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Neurocinematic therapy - An interdisciplinary perspective

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ABSTRACT

The present article is a typical perspective paper. It neither substantiates nor confirms theories, nor does it produce robust data-driven outcomes in the context of evidence-based medicine. It rather sheds light on the emerging field of neurocinematic therapy and promotes interdisciplinary discussion. Within the broad realm of neurocinematics, neurocinematic therapy is considered a realm of applied sciences with a particular impact on clinical areas and public health systems. It does not necessarily comply with standardised diagnostic manuals but inspires a multifaceted view of notions referring to pathology. Neuropsychological processing of individual movie experiences plays a crucial role and regards the interplay between psycho-affective phenomena and central-nervous functioning of specific brain areas, network connectivities and neural principles such as brain plasticity. According to the characteristics of meta-syntheses, the article respects all kinds of relevant approaches such as neuroimaging or qualitative empirical research, and harmonises their outcomes from the perspective of scientific epistemology, meta-methodology and theory of science. From a translational medical point of view, such scientific syntheses are designed to impact clinical practice and public health. The present study identifies seven potentially therapeutic features of movie experience which suggest a preliminary scientific framework: i) change of pathological cognitive patterns and compulsive thought, ii) integration of fragmentised identities, iii) intuitive development of self-therapeutic measures, iv) re-balancing of inner calmness and dynamic lifestyles, v) biographical work and episodic exposure training, vi) synchronisation of movie rhythms, life rhythms and inner rhythms, and vii) clinical trance as well as movie-based auto-hypnosis.

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Introduction

In the late 1980s, the author of this article established music therapy at the neurological and psychiatric hospital in Salzburg (Austria). One day, the psychiatric staff decided to go together to the cinema to watch Miloš Forman's film "*One flew over the cuckoo's nest"*, which had been issued in the year 1975. This event was not only moving, but also triggered a flood of questions. First of all, there was the question of whether we misunderstand our patients and consider ourselves on the one side of the border between normal and abnormal minds – and whether our behaviours and attitudes are arrogant and ignorant, both in terms of psychopathology and humanity. Moreover, there was the question of how our psychiatric inpatients would experience and comprehend the movie. Would their schizophrenia, major depression or post-traumatic stress disorder have a crucial impact on their holistic perception of the film? Would they identify themselves with one character or the other, or would the film even reinforce the opinion of some patients that *they* are the good and *we* are the bad? We began to discuss interdependencies between pathological dynamics and individual ways of understanding cinematic arts, which importantly involved psychiatric issues. Eventually, we came to discover some of the patients' features in our minds.

From this time on, I began to view "abnormal behaviour" and "pathological minds" from a multidimensional perspective, not only based on standardised diagnostic manuals and actual psychiatric theories, but also with the eyes of the arts, cinematic arts included. Over time, I got more and more convinced that

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psychiatry should consider artistic views on what we commonly call "insane".

Years later, I met the head psychiatrist of the Clinic and Polyclinic for Psychiatry and Psychotherapy of the Technical University Munich, Hans Förstl, since 1st October 2020 professor emeritus. He told me that in his opinion the usual psychiatric inventories, which are used to make diagnoses according to international standards, represent only one side of the psycho-affective realities we are dealing with. Another one concerned his interest in the literature his patients read, the music they listened to, the films they watched – and how they experienced these pieces of art. This opinion is completely in line with the key suggestion of the present perspective paper: Regarding the arts helps us to understand people more adequately with psychiatric diagnoses.

Position within the realm of neurocinematics

This article combines movie therapy and neurocinematics. Moreover, it suggests certain approaches for in-depth discovery of the subtle relationship between "psychiatric minds" and psychiatrically sensitive films, which does not mean that they are necessarily dealing with explicit psychiatric issues, though.

Movie therapy is widely considered a form of artistic or expressive therapy – thus akin to music, dance or art therapy – aiming at medical and mental health advantages. Recent research has shown that developments go hand in hand with a broad range of self-help activities such as TV-movie- or video-based self-treatment (Mastnak, 2022). While Gary Solomon (1995) is usually regarded as the founder of cinema therapy, a new cinema therapy movement, inspired by the documentary 'Calypsonians' by director Anghelo Taylor, emerged in 2019. His *Cinema Therapy Manifesto* highlighted that 'for cinema therapy truly exist the filmmaker must have an internal search, question or problem to solve inside himself but that relates with the rest of humanity or with specific community. Once the filmmaker and his crew engage in the process of filmmaking, they start healing through the revelation and situations that happen along the process of making a film. In the end, the result of that process will be medicine for all the viewers as human beings.

Michael Powell's PhD thesis (2008) focused on cinema therapy as a clinical intervention. Cinematics for health purposes are in the ascendant – and nowadays, cinema therapy is used to treat a broad spectrum of medical conditions such as relationship problems (Eğeci and Gençöz, 2017) or anxiety disorders (Dumtrache, 2014; p. 717):

Cinema therapy refers to the use of movies as a support for the individual's personal and interpersonal development and it represents a promising method that enhances both the attractiveness of the therapeutic process and the depth of significant personal and relational development. Through this research, we aim to build and develop a cinema therapy program, as well as to identify its effects on the participants' anxiety levels. The results of the present study indicate a significant drop in anxiety among the participants in the cinema therapy program as opposed to those from the control sample. This paper is an advocacy of the use of movies as a support in the personal development process, and in the modelling of emotional, value and behavioural dimensions of human personality.

While the term 'cinema therapy' commonly relates to distinct models in clinical settings, TV therapy (Mastnak, 2022) deals with further issues such as self-administered TV therapy, both as an intended and an involuntary curative process. Particularly through experience and discovery of the beneficial impacts of watching TV on the psyche, this medium is being widely used for emotional self-regulation alongside the improvement of quality of life.

Looking back over the history of neurocinematic therapy, we are faced with neurocinematics, a relatively new discipline that has a double origin. Firstly, neuropsychological ideas arose already during the early years of film and are inextricably intertwined with pioneers of film psychology such as Sergei Mikhailovich Eisenstein (Сергей Михайлович Эйзенштейн) and his theory and practice of montage, or the "Kuleshov effect" (Эффект Кулешова), namely that the juxtaposition of a series of images together can create unique ideas and emotions in an audience's mind (Baranowski and Hecht, 2017; Calbi *et al*., 2017). Scientific findings went hand in hand with the viewpoints of famous directors such as Alfred Hitchcock's statement that film creation should be based on an exact science of audience reactions. However, the actual neurocinematic research eventually began in the early years of this millennium, particularly due to the fast progress of neuroimaging techniques such as functional magnetic resonance imaging (fMRI).

We meet afresh the dichotomy between psychological knowledge underlying filmmaking and film psychology as an autonomous science – in other words, on the one hand incentives such as "Rise of neurocinema: How Hollywood Studios harness your brainwaves to win oscars" (Randall 2011), and on the other neuroscientific research that gave rise to a new interdisciplinary scientific domain – by way of illustration, in China most vigorously promoted by Wang and colleagues (2016). Today, neurocinematics (Moghadasi, 2015) focus on a broad spectrum of neuroscientific issues related to the experience of movies such as changes of emotional arousal during film watching (Park *et al*., 2021).

Combining neurocinematics, movie therapy and neuro-psychiatry leads to the new field of neuro-cinematic therapy, which has importantly been inspired by Prof. Yiwen Wang from Beijing Normal University and represents the core of the present article. It distinguishes three main targets: i) to explore clinical and public health benefits of cinema, ii) to identify individual and pathological traits determining movie experience, and to iii) reveal neuropsychiatric healing factors of films.

Diagnoses and complex processing

A study from Yale University (Gruskin *et al*., 2020) revealed that adolescents with greater depressive symptom severity exhibit atypical fMRI responses during movie viewing and that this effect is stronger during less emotional moments of the movie. In contrast, children's depressive symptom severity and profiles were unrelated to their brain response typicality or similarity. Together, these results are considered to indicate a developmental change in the relationships between brain function and depressive symptoms from childhood through adolescence. According to the authors, these findings suggest that depressive symptoms may shape how the brain responds to complex emotional information in a dynamic manner sensitive to both the developmental stage and affective context.

Such studies not only show how psychiatric disorders may influence complex processing of film experience, but also help to improve diagnoses and deepen insights into interdependencies between developmental states, personality traits and brain functions. The Yale study is speaking of depressive symptoms and not of diagnosis – and this may have good reasons. Clinical practice is

often confronted with the problem that patients' sense that standardised diagnostic inventories do not mirror the nature of their mental and affective difficulties – they are too general, too abstract, to neutral.

By contrast, they are likely to recognise a high affinity between movie characters and themselves. Regarding depression, a patient may discover striking similarities with Justine's complex mental features in Lars von Trier's film "Melancholia" from 2011. Although Justine's issues are so unique that there is nearly no chance of conformity with a patient's profile, the psychological characteristics as a whole may inspire a subjectively recognised analogy – and this can mesmerise psychiatric patients. In other words: although details are dissimilar, they feel a holistic identity and resemblance. However, this phenomenon is usually ignored in item-based diagnostic procedures. Consequently, interdisciplinary movie science not only helps to better understand psychiatric patients, but also provides complementary approaches to diagnostic conventions.

Additionally, interdisciplinary movie research may crucially impact on pathological evaluations, which usually imply – simply speaking – that disorders are bad and normal states of mind good. Of course, this is not a general criticism, and particularly personalised psychiatry is highly regarded for its discrete and empathetic recognition of individual features and traits. For instance, Ron Howard's film "A Beautiful Mind" from 2001 was inspired by Sylvia Nasar's biography of the mathematician John Nash, a Nobel Laureate in economics. Early in the film, Nash begins to develop paranoid schizophrenia and exhibits delusional episodes. Patients may perceive people in a very similar way – e.g., friends who do not exist in the so-called "normal world" – and thus learn to differentiate dissimilar modes of existence. In such cases the film's protagonist would more adequately mirror complex personalities and perception modes than conventional pathological frameworks, hence the neurocinematics' potential to improve psychiatric measures and assessments. Moreover, such approaches have the potential to relativize rigid psychiatric views that exclude the possibility of multiple worlds and 'incompatible' realities too.

By way of illustration, there are – although this view is contradictory to conventional (Western) understanding of cognition and psychopathology – good cross-cultural and interdisciplinary reasons to differentiate between biologically triggered states of hallucination and unusual states of mind which are sensitive to information that is inaccessible to 'normal' people. Consistent with the classical dopamine theory of schizophrenia, animal testing (Schmack *et al*., 2021) showed that hallucination-like percepts that were preceded by elevated striatal dopamine levels, could be induced by optogenetic stimulation of mesostriatal dopamine neurons, and could be reversed by the antipsychotic drug haloperidol – a strong argument for a mere biological mechanism.

By contrast, the principle of the entropic brain (Carhart-Harris, 2018) speaks of heightened criticality that enables the brain to be more sensitive to intrinsic and extrinsic perturbations which may translate as a heightened susceptibility to 'set' and 'setting' – where 'set' refers to the mental state and 'setting' to the environment. As many cultures involve notions of a third sense, particularly cross-cultural psychiatry is faced with phenomena which could be either pathological or dependent on specific transcognitive giftedness. At this point, a wealth of movies dealing with parapsychology come into play and raise afresh questions about the function of our brain: Is it the biological generator of our mind or is it a transformer and filter of information, which is also susceptible to existence beyond the principles of a positivistic materialistic view of the world?

Back to the title of this section: interdisciplinary neurocinematics have great potential to broaden the horizon of diagnostic views, reveal different mental modes of movie processing, and even approach the question of functions and the nature of the human brain – those which are in line with standardised neuroimaging as well as those that transcend conventional neuroscientific thought.

Key neuroscientific perspectives

Since the early times of neurosciences, the idea that certain physiological and psycho-behavioural functions were assigned to distinct brain areas has been characterising theoretical considerations and associated research. The German neurologist Korbinian Brodmann (17th November 1868 – 22nd August 1918) is highly regarded as the key pioneer, who distinguished 52 distinct cortical regions based on cytoarchitectonic characteristics. Although the Brodmann areas are still in use, knowledge has made progress such as mirrored by the triple-scale concept that includes repetitive modular-like structures and micro- as well as meso-maps (Amunts and Zilles, 2015).

Nonetheless, the scientific focus on functional key centres of the central nervous system is still of crucial importance, and neuroimaging techniques correlate physiological features such as brainwave characteristics or blood oxygen level changes with psycho-behavioural phenomena. By way of illustration, brain studies elucidated the decisive involvement of the amygdala in anxiety and fear, which is a major topic in neurocinematics too (Kirk et al., 2022). However, the deeper we go into the matter, the more we discover that psychological phenomena relate to highly complex dynamics such as the amygdala-prefrontal circuit during threat processing. In this context, a recent study from South China Normal University (Cui *et al*., 2021) was dealing with amygdala-based functional networks alongside the differentiation between consensual and idiosyncratic emotional responses during movie watching.

Advanced neurosciences and neurocinematics call for a complex view of functional units and their connections – in other words, specific dynamic networking. For instance, certain brain regions within the posterior medial network (PMN) are characterised by sensitivity to episodic tasks, and they also demonstrate strong functional connectivity as part of the default mode network, which is of significance to neurocinematic reasoning (Cooper *et al*., 2021):

Here, we probed functional connectivity of the PMN during movie watching to identify its pattern of connections and subnetwork functions [...] Consistent with prior findings of default network fractionation, we identified distinct PMN subsystems: a ventral PM subsystem (retrosplenial cortex, parahippocampal cortex, posterior angular gyrus) and a dorsal PM subsystem (medial prefrontal cortex, hippocampus, precuneus, posterior cingulate cortex, anterior angular gyrus). Ventral and Dorsal PM subsystems were differentiated by functional connectivity with parahippocampal cortex and precuneus and integrated by retrosplenial cortex and posterior cingulate cortex, respectively. Finally, the distinction between PMN subsystems is functionally relevant: whereas both dorsal and ventral PM connectivity tracked the movie content, only ventral PM connections increased in strength at event transitions and appeared sensitive to episodic memory.

Looking back over the history of neurosciences, and neurocinematics in particular, we reveal a certain "triple jump"from

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research on functional units over functional networks and network connectivities to the question about the true quality of such dynamic interdependencies. By way of illustration, an international group of researchers (Demirtaş *et al*., 2019) was dealing with the question of how endogenous neuronal activity self-organises during particular brain states. Movie watching was studied about task-induced functional connectivity (FC) and revealed 'systematic and large-scale reorganization of functionally integrated responses while subjects are watching movies' alongside increased correlations within frontal brain regions and reduced correlations between fronto-parietal areas.

Regarding the meta-synthetic approach at the end of this perspective paper, the last statement requires further discussion. According to our findings, movie watching may trigger intense self-reorganising processes, which are consistent with increased prefrontal interactivities, while movie experiences with high biographical significance are likely to more vividly involve fronto-pariental connectivity, hence the need to distinguish interdependencies between neurophysiological and individualised psychological processes in neurocinematics.

This question, however, goes hand in hand with the extremely knotty problem of matter-mind-transition, which not only refers to Western philosophies about body-soul-dualism, but also relates to key issues of interdisciplinary neurosciences. Decades ago, the philosopher Karl Popper and the Nobel Prize Laureate John Eccles (1977) approached this problem through transitions between Popper's World 1 (matter) and World 2 (mind). The author of the present article tackles this very issue too: His 'quantum spirit theory' assumes specific qualitative transitions within energetic fields that are neither (typical) matter nor mind (Mastnak, 2013). In terms of neurocinematics and neurocinematic therapy: A key to the discovery of healing mechanisms of movie experience may inhere in complex metamorphoses between physical and mental entities. Neural processes and movie experiences can be considered occurrences linked by principles that are inextricably intertwined with information theory and quantum ontology.

The enigma of aesthetics

Simply speaking, TV news and movie art differ in terms of aesthetics. Probing into the nature of aesthetics, however, is not so simple. Since time immemorial cultures have been dealing with the enigma of 'beauty' in the broadest sense of the word – and philosophical considerations have inspired the discipline of aesthetics, psychological aesthetics included: from Alexander Baumgarten's "Aesthetica" issued in 1750 and his "Aesthetices finis est perfectio cognitionis sensitivae" (beauty consists in the perfection of sensitive cognition; according to the Oxford academic translation) to contemporary psychological thought (Allesch, 2014). The psychology of film (Tan, 2018) also involves psychological aesthetics such as research on idiosyncratic dynamics of aesthetic enjoyment during movie watching (Isik and Vessel, 2019).

In the realm of neurocinematics, neuroaesthetics come into play. This relatively new discipline made rapid progress and advocates particularly – and completely consistent with the views of the present paper – 'deeper collaboration between neuroscientists studying aesthetics and those in the arts and humanities' (Iigaya *et al*., 2020). Although there are encouraging steps towards neuroaesthetics of movie such as analyses of brain responses to aesthetically appealing natural landscape movies (Isik and Vessel, 2021), cinematic neuroaesthetics are still in *statu nascendi* – but highly promising (Temenuga, 2014).

Although arts-based therapies may be considered – quasi by definition – deeply connected to aesthetics, a closer look into their (clinical) practices reveals astonishing deficiencies. Regarding music therapy, Kenneth Aigen (2007) even spoke of 'in defence of beauty', and Mastnak (2017) suggested to more profoundly consider sound qualities as critical moments in music therapy. Analogously, the present article advocates a sharpened focus on aesthetics in neurocinematic therapy.

During my research days in Turkey, I visited an oriental bazaar and was captivated by the beauty of a small carpet. While carpet dealers in these cultures often exhibit pushy behaviour, this merchant just said "beauty is healing" and gave me time, although I did not buy. Healing beauty is both a cultural phenomenon, an ontological enigma and a therapeutic challenge. In this context, activities at the Whitney Humanities Center of Yale University (Lee *et al*., 2015) brought about an anthology of essays about the therapeutic qualities of art and beauty. In the realm of neurocinematics, the healing power of beauty is nearly a *tabula rasa*, though. And yet, it seems to be a key to further steps in neurocinematic therapy – alongside the question of how mental disorders influence aesthetic experiences and how "abnormal" minds are processing beauty.

Meta-syntheses and translational medicine

At the latest when it comes to integration of neuroscientific, qualitative empirical and aesthetic data, meta-synthetic approaches have to be taken into consideration. While meta-analyses are well known in medical areas, particularly within the realm of evidence-based medicine, meta-syntheses are less popular – result of certain trends in the evolution of medical research. From the perspective of philosophy of science, creative innovation in medical areas has fallen into a decline: technical devices are developed and produced in medical technology companies, pharmacological research is conducted in highly specialised enterprises, and physiology has more and more become a topic of microbiology and biochemistry. Together with the rise of systematic assessment of effect sizes – the core of evidence-based medicine (Djulbegovic and Guyatt, 2017) – developments also resulted in a dominance of standardised research models such as randomised controlled trials and meta-analyses, alongside a strong belief in the reliability of such ways of data processing. However, from critical meta-methodological perspective (Mastnak, 2021a) systemic shortcomings exist in these methods, hence the urgent need to clearly distinguish truth theoretical values of research models as well as of actual research.

Meta-analyses (Lee, 2018) are designed to provide a robust assessment of effect sizes. Relevant data derive from comparative processing of (usually) RCTs on clearly delineated topics. In contrast, systemic meta-syntheses (Mastnak, 2021b) use specific modes of logic reasoning and research value estimation to create new theoretical frameworks: they do not use standardised procedures but require scientific epistemological inventiveness and intelligence. This is akin to mathematical reasoning: while there are standard algorithms to solve standard problems, mathematical discoveries – and this is what great mathematicians are famous for – need high mathematical creativity.

Dealing with dynamic systems, complexity sciences merge information of different nature to generate meta-syntheses – in our case integrating neuroscientific, qualitative empirical and aesthetic data to nourish and substantiate neurocinematic therapy.

The following example shall give an idea of possible modes of reasoning in meta-syntheses. A wealth of neuro-scientific and mixed-methods data explains brain functions underlying personality and identity disorders, such as in borderline personalities (Bozzatello *et al*., 2019):

We analysed hemodynamic response in the regions of interest during the presentation of resolved and unresolved life events. With reference to the condition "resolved", increased cerebral activity in the right anterior cingulate cortex (ACC), right medial prefrontal cortex (MPFC), right dorsolateral prefrontal cortex (DLPFC), and bilateral insula was registered in BPD patients compared with controls. In the condition "unresolved", increased brain activity was observed in patients in bilateral ACC, bilateral DLPFC, and right temporoparietal junction. Hyperactivity in ACC and DLPFC in BPD patients with both conditions (resolved and unresolved contexts) may be due to an inefficient attempt to reconstruct a coherent narrative of life events (resolved or not).

Neurocinematic research explores interconnections between pathological traits, unusual mental movie processing and underlying brain mechanisms, e.g., in patients with first-episode psychosis (Rikandi *et al*., 2018) – connectivity aberrations of the precuneus-posterior cingulate cortex with the anterior cingulate-medial prefrontal cortex. While general neuro-psychological knowledge associates these areas with episodic memory, biographical awareness, self-processing and self-identity, comparative neuroscientific research yields novel (hypothetical) frameworks. Further studies are designed to test or substantiate such complex models – by way of illustration, involving patients with dissociative identity disorders and their responses to the thriller 'Split' (directed by M. Night Shyamalan and released in 2016). While some patients criticised the poster's different facial expressions with the argument that these were not abnormal, they identified with some of the protagonist's traits.

Data integration through interdisciplinary reasoning and system compatibility adjustment results in new theoretical propositions and movie therapy models. Related theories are tested through interdisciplinary research and applied in clinical practice, which goes hand in hand with the characteristics of translational medicine. Translational medicine, particularly in the context of precision medicine-based therapy (Wang and Wang, 2021), is often related to "bench-to-bedside" transfer of microbiological, biochemical or genetic findings, while the genuine idea of translational medicine is to bridge the gap between research and clinical application in general. This also counts for neurocinematic therapy. Consequently, the next section shall give insights into preliminary, clinically relevant meta-synthetic approaches that are based on case discussions, comparative qualitative reasoning and neuroscientific theories.

Seven key mechanisms of neurocinematic therapy

This section shall give an idea of possible meta-synthetic ways in neurocinematic therapy. It integrates i) "case focusing" that differs from broader case studies in concentration on single key perspectives, ii) processing of informally collected qualitative data, iii) heuristic-artistic views of film art, and iv) relevant neuroscientific facts and findings. It is not considered a presentation of fully elaborated theories, but rather a model to inspire further in-depth research, alongside the development of more comprehensive and robustly substantiated frameworks.

Change of cognitive patterns

A middle-aged man – participant one, 'P1' – had been watching the German movie "Brother of Sleep" – "Schlafes Bruder" in German – by Joseph Vilsmaier, released in 1995. He reported that one scene of that 'throughout mesmerising' film had changed something important in his mind. The protagonist, Elias, a highly gifted musical autodidact specialising in playing the organ, has – pathologically interpreted – musical hallucinations. Participating in an organ competition he should improvise over the choral "Brother of Sleep", which he does not know, hence the seemingly hopeless situation. A friend encourages him "You are the Lord of now" ('Du bist der Herr der Stunde'). Elias begins to improvise, gets more and more excited, plays like in trance – and eventually wins the contest.

During the relatively short movie scene – it only lasts about 10 minutes – P1 recognised that since his early childhood, he had been afraid of tasks he might not be able to fulfil. Consequently, he tried to construct all kinds of 'safety measures' to avoid being doomed to failure. Looking back over his life, he realised that such critical situations were rare – moreover, they did not have any devastating impact on his existence. And yet, the permanent horror of getting shipwrecked by his shortcomings overshadowed his world – until the movie scene suggested an alternative: use all your giftedness to meet (seemingly) unsolvable problems and master them in a way nobody would expect.

This "case focus" suggests that film scenes have a hidden potential to change adverse – or even detrimental – cognitive or psycho-affective patterns. The phenomenon is akin to the experiences of other testees with strongly consolidated hermeneutic filters. Regarding film therapeutic effects, some conditions seen to be prerequisites: i) the experience of high identity with a film scene or a protagonist in action, ii) a distinct state of altered consciousness such as ecstatic excitement or trance-like immersion, iii) a convincing – and often spontaneous – recognition of analogy between a protagonist's trait and oneself, and iv) a promising novel solution.

From a psychopathological perspective, P1's problem involves obsessive-compulsive traits and/or excessively rigid habits. While cognitive-psychological delineations shed light on continuous misinterpretation of intrusive thought – which occurs in 'normal' people too – and adverse cognitive habituation, neurosciences suggest complex processing underlying these phenomena – such as abnormally high activities throughout the frontal cortex and subcortical structures, orbitofronto-striatal abnormality and cognitive dysfunction in executive function, attention, nonverbal memory and visuospatial skills (Nakao *et al*., 2014), or how recent German findings described (Endres *et al*., 2022; p. 670):

With respect to OCD (obsessive compulsive disorder) a moderate heritability is assumed. On a molecular level, genetic variants and epigenetic variations in the serotonergic, dopaminergic and glutamatergic systems in particular seem to play a role in the pathogenesis of the disease and affect the corresponding neurotransmission. Cortico-striatal-thalamo-cortical loops are neurochemically modulated, and predominance of the activity of the direct excitatory pathway is hypothesized in OCD. Recent research also provides evidence for the involvement of frontoparietal and fronto-limbic networks.

This leads to our first neurocinematic therapeutic trace: Adverse stable cognitive and behavioural patterns rank from inappropriate attitudes to obsessive-compulsive symptoms. Random movie experience or movie-based intervention may cause pro-

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found neuro-cognitive reorganisation with considerable therapeutic and developmental impact. While psychological phenomena look rather simple, associated central nervous processes are of high complexity and require further neuro-cinematic research.

Re-integration of fragmentised personalities

Our second case focus relates to Ken Russell's film "The Devils" (released in 1971). It narrates the historical fall of Urbain Grandier, a 17th-century Catholic priest, who was accused of witchcraft involving the sexually repressed nun Sister Jeanne des Anges – just two years after Krzysztof Penderecki's opera "Die Teufel von Loudun" (The Devils of Loudun) – written in 1968 and 1969 – on precisely the same topic.

P2 is a deeply spiritual young woman who feels a strong mission to do righteous deeds. At the same time, she is full of wild sexual desires and frequently haunted by evil thoughts and criminal temptations. While yearning for a life in harmony and finding fulfilment in her existence, she experiences herself shattered – in psychological terminology "self-fragmentation". Watching the "The Devils" mesmerises her. The fate of Sister Jeanne seems to mirror her fate. And yet, different from identification with the movie character she still senses a gap between the nun and herself. She watches the film on video several times, often just selected scenes – and feels the film's reality and her one gradually drifting apart. Describing this sensation, she uses the image of rails with constantly increasing rail gauge, which makes them useless. During this process, she feels more and more an unexpected re-integration of herself. She senses an emerging peace in her soul while conflicting attitudes and behaviours are fading into irrelevance – and criminal imaginations and impulses have gone.

Self-belief, self-processing and self-fragmentation belong to the most complicated and complex issues in neurosciences and neuropsychiatric. They interact with latent psychoses and involve alterations in functional connectivity between cortical midline structures, sensorimotor networks and the posterior cingulate cortex, which impact self-processing (Cowan *et al*., 2022): "Dynamic interactions between intrinsic and extrinsic self-processing supported positive self-beliefs in typically developing youth while undermining positive self-beliefs in CHR (clinical high risk for psychosis) youth. Implications are discussed for basic self-fragmentation, narrative self-related metacognition, and global belief updating. Interventions for self-processing may be beneficial in the CHR syndrome".

While notions of self-fragmentation and self-integration (Ye, 2013) are often associated with schizophrenia (Yip, 2018), we suggest that this phenomenon may also occur in other personality disturbances. Moreover, we assume that experience with relevant films may cause alleviation and/or beneficial psycho-affective reorganisation, hence our second neurocinematic therapeutic trace.

Creative auto-therapy and quality of life

"Miss Peregrine's Home for Peculiar Children" is a fantasy film directed by Tim Burton and written by Jane Goldman, based on a novel by Ransom Riggs. The peculiar children and her headmistress Alma Peregrine have paranormal powers. To avoid persecution – there are the deadly Hollows – they hide from the outside world in a time loop set to 3rd September 1943. This allows them to live the same day repeatedly and avoid ageing as long as they stay inside the loop – only the protagonists' activities and experiences are loop-independent, hence humanly variable. Jake from the outside finds them and falls in love with Emma Bloom, a girl with aerokinetic abilities.

P3's life is fairly monotonous. All days are quite similar, while he feels a strong, though blocked, creative power within himself. By chance he sees the film and is particularly fascinated by one scene: Emma knows a secret hideout, a sunk ship, and takes Jake with her. In the grand hall of the ship, she blows with a single enormous blow all the water away – and they are safe and together. P3 watches this scene again and again, falls in love with Emma, imagines his own Emma, and begins to separate his everyday life from his dreamland with the girl.

Above, we referred to Ron Howard's "A Beautiful Mind" – alongside the psychotic issue of hallucinated individuals. In the world of film, this is not a new topic at all. By way of illustration, Henry Koster's comedy-drama "Harvey" (1950) is a story about a man whose best friend is a pooka, a nearly two meters tall – to others invisible – white rabbit. From a conventional psychiatric perspective, such symptoms of schizophrenia should be cured; from the perspective of the 'patients', however, they may enrich their lives and give them a deeper sense.

From a neurocinematic perspective, identification with fictive characters and/or integrating them into one's world of fiction is associated with mental imagery, empathy and immersive experience called 'presence' – qualities that covary with the left hippocampal volume, cortical thickness in the right anterior insula and the left dorsal medial prefrontal cortex, as well as with grey matter volume in the dorsolateral prefrontal cortex (Cheetham *et al*., 2014). However, in our case, P3 did not stop at the creation of his own Emma, but discovered that – like in the film – stereotypical days can be enriched through creative thought and action.

From a neuroscientific perspective, creativity is essentially connected with core hubs of the default mode network alongside greater connectivity between the left inferior frontal gyrus and the entire default mode network; moreover, greater functional connectivity between the right inferior frontal gyrus and the bilateral inferior parietal cortex, together with the left dorsolateral prefrontal cortex (Beaty *et al*., 2014). Regarding film and creativity, we also refer to findings about high dream recall frequency in increased creativity associated with default mode network connectivity (Vallat *et al*., 2022). Broadly speaking, we understand movies both as a space to experience fantasy and as a trigger of creative self-actualisation to improve quality of life, hence our third neurocinematic therapeutic trace.

Passion and calmness

The balance between excitation and inhibition is one of the best researched topics in neurosciences (Sohal and Rubenstein, 2019). In general, the balance between complementary states of mind and affect seems to be a human health principle – several spiritual traditions excluded. This equilibrium is also mirrored in the balance of yin and yang, which impacts on the whole spectrum of health such as immunology (Santambrogio and Franco, 2022) – in Western medicine with concepts that may differ from Chinese medicine, though. In a psychopathological way, this polarity is associated with bipolar disorders – and in a most human sphere they are deeply connected with love.

"Reisei to Jōnetsu no Aida" ("Between Calmness and Passion" in authorised English translation) is a Japanese movie (2001) directed by Isamu Nakae. Junsei Agata, one of the main characters, remembers a 10-year promise: when he was a college stu-

dent, he agreed with his girlfriend Aoi to meet on her 30th birthday at the top of the Duomo in Florence. He still hopes that Aoi remembers the promise and decides to return to Florence to prove the truth of their love.

P4 describes two completely dissimilar modes of how he experiences the film: the naive joy of its romantic spirit *versus* the oscillation of two conflicting traits, namely self-isolating withdrawal and euphoric conviction. Moreover, he discovers that his inner attitude towards the crucial event – the meeting on the Duomo in Florence – resembles optical illusions that jump from one interpretation of a picture to the other, such as in the famous example of the old young lady. And while the oscillation between hope and despair drives him mad, he senses a solution in a sort of calm passion, which is – from a neuroscientific perspective – a tough nut to crack. Relevant neuroscientific findings spring to mind: intense romantic love, particularly in its early stages, can show manifold symptoms of substance and non-substance or behavioural addictions, including euphoria, craving, tolerance, emotional and physical dependence, withdrawal and relapse (Fisher *et al*., 2016).

Movies can provoke the most unusual affective states and help us to explore the broad spectrum of our minds' manifestations. They can lead to a dynamic response to the equilibrium between calmness and passion, and they can trigger complex emotions that mirror the boundless nuances of our inner lives. Neurocinematic correlates of such processes, which shape our fourth trance, are still far from being sufficiently understood, though.

Biography work

Biography work as it is used for psychotherapeutic and self-processing purposes (Kulka, 2021) is probably the most self-evident modality in movie therapy. Various film genres from documentary to fiction provide a most inspiring space to remember and explore biographical key experiences and dynamics. Moreover, movies themselves can have a decisive impact on biographies. Decades ago, a Catholic nun told the author of the present article that once, when she was young, she went to the cinema – without distinct intentions, just so, as young people used to go to the cinema at that time. But when she came out, she had made her decision to become a nun. Later, already being a nun, she became the headmistress of a Catholic school in Austria and never regretted her decision: the decisive moment was right.

Many years ago, P5 had a girlfriend suffering from bulimia. Nonetheless, their sexual life was wild and creative, and their romantic connection was full of sensual pleasure. Once P3 had to leave the town for three weeks. When he returned, his girlfriend had committed suicide. She had spent some days at home with her parents in a small mountain village, and during her stay, a former classmate hanged himself in the neighbourhood. A few days later she followed his example. Immediately after he had learnt about her death, P5 began to talk to her in his mind, hoping her ghost would appear and their ecstatic sex life would go on. However, he never encountered her apparition, except in a few erotic dreams. And yet, over time he created a certain vivid imagination of her presence. Once he saw the picture of a beautiful, but somehow peculiar-looking naked lady in a pond. The caption referred to the Chinese movie "húxiān yāoguài yǔ shūshēng de àiqíng" (The Romantic Love between the Immortal Fox Ghost and the Scholar"). He wanted to see the film, could not find it, and began to seek films about his desired topic "romantic love with ghosts" instead, e.g., Stanley Kwan's supernatural romantic drama "Rouge" from 1987. He did not intend to cope with the loss in a psychotherapeutic sense, but to continue an erotic relationship in a parallel world – and he felt that watching films that touch upon his story would enrich his inner life.

From a neuroscientific perspective, P5's utopian relationship is highly complex and goes hand in hand with imagination, episodic and autobiographic memory, involving manifold areas and processes such as the anterior hippocampus (Zeidman and Maguire, 2016) alongside prefrontal-hippocampal interactions (Eichenbaum, 2017), as well as the praecuneus (Hebscher *et al*., 2020). Moreover, these processes encompass interactive self-efficacy and curiosity, which are associated with multiple functional connectivity between the default mode network, the fronto-parietal task control network and the salience network, together with the prefrontal cortex and the angular gyrus (Li *et al*., 2019). However, specific neurocinematic studies are expected to elucidate more specifically such connections with movie experience, which form our fifth trace.

Rhythms of life

P6 spoke of three ways he experienced rhythm and time structures: cyclic experiences such as in dance or smooth rocking to music, short remarkable events such as flashes of lightening or rapid motor reactions, and finally the rhythm of life – and particularly this last one caused problems. P6 felt a stark discrepancy between his inner life rhythms and the rhythms of his "external life" – in other words, his behavioural existence in sociocultural environments. And this had driven him mad.

By chance he saw the American musical drama film "All That Jazz" by Bob Fosse (released in 1979) – a semi-autobiographical fantasy story featuring moments of Fosse's career as a dancer, choreographer and director. P6 felt connected: shapes of life-rhythm differ completely from musical rhythms and their subtle principles of fluctuation, repetition and transformation. Although the film ends with the death of the ingenious and remorselessly self-sacrificing protagonist, P6 felt a certain relief: the movie experience as an oasis to overcome the incompatibility and tension between inner and outer life rhythms.

Neuroscientific findings are pertinent tools to explain P6's first two rhythmic modes. Broadly speaking, while cerebral timing of musical beats is importantly associated with rhythmic processing in the supplementary motor cortex and the basal ganglia, shorter accents rather involve cerebellar mechanisms (Zatorre et al., 2007). A Japanese study (Konoike *et al*., 2012; p. 328) summarised interactive rhythmic processing:

Previous brain imaging studies have elucidated brain regions related to the perception and production of rhythms. However, the neural substrates involved in the working memory of rhythm remain unclear. In addition, little is known about the processing of rhythm information from non-auditory inputs (visual or tactile). Therefore, we measured brain activity by functional magnetic resonance imaging while healthy subjects memorized and reproduced auditory and visual rhythmic information. The inferior parietal lobule, inferior frontal gyrus, supplementary motor area, and cerebellum exhibited significant activations during both encoding and retrieving rhythm information. In addition, most of these areas exhibited significant activation also during the maintenance of rhythm information. All of these regions functioned in the processing of auditory and visual rhythms. The bilateral inferior parietal lobule, inferior frontal gyrus, supplementary motor area, and cerebellum are thought to be essential for motor control. When we listen to a certain rhythm, we are

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often stimulated to move our body, which suggests the existence of a strong interaction between rhythm processing and the motor system. Here, we propose that rhythm information may be represented and retained as information about bodily movements in the supramodal motor brain system.

By contrast, P6's third – and in his opinion immensely important – rhythm mode, namely the rhythm of life, is still poorly studied in neuroscientific domains. And yet, films have their inner rhythms which depend on acting, music, film editing and features of a higher order – and these rhythms may interact with subjective experiences of life rhythms, also in a therapeutic sense, hence our sixth neurocinematic therapeutic trace. This also involves the notion of synchronisation, which plays an important role in neurosciences, both in terms of intra-cerebral and inter-individual synchronisation (Hu *et al*., 2017; Kawasaki *et al*., 2018). While there is advanced knowledge about these phenomena, we are confronted with a huge lack of neuroscientific studies concerning life rhythms, particularly in the context of movie experience.

Trance and auto-hypnosis

The Czechoslovakian surrealist film "Sedmikrásky" ("Daisies", released in 1966) by Věra Chytilová counts as a cornerstone of the Czechoslovak New Wave movement. The peculiar pranks of the two female protagonists – Marie and Marie – feel like a lived delusion. While the film should be a satire of bourgeois decadence, it turned out to become "a necrologue about a negative way of life" (Anderson, 2012). As it was considered critical of authoritarianism, including Czechoslovak communism, "Sedmikrásky" was banned from theatres and cultural export in the Czechoslovak Socialist Republic.

Nonetheless, a young lady, P7, did not associate this movie with political issues. She felt deeply immersed in its crazy world, and what she described reminded her of hypnotic séances, shamanistic rituals and hallucinatory phenomena under the influence of psychedelic drugs – in P7's case without negative neurophysiological impact, though. These movie-triggered psychic states were connected with a strong feeling of self-identity, and she realised a deep yearning for sensory-affective experience beyond too normative, rigid, dried-out and soulless environments: The spirit needs unchained self-realisation. Qualitative-empirical data from other people experiencing mesmerising movies coincide with such sensations and suggest potentially positive effects of movie-watching on altered states of mind.

From the perspective of neurocinematics, these findings call for the discovery of neurophysiological correlates and underlying mechanisms. While modern hypnotherapy speaks of clinical trance, non-clinical phenomena of movie-triggered altered states of consciousness suggest differentiation between therapeutic hypnosis and arts-based trance – the first more focusing on clinical processes, the second on aesthetic immersion. However, these modes can also penetrate each other and form the holistic (and perhaps new) phenomenon of neurocinematic altered consciousness.

A study from Belgium (Vanhaudenhuyse *et al*., 2014; p. 343) pointed out that hypnotic processes modify self-awareness as well as environmental awareness-related brain networks. Both involve cortical and subcortical areas such as anterior cingulate and prefrontal cortices, basal ganglia and thalamic regions. Although the study relates to anaesthesiologic purposes, these neural mechanisms also concern hypnotic processes in general, hence the authors' conclusion that 'hypnosis can be considered as a useful analogue for simulating conversion and dissociation symptoms in healthy subjects, permitting better characterization of these challenging disorders by producing clinically similar experiences'. This statement is completely in line with the view of the present paper: movie-based hypnotic experiences can both simulate and alter pathological states such as in dissociative or psychotic disorders, for instance.

A recent Italian review about the neurophysiology of hypnosis (De Benedittis, 2021, 292) focused on a 'neglected topic in hypnosis research', namely the neurochemical correlates of hypnotic processes and responses such as various neurotransmitters and neuromodulators, e.g. dopamine, glutamate, GABA (gamma-aminobutyric acid), NMDA (N-methyl-D-aspartate), serotonin and oxytocin:

Summarizing, dopamine is the most studied neurochemical as a candidate for its involvement in hypnotic suggestibility. Preliminary biological and pharmacological studies, and behavioral/electrophysiological research suggest that elevated dopamine is associated with hypnotic suggestibility. Glutamate is the primary excitatory neurochemical in the brain. Although it has received far less attention than other neurochemicals in the context of hypnosis, multiple (indirect) lines of evidence implicate glutamate in hypnotic responding. Gamma-aminobutyric acid (GABA) is the dominant inhibitory neurochemical in the brain. Pharmacological literature imply that elevated GABA produces, or is associated with, increased suggestibility. Oxytocin has received considerable attention in a variety of psychological domains (e.g., social behavior, empathy) [...] Pharmacologically studies using psychotropic drugs suggest that serotonin may enhance hypnotic suggestibility. This review represents a significant advancement in our understanding of the neurochemistry of hypnosis, though the authors warn that the putative effects of multiple neurochemicals underlying hypnotic responses need to be interpreted cautiously due to complex interactions between neurotransmitters and neuromodulators and other variables.

Complementary to the dualism of "normal" and insane people, a Canadian study (Rogerson *et al*., 2021) used fMRI to explore neural correlates of trance processes and alternative states of consciousness in a traditional South African healer: "Positive BOLD [blood-oxygen-level-dependent] activation was shown in the auditory cortex in both hemispheres during a trance process. Other brain regions tightly correlated to trance perception were the right parietal, right frontal, and area prostriata [...] The orbitofrontal cortex [...] was negatively activated and most correlated with music when trance was high, showing the largest differential between high and low trance perception. This is the first study to directly correlate BOLD signal variations in an expert subject's percept of trance onset and intensity, providing insight into the neural signature and dynamics of this unique form of ASC (altered states of consciousness)".

Merging this case focus, comparative qualitative data, and neurophysiological studies on hypnosis and trance, we suggest that deep movie immersion can trigger altered states of consciousness and facilitate the benefits of hypnotherapy and clinical trance, auto-hypnosis included. Moreover, it may efficiently respond to a significant loss of cultural trance experiences alongside ecstatic artistic experiences in many societies. This also touches upon the beauty of trance in the Chinese sense of "huǎnghū" alongside the hypnotherapeutic potential of reorganising one's mind and personality, hence our neurocinematic therapeutic trace 7.

Conclusions

While scientific papers in medical journals often take the discussion section as a sort of formal conclusion, the present article regards it as indispensable for revisiting core challenges of neurocinematic therapy.

Firstly, we are confronted with the fact that interdisciplinary research on neurocinematic therapeutic topics brings about novel concepts of mental diseases, unusual personality traits and coping styles, which may importantly differ from conventional psychiatric and psychopathological views, or even conflict with standard theories. From the perspective of the philosophy of science, neither of the conflicting sides can probably falsify the other part, while arguments call for interdisciplinary approaches. Joint attempts should unearth common truths or – once again – realise that theories depend on underlying methods. They never represent the entire reality, but help us to approach the real nature of our objects of interest. In this sense, we can regard novel neurocinematic therapeutic concepts as complementary to conventional medical theories. Further interdisciplinary research is needed.

Secondly, particularly neuroimaging reveals distinct correlations between mental and neurobiological events, for instance between experienced anxiety during a frightening movie scene and processes in the amygdala, the praecuneus and the ventromedial prefrontal lobe – a complex that might give rise to movie-triggered fear with biographical and individual significance. However, correlations do not yet substantiate a causal connection – in other words, we cannot say that a certain cerebral activity generates a certain emotion. Moreover, the term 'causal' implies a certain one-dimensional function, while newer neuroscientific outcomes rather suggest complex interactive loops underlying – or eventually generating – mental phenomena. The interactive triangle consisting of movie, brain and experience poses epistemological questions which need intensive interdisciplinary collaboration.

Thirdly, we must afresh point out that the above-suggested theoretical framework and its related seven key mechanisms are only based on preliminary research and have to be understood as a work in progress – or a model to inspire further research. The main target of this perspective paper is not to present full empirical research with robust data alongside their adequate analysis and interpretation, but to suggest meta-synthetic modes in neurocinematic therapeutic research and to highlight the necessity of meta-theoretical and science-epistemological reflection.

Fourthly, we have to distinguish intervention modes within an enormously broad spectrum ranging from explicit clinical treatment, e.g., to modulate symptoms in schizophrenia, via supervised or self-administered film-based self-regulation, educational measures at school to help pupils discover movies in the context of health promotion, resilience and subclinical therapy, to unconscious movie-applications to adjust self-images, life-experiences and mental states. It goes without saying that this broad spectrum requires dynamic notions of mental health and disease alongside therapeutic indications. Additionally, movies themselves may importantly contribute to discussions about diagnoses which transcend conventional diagnostic manuals and standards.

An interdisciplinary focus group to pose the right questions, guide appropriate research, and design new research methods is suggested. The mere application of standardised methods such as analysis of BOLD-signals in fMRI is facing epistemological limitations. Prospects of neurocinematic therapy importantly involve complexity sciences as we also know them in public health domains (Sturmberg, 2016). They oppose reductionism as well as the truncation of complex realities.

To sum things up: the present article hopes to encourage interdisciplinary research on neurocinematic therapies, as well as to contribute both to cinema research and to public health. The *European Academy of Sciences and Arts* could considerably contribute to a prosperous future in this domain.

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