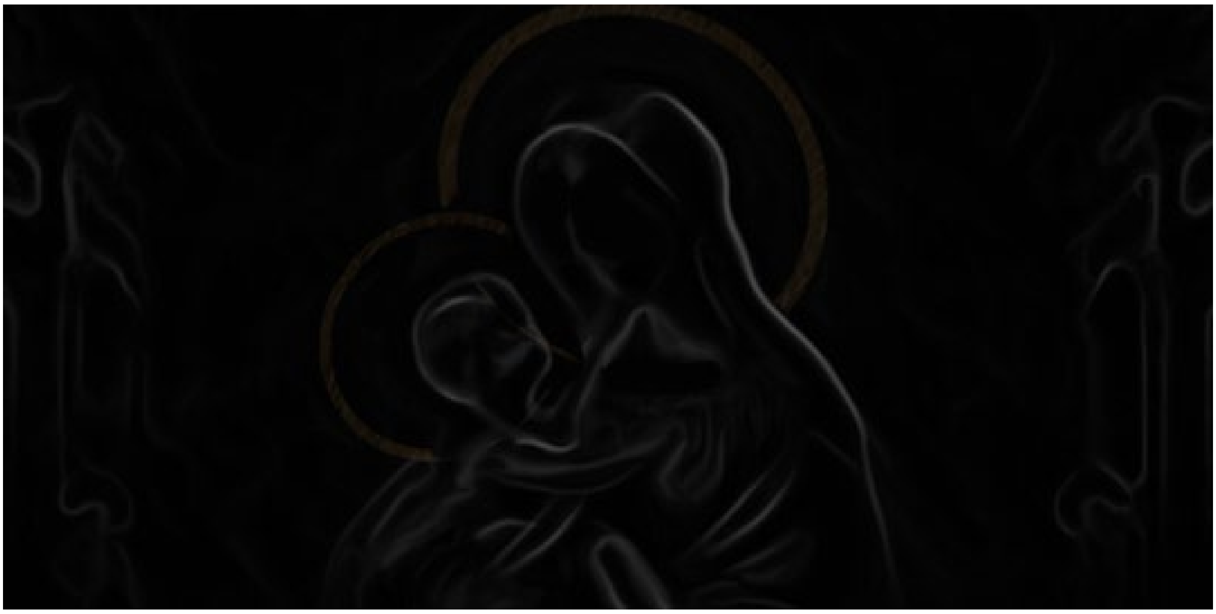


Figure 1A, B.

	STAGE 1	
	Group 1	Group 2
1	YES	YES
2	NO	YES
3	NO	YES
4	YES	YES
5	NO	YES
6	NO	NO
7	NO	YES
8	NO	NO
9	NO	YES
10	NO	YES
11	NO	YES
12	NO	YES
13	NO	YES
14	NO	NO
15	NO	NO
16	NO	YES
17	YES	YES
18	NO	YES
19	NO	NO
20	NO	YES

	STAGE 2	
	Group 1	Group 2
1	YES	YES
2	NO	YES
3	NO	YES
4	YES	YES
5	NO	YES
6	NO	YES
7	YES	YES
8	NO	NO
9	NO	YES
10	NO	YES
11	NO	YES
12	YES	YES
13	NO	YES
14	NO	YES
15	YES	YES
16	NO	YES
17	YES	YES
18	YES	YES
19	NO	YES
20	NO	YES

Table 1

Imagination also plays an important role in the stylistic and aesthetic interpretation of the cinematic image. Vivian Sobchack (1992), in "The Address of the Eye: A Phenomenology of Film Experience", emphasizes the role of imagination in the phenomenological perception of the film. The author suggests that viewers not only interpret visual images literally, but use their imagination to construct deeper meanings, related to the film's atmosphere, tone and visual symbolism. For example, in films that use abstract or stylized visual compositions, viewers must use their imagination to decipher hidden meanings and build a coherent aesthetic experience. Expressionist films or those that use visual symbolism, such as those directed by Andrei Tarkovsky or Ingmar

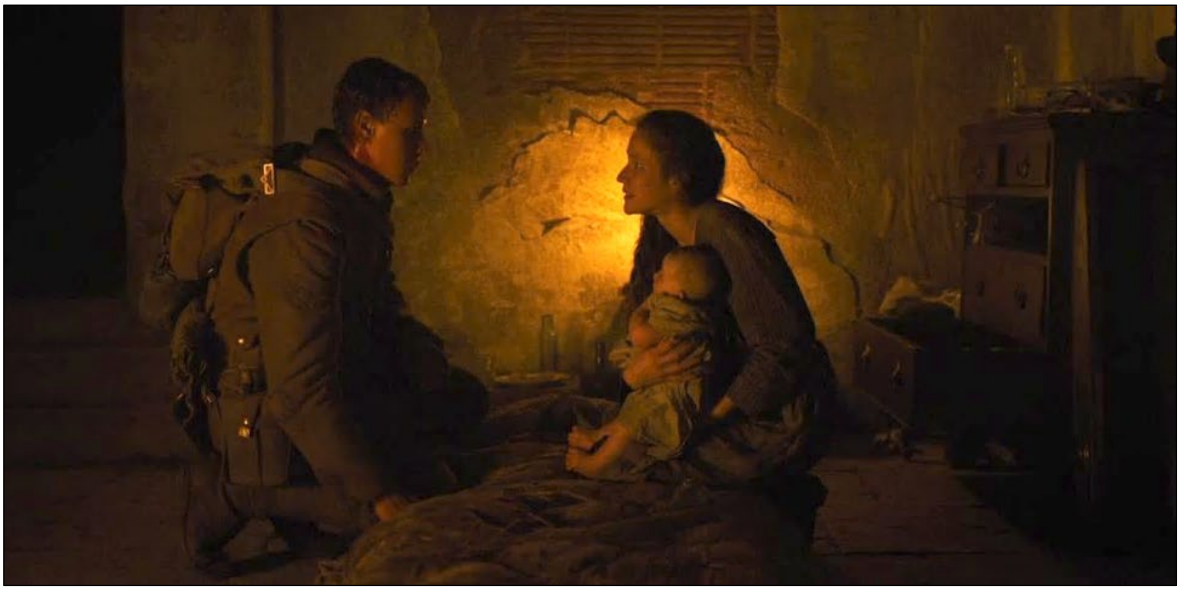
Bergman, intensely demand the viewer's imagination to interpret the complexity of the images. Against this background, imagination is not only a narrative mechanism, but also an aesthetic tool that enables the viewer to interpret and rate the visual style of the film.

The imagination mechanism also uses memorized information concerning visual codes often used in the film image. Adam Jean-Michel and Mark Bonhomme take over from Umberto Eco an older classification aiming to establish four important categories of visual codes that are taken into account in imaginative processes. The first category encompasses iconographic codes that describe culturally connoted architectures, such as the Christmas celebration and all the associated symbols: red colors in association with white, the Christmas tree, the sleigh with reindeer; the Resurrection (with the associated symbols: the Christian cross, the crown of thorns, the white shroud, etc.). The second category is made up of stylistic codes, found in the image as unique and original creations that belong to a certain author's brand. The third category - iconic codes involves image de-structuring into stable visual elements (for example, Santa Clause's white beard or certain chromatic associations, such as the colors of a national flag). The fourth category includes the codes of the unconscious, through which certain psychic projections caused by the reading of visual signs or clues are identified (Adam, Bonhomme, 2005).

In this regard, we carried the T_02 test. We set out to ask a sample of 32 subjects to identify an image with a symbolic potential from a 3-minute film sequence (01:15:20-01:18:20) from the "1917 production (directed by Sam Mendez, 2019, produced by Dreamworks Pictures and Reliance Entertainment, UK, USA, India, Canada, Spain), which plays at minute 01:16:20 the illustration in Figure 2A. Selected from a wider sample, all 32 subjects were chosen on test-basis average encyclopaedic knowledge. The age of the subjects was between 20-25 years and the male/female ratio was 1:1. The 32 subjects were divided into two groups as follows: in Group 1 were chosen 16 subjects who did not have a relevant background of religious knowledge, and in Group 2 were included 16 subjects who had average knowledge in the field of religion (it was not checked whether they are atheists or theists, but all 32 subjects belonged to the Orthodox or Catholic religion). The images were presented in HD resolution (1920X1080PX) and were projected 20 seconds for each subject, on a 22-inch color monitor, positioned at a distance of approx. 60cm of subject.

The identification of the image with a symbolic potential was problematic for the subjects in Group 1 (only 25% identified a possible similarity) while as obvious as possible for the subjects in Group 2 (81.25% identified a possible similarity). When faced with the sequence, most of the subjects in Group 2 identified a possible similarity with the image of the Mother Mary with the Child Jesus found in many of the paintings with religious subject (see Table. 2).

A



B

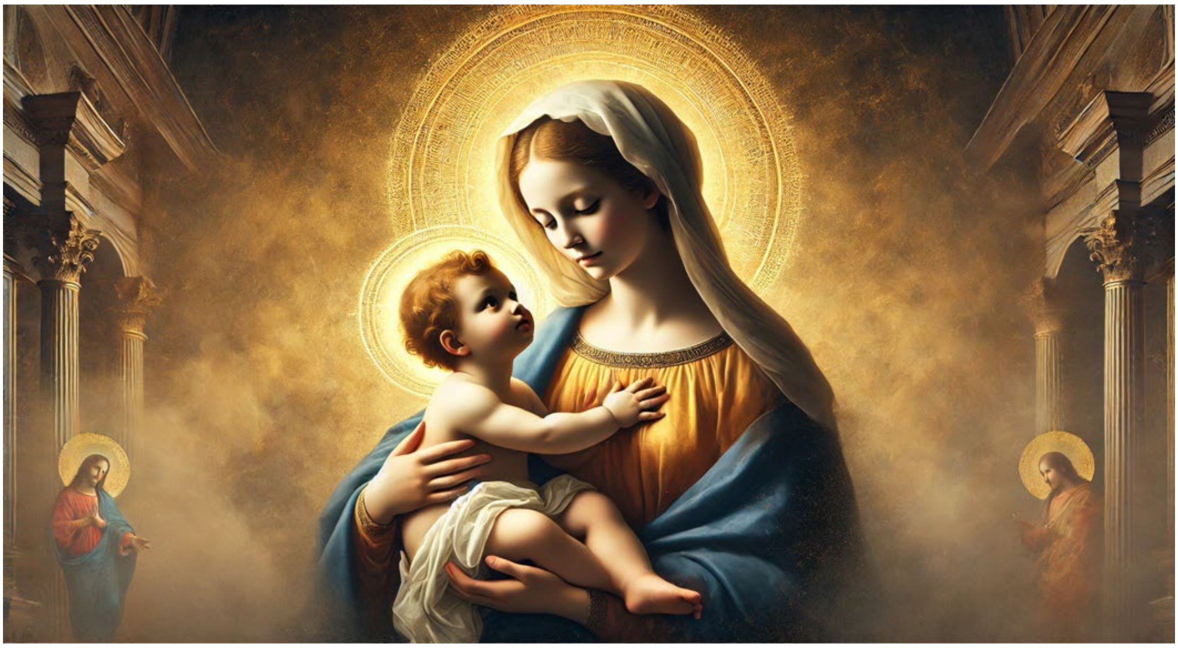


Figure 2A, B. A: test image (screen shot min. 01:16:20); B: picture reference

The second task – exclusively for the 18 subjects who identified the possible similarity - was to identify which was the most important visual clue they took into account. Most of the subjects, i.e. 13 out of 18 (72.22%) answered that the most important visual clue in choosing the answer was the luminous aura formed behind the woman (or the color of the aura light) holding the child, 3 subjects out of 18 (16.67%) said that the clue was represented by the mother's posture and her position with the child, and 2 subjects (11.11%) said they could not identify a specific defining element.

group 1		group 2	
No.	Identification of the image similarity with the Mother Mary with the Child Jesus	No.	Identification of the image similarity with the Mother Mary with the Child Jesus
1	NO	1	YES, the mother's posture with child
2	NO	2	YES, Rear Light
3	NO	3	YES, Rear Light
4	YES, Rear Light	4	DA, I do not identify the particular clue
5	NO	5	YES, Rear Light
6	YES, Rear Light	6	YES, Rear Light
7	YES, the mother's posture with child	7	YES, Rear Light
8	NO	8	YES, Rear Light
9	NO	9	YES, the mother's posture with child
10	NO	10	NO
11	NO	11	YES, Rear Light
12	NO	12	YES, Rear Light
13	NO	13	YES, Rear Light
14	NO	14	NO
15	NO	15	DA, I do not identify the particular clue
16	YES, Rear Light	16	YES, Rear Light

Table 2

To wrap up, we draw the conclusion that it is not the identification of a certain context, of people or of certain postures/facial expressions that is taken into account in the imaginative process, but a visual clue from the stylistic category, in this case the effect produced by a light source with a certain chromatic.

Sobchack also emphasizes the importance of "spatial imagination," by which the viewer completes his/her perception of the filmic space. The cortex geometrically interprets the perspectives from which the cinematic planes are filmed and unites them to mentally construct the filmic space in which the action occurs. Within this process, the mechanism of imagination intervenes and we observe that, even if the perspectives used in the filmed shots do not completely define a certain space, the brain quite easily constructs the entire space in which the action takes place, completing the missing segments with virtual, imagined visual details, according to the contents of the spaces that appear in the filmed planes and that have been memorized. The process helps the brain to perfectly understand displacements in space or time, even if they are strongly condensed. We would highlight the importance of this process, especially in films with complex narrative structures, in which the onlooker must make imaginative inferences in order to understand the logic of actions (Sobchack, 1982).

As for the determining of the position for an object or a person in space, either in relation to oneself or in relation to other objects or persons, this is based, we note, also on the mechanism of imagination; through the processing and integration of spatial representations, such as direction , orientation, distance and position. This spatial information is encoded by the brain using two main frames of reference: the egocentric one, which places objects in relation to the observer's position and orientation, and the allocentric one, which describes the location of objects independently of the observer's position, using the relationships between objects. These processes are supported by complex neural networks involved in the perception and representation of space. The posterior parietal cortex plays a central role in the egocentric frame of reference, integrating information from sensory systems (visual, auditory, somatosensory) to construct a spatial map relative to the observer's body. On the other hand, the hippocampus and the parahipocampal cortex are essential for the allocentric reference frame, being involved in the formation of cognitive maps that encode spatial relationships between objects. Such information is important in terms of understanding how the anthropomorphism of the camera is built: the visual onlooker can integrate more easily inside the scene

Imagination is also the catalyst for another process, namely the narrative perception, the so-called "gap filling", in which the onlooker uses imagination to reconstruct events that are not explicitly presented on the screen through images, sounds or dialogue (Noël Carroll, 1996). This process is extremely important because it gives coherence and consistency to the understanding of the film as a whole. Via this process, we can deduce, for example, what the characters' traits are, we understand their motivations for certain actions, we can detect emotional or mental states, such as: fear, dread or horror, joy, love, melancholy or longing, anger or depression. Imagination facilitates the viewer's empathy for characters, a process well documented in studies of film psychology.

Murray Smith introduces the concept of "imaginative engagement", whereby the viewer uses their imagination to simulate the emotions and perspectives of the characters. This cognitive and emotional engagement allows the viewer to live the film on a deeper level, even when the characters ' experiences and actions are different from those in the viewer's real life (Murray Smith, 1995). We emphasize another essential role of the imagination, namely that of mediator of emotional experiences. In genres such as thriller or horror film, imagination amplifies feelings of fear or tension. In horror films, for example, everything that is not explicitly shown by image on screen is often scarier than what is explicitly shown, as the onlooker uses his/her imagination to fill in the terrifying details. This is clear evidence of how imagination can intensify emotional responses while watching the film.

Furthermore, in addition to filling in the gaps in the filmic narrative, imagination plays a crucial role in anticipating future events. The onlooker is constantly engaged in a process of anticipation, imagining what might happen next in the story. Apart from the clues provided by the image, sound or text – explicit information, this process is fueled by the elements memorized throughout life in the encyclopaedic knowledge, elements derived from one's own experience, from the cultural background, but also from the knowledge of cinematic conventions.

Also, science fiction or fantasy productions are further examples in which the mechanism of imagination have a decisive intervention. In such film genres, viewers are invited to suspend disbelief and accept eminently fictional or fantastical worlds. Such genres rely heavily on the onlookers ability to imagine alternate realities and navigate among abstract or supernatural concepts, of which he/she has no material knowledge or information. Previous experiences hardly help at all, and imagination is needed to reconcile what is seen on the screen with terrestrial realities. Viewers must adapt their expectations and use their imagination to make the fantasy elements being viewed plausible and to "translate" the fantasy elements in terms of narrative and visual comprehensiveness. We could speculate that viewers who have a cultural/professional background rich in scientific information are somewhat advantaged because they can more easily imaginatively integrate the concepts provided by these genres of films. They can more easily understand how certain propulsion systems of ships work and understand certain ideas and concepts of space technique, possess more advanced information of astronomy or astro-biology, are familiar with many concepts such as theories of relativity and time travel, the speed of light, wormhole, black hole, nebula, etc.

In the case of this film genres, imagination involves more complicated processes of abstraction, in which the elements and phenomena viewed are perceived mainly through mental simulation, using the ability to mentally simulate possible experiences, without experiencing them directly.

Conclusions

The intervention of the imagination during the viewing of a film, from a neuro-psychological perspective, is a complex process that involves an interaction between multiple brain regions as well as cognitive, emotional and perceptual processes. Not only does it help us construct hypothetical scenarios and navigate possible alternative realities, but it also plays a vital role in empathic processing, in mentally simulating actions, and in experiencing emotions associated with film events and scenes. At the same time, imagination plays an essential role in filling narrative gaps in films, such as the temporal ellipsis, but also in interpreting visual/stylistic details and building a coherent narrative. We note that watching a film involves integrating new information with that stored in episodic memory to generate a unique interpretation for each viewer. At the same time, mirror neurons facilitate mental simulation as they get activated during the perception of the actions of the characters in the film, exactly as in cases where the onlooker would perform these actions himself. This process contributes to the development of empathy and emotional involvement of the onlooker of the film. At the same time, it is obvious that the differences in the interpretation of a film are due to differences in content and quality of the cultural background, social-anthropological differences, individual knowledge and experiences that transfer diverse information into long-term memory, which produces unique mental constructions for each viewer. We also conclude that the mechanism of imagination is essential for the aesthetic and stylistic interpretation of the cinematic image, especially in films that use means of expression that are part of the class of expressionist models.

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