



UNIVERSITÀ DEGLI STUDI DI PADOVA

Dipartimento di Filosofia, Sociologia, Pedagogia e Psicologia Applicata (FISPPA)

Corso di laurea in Scienze Psicologiche Sociali e del Lavoro

Elaborato Finale

CREATIVITY IN ART

Relatrice:

Prof.ssa Antonelli Elena

Laureando:

Canepa Giovanni

Matricola:

2017580

Anno Accademico 2023/2024

RIASSUNTO IN LINGUA ITALIANA

I temi legati alla creatività e al suo funzionamento sono tra i più sfaccettati che la letteratura psicologica accademica abbia recentemente indagato. In primo luogo viene presentato il concetto di creatività e le varie metodologie di analisi legate ad essa. Il secondo tema esaminato riguarda i modelli tradizionali del costrutto creativo mentre successivamente vengono descritti i modelli più recenti. Nel secondo capitolo si fornisce la definizione di persona creativa. Il tentativo è di identificare i tratti che distinguono le persone creative dagli individui non creativi prendendo in considerazione anche le disposizioni associate al pensiero divergente. Viene inoltre discusso il rapporto tra psicopatologia e creatività. Successivamente, la contestualizzazione della creatività in relazione all'Intelligenza Artificiale (AI) fornisce un'apertura al terzo capitolo di questo elaborato. Viene affrontato il tema della produzione creativa tramite AI, con un focus sulla definizione di Arte Generativa. Nella sezione finale del terzo capitolo si discute sul recente impiego dell'intelligenza artificiale per generare opere d'arte. In chiusura dell'elaborato, si specula su come la nostra conoscenza del processo creativo si sia evoluta per perfezionare e utilizzare nuove risorse per creare e valutare l'arte.

TABLE OF CONTENTS

INTRODUCTION	4
CHAPTER I - The Evolution of the Concept of Creativity	6
1.1. Definition of creativity in various analysis contexts.....	6
1.2. Classical Models of Creativity	7
1.3. Recent Models of Creativity.....	10
CHAPTER II - The Creative Personality	13
2.1. The Creative Personality and Inquiry Methods	13
2.2. The Psychological Profile of Creative Individuals.....	15
2.3. Evaluation of the relation between creativity and psychopathology	16
CHAPTER III - Creativity, Artificial Intelligence and Art	20
3.1. Creativity and Artificial Intelligence	20
3.2. The Generative Art.....	22
3.3. Creating AI art	23
DISCUSSION.....	26
APPENDIX A.....	28
REFERENCES	29

INTRODUCTION

Themes related to creativity and how it operates are some of the most multifaceted that academic psychological literature has recently investigated. The literature related to the subject of creativity addresses these several features, each from its particular perspective. Researchers have primarily focused on defining creative production, identifying and categorizing the mental processes that are involved in creative process, figuring out which is its relation with psychopathology and, ultimately, assessing how the recent frequent use of artificial intelligence affects the production of creative artworks.

The aim that motivated the writing of this paper is to compile and exhibit the aforementioned themes in a manner that would be understandable even to readers without a specific background in the field. Firstly, the concept of creativity and the various methodologies of analysis of the shortcomings pertaining to creativity are presented. The second subject examined is the traditional models of the creativity construct. Indeed, the researchers' original focus is on creativity as one of the most appropriate form of displaying intelligence. It is considered to be a logical restructuring analysis of challenging information. Subsequently, more recent models are described. Researchers studying creativity have noted how the concepts of intelligence and creativity are distinct from one another. Several academics assert that sometimes the least amount of imagination could be observed among those students who are thought to be the most intelligent. As a result, the finding that there is barely any correlation between intelligence and imaginative ability suggests that the two constructs must probably be seen as distinct mental processes (McCloy & Maier, 1931; Welch, 1946). The definition of creative person is given in the second chapter of this thesis. The purpose of this topic's academic investigation is to identify the traits that distinguish creative people opposed to non-creative individuals. In particular, it is suggested that scholars employ two main approaches to analyse the creative person characteristics. The first approach is to assess the outcomes of the study of various cognitive processes that are prompted by the creative context. Another strategy is to assess the individual's creative output directly in terms of the degree to which unique and acclaimed particular scientific or artistic creations are. Following throughout the chapter, we also take into account the mental traits of creative individuals and the dispositions associated with divergent thinking. The relationship between psychopathology and creativity is discussed. Whether this association is a phenomenological reality or a product of cultural background is the question that was addressed throughout this chapter. The aforementioned relationship appears in an extensive amount of literature and we believe that shed light on the significance of this association is necessary. The contextualization

of creativity in relation to Artificial Intelligence (AI) provides an opening to the third chapter of this paper. The topic of creation via AI is discussed, with a focus on the Generative Art definition. The third chapter's final section discusses the processes involving artificial intelligence being used to generate works of art. As a result, the important issues raised by the even more frequent employment of contemporary artificial intelligence in artistic production are presented.

CHAPTER I - The Evolution of the Concept of Creativity

1.1. Definition of creativity in various analysis contexts

Even though creativity is one of the most valued and desired human abilities, it is a challenging concept to define unequivocally. In common sense, it is a skill that allows people to create novel concepts and projects, imagine new products or solutions, respond to specific tasks, have precise inquiries, and provide a virtually infinite number of solutions that overcome logical reasoning. Several academics have recently developed a more concise description. This definition covers on the core aspects of the creativity construct. As a result, creativity is defined as the ability of people to generate an idea that is both original and unexpected, as well as appropriate. Additionally, for a creation to be relevant, it must be beneficial and compatible with the task or context's requirements (Sternberg & Lubart, 1999; Runco & Jaeger, 2012).

This trait has traditionally been considered to be a difficult topic to study from both a scientific and interpersonal perspective. However, as observations of this phenomenon advance, the concept of Creativity evolves, adjusting to the investigation's standpoint. An example that demonstrates the diverse nature of how creativity has been understood throughout time is given. For the Latins and the ancient Greeks, it was assumed that creativity was a form of divine inspiration. As a result, creativity can be traced back to an embodiment of gods who, by placing themselves between the realm of the divine alongside what is human, function as an intermediary between the two. Poets and musicians, for example, get inspiration for their works from entities such as the Muses (Montanari & De Molli, 2020). Humanism, on the other hand, represents a significant shift in approach. In practical terms, according to the anthropocentric perspective of the time's philosophical frameworks, creativity is considered as the natural outcome of the individual's skills rather than a supernatural endowment. As a result, debates concerning creativity shift to the personal characteristics that may influence it. From such a standpoint, it has gradually become acknowledged that creativity is a personality trait of an extraordinary individual known as creative person. Between the end of the nineteenth century, scientists began to question which individual traits are capable of affecting creativity. As a result, academics attempted to identify some characteristics of creative people. Throughout this theories, we are referring to Classical Models of creativity. It should be mentioned that the innovation of this viewpoint is the introduction of the empirical research methods into this field of study. The aforementioned theories are based on the principle that all individuals possess some degree of creative ability: creativity is no longer an exclusive advantage of some blessed individual. These initial research are primarily psychological in nature. Subsequently, recent research in other domains, such

as economics and sociology, has been included, allowing scholars to construct a more comprehensive and articulated understanding of creativity. As a result, the individual's personality traits as well as the influence of environmental elements have been considered simultaneously. The interdisciplinarity of research on creativity feature what we address as recent models of creativity.

1.2. Classical Models of Creativity

Among the first classical models of creativity stands out the one presented by pedagogue John Dewey in 1910. In his essay, Dewey divides the process of producing creative thinking into five stages that occur in a predetermined order: (1) sensation of a difficulty, (2) identification and definition of the problem, (3) proposal of possible solutions, (4) examination of the solutions, (5) verification of the solutions with experimental tests. As a result, Dewey first shows a typology of model based on stages or phases. This archetype would be implemented by numerous other authors who frame their models according to a progression of phases that the individual confronts during the creative production process (Rossman, 1931; Eindoven & Vinake, 1952; Osborn, 1953; Johnson, 1955). These theories mainly differ in terms of the number of phases and the components that relate to each phase.

One of the most representative model structured as a process is the one proposed by Wallas in 1926. However, before describing Wallas' theory, it is vital to mention the findings of Wolfgang Köhler, a Gestalt psychologist and pioneer in learning research. As a result of his studies on the question-solving capacities of animals, Köhler (1948) proposed the concept of insight or sudden solution intuition. Wallace took up the concept of insight and proposed a standard creative process sequence: (1) Preparation: the subject identifies a project or a task to be implemented; (2) Incubation: the project appears to be put aside or postponed, but mind continues to work on it subconsciously; (3) insight: revelation of the possible solution to the problem; and (4) verification: all work is examined and validated. According to the model, all of the aforementioned stages are accompanied by the process execution and project realization. Furthermore, Wallace introduces the definition of logical and analogical thinking. Analogical thinking develops in a non-linear manner through similarities and differences, suggestions, and analogies. According to the author, analogical thinking occurs in the second and third phases of the process. Logical thinking proceeds in a linear manner through sequences such as cause and effect or premises and consequences. The first and the fourth phases of the process involve logical thinking. However, the majority of models based on phases or stages adopt a cognitivist approach. Even including the insight element, models based on a single process have limitations. As it is defined, insight is a difficult topic to assign to a specific phase of a process. Given that insight arises, it remains to be determined when it emerges and what circumstances trigger it.

Additionally, none of these models adequately account that various phases of the creative process could occur simultaneously. Furthermore, it is not properly considered that the overlap can rely on both the nature of the problem and the individual's personal style, emotional status and temperament. Finally, none of the models can be applied to complex creative processes. For example, numerous creative moments of inquiry, incubation, insight, and verification can take place concurrently during the production of a collective project. They are also linked, from the initial planning stages to the final implementation phases. Furthermore, separate individuals may be in charge of the various processes independently.

Among the classic theories on creativity, the contribution of the psychoanalytic movement must be acknowledged. Sigmund Freud proposes a psychodynamic theory of creativity. It is a model that attempts to explain the operation of psychic forces within the creative person. The creative subject has the ability to turn the unconscious energy into something socially helpful and acceptable, including the production of a creative output. As a result of being dominated by the principle of pleasure, this individual has a tendency to satisfy his deep needs as well as his sexual and destructive urges. This viewpoint is certainly difficult to validate empirically. However, it serves as the foundation for numerous re-elaborations of the original principle. Indeed, Freud's concepts were later adopted by Rogers and Maslow's humanistic psychology. Both claimed that creativity was related to the emancipation of an individual's motivations, not to the unconscious, as Freud believed. The key factor is the urge for self-realization. Erich Fromm's viewpoint is more accommodating. As a result, according to Fromm (1959), the creative individuals express their need to affirm themselves. According to both psychoanalytic and humanistic views, the creative subject has a very rich interiority that opposes to the indifference with which people cope with life.

On the other hand, the Gestalt movement provides a slightly different perspective on creativity than those just discussed in this paragraph. Köhler (1959) and Wertheimer (1945), as well as other movement scholars, attempt to describe what the thought patterns are when the subject confronts a problematic circumstance. In other words, when there is a need to find a solution to an issue. Indeed, constructive thinking, according to Wertheimer (1945), consists in identifying the qualities of the problematic setting. Simultaneously, the creative individual identifies those elements that require improvement in relation to the problematic circumstance. According to the author, this activates a set of procedures that allow individuals to shift from a peripheral depiction of the present scenario into one that reveals its core elements. The procedures of grouping, segregation, centring, decentralization, and transposition enable individuals to shift from a disorganized to an organized approach to the problem. Wertheimer concludes by asserting that the renovation process is followed by a sense of accomplishment and discovery. It should be noted that, while the Gestalt vision emphasizes

reorganization of the characteristics of the problem to be solved, it does not exclude the occurrence of all cognitive phases such as recalls to memory, abstraction procedures, generalizations, and trial and error attempts, typical features of classical and associationist models. However, the Gestalt school's concepts do not satisfy the majority of creativity researchers. The solution to a challenging issue based on the re-elaboration of accessible knowledge implies that the solution is reachable via an obligatory method. The mental process is determined by the contingencies outlined by the setting. This is in contrast to the current understanding of creativity, which is the creation of something novel that cannot be found in the stimuli that motivate creative thinking.

The factorialist conception of intelligence, exemplified by Guilford, is therefore reported. According to Guilford and other scholars in the factorialist movement (Thurstone, 1938; Torrance, 1977), thought, which is a component of the intelligence construct (synthetically quantifiable by the intelligence quotient), can be divided into distinct components. These components are known as mental factors. Guilford (1967) distinguished between convergent and divergent thinking. Convergent thinking is defined as thinking that shows itself in shortcomings with a single appropriate solution, such as notional or logical problems. Divergent thinking is defined as problem solving that admits multiple viable solutions. It is the form of thought that diverges, or changes direction. Divergent thinking is essential in the creative process, and it consists of the following factors, according to Guilford: (1) Fluidity, or the ability to produce a large number of ideas, regardless of their quality, beginning with a specific stimulus; (2) Flexibility, which means the capacity to leave one thought pattern for a different one. In other words, the ability to take new directions in problem solving; and (3) Originality, such as the ability to generate new and original solutions. The primary issue with these suggestions is that they do not offer a genuine addition to the concept of creativity. Creativity continues to be a transversal component integrated into the higher construct of intelligence and it is not explained as a separate phenomenon. Furthermore, the so-called mental factors may not be real parts of the mind. Many academics use the term "mental factors" to refer to actual mental talents, however for many others it refers to descriptive categories of mental functioning, in other words, a tool used to make an argument simple to comprehend.

In contrast with the factorialist movement, for a group of other authors, understanding the Creativity construct in cognitive terms can be described from an associationistic standpoint. Sarnoff A. Mednick is one of the most prominent proponents of this particular school of thought. According to Mednick (1962), creative thinking is essentially the ability to combine together ideas that are potentially dissimilar in a productive way. The greater the distance between the components is, the more creative the mental process and solutions result. Multiple elements can be connected in a variety of ways. One method, according to Mednick, is affiliation through accidental contiguity. It is the

unintentional or informal combination of elements. Another associative path is formed by the mechanism of similarity: the stimuli or reactions are diverse from one another but they share some characteristics that facilitate their association. Meditation, on the other hand, is the most common creative associative activity. Meditation, according to Mednick, enables humans to relate two particularly distant items through a series of less explicit intermediate steps. The focus of this approach is to distinguish between creative thought and eccentric personality. However, while the associationist viewpoint is acceptable from a theoretical point of view, no cogent tests have been performed to verify its validity from an empirical standpoint. Associative capacity might thus be considered a fundamental component of creativity. Furthermore, the theory provides a solid foundation for assessing individual differences in creative thinking. In association hierarchies (the way individuals decide to associate stimuli), it is possible to observe an aspect of associative fluidity, which is also highlighted by factorialist theories as determining individual differences. Given the findings thus far, it is hard to establish a single cognitive process, such as association, as the foundation of all complex behaviour, such as creative thinking (Rubini, 1980).

1.3. Recent Models of Creativity

Recent research has refocused the concept of creativity combining it with other field of studies such as sociology, economics and philosophy. The essential assumption of these research is that the environment applies stimuli as well as pressures on individual and group creativity. The concept of genius loci is reintroduced: certain expressions of Creativity at a “local” level may only be detected and measured by acknowledging the cultural framework of reference as a proper paradigm. Personal characteristics and emotions that might impact and shape creative production also receive significant importance.

Amabile (1996) provides the componential model, with an emphasis on the creative process and, more importantly, the factors required for creativity to function. This approach highlights the three primary components of creativity, which define an individual’s creative potential when faced with a task: (1) expertise, (2) creative thinking skills, and (3) motivation. Knowledge, technical skills, established experience, and talent on a certain field are examples of specific skills that rely on intrinsic cognitive, motor, and perceptual talents in combination with educational experience (Thomson & Jaque, 2019). Creative or divergent thinking refers to the ability to recognize novelty. Additionally, the ability to create distant associations and the capacity to inhibit oneself (which enables individuals to focus on the task) are included among the creative thinking skills. Lastly, The motivating factor that pushes a person to complete a given task is highlighted, and it is therefore dependent on inner

motivation, limits, and extrinsic reinforcements. According to Amabile, individuals are going to be more creative if their motivation for the project is intrinsic, allowing them to regard themselves as more involved, interested, and ultimately fulfilled.

The investment theory of creativity, which has been proposed in different variants by Sternberg and colleagues, is the second recent creativity model that we propose. The importance of motivation is emphasized in Sternberg and Lubart's (1991) theory: the most imaginative individuals invest considerable effort in their ideas, therefore their innovation survives despite challenges (Thomson & Jaque, 2019). Sternberg (2012) suggests six integrated traits of the Creative Person. These six components are as follows: (1) intelligence, (2) knowledge, (3) intellectual style, (4) personality, (5) motivation, and (6) environmental context. Each resource is believed to contribute to a person's level of creative production. Furthermore, certain resources interact with the others to enhance creativity. The proposed theory also explains the initial social rejection of a new creative product: the new creation must be gradually accepted by the population via continuous re-presentations by its creators. The idea of Propulsion suggested by Sternberg and Kaufman (2012) is developed beneath the Investment theory (Sternberg & Lubart, 1991). It is related to the impact of a creative outcome in redefining the environment. The assumption that the most creative people invest more resources in their projects is still acknowledged. Therefore, these authors attempt to conceptualize creative individual's propensity to remain committed with their creative efforts. Sternberg and Kaufman (2012) offer eight alternative approaches, each of which is specific to its domain.

1. Replication: a work of art is reproduced as a test. Even if it is not generating original and innovative solutions, the replication helps individuals to explore further into a specific domain (Kaufman, 2016).
2. Redefinition: it is the proposal of a new point of view on the individual's domain.
3. Forward Incrementation: it involves a small modification of the project, but the domain remains unchanged.
4. Advanced forward increase: while remaining in the same creative domain, it entails various stages to be implemented until the initial framework of the concept is slightly modified.
5. Redirection: the creative process is restarted.
6. Reconstruction: the previous work is reconstructed in order to shift to another creative direction.
7. Reinitiation: individuals attempt to shift the creative sphere towards a new conceptualization of the domain through their activity.
8. Integration: it is the combination of two domains in order to develop a new concept.

Lastly, we offer a recent research which has refocused the concept of creativity on “strictly social components”. Perry-Smith and Shalley's (2003) social network view emphasizes the social dimension of creativity and proposes a number of ways by which the social context affects the creative process. It relies on the notion of network ties. Network ties, or social links, can be defined as the social relationship that occurs between two individuals. However, an understanding of tie strength is crucial and fundamental to social network models. The aforementioned idea can be explained as a continuum with weak relationships on one end and strong ones on the other. The amount of engagement, intensity of emotion, and reciprocity that occurs between two individuals determines where they proceed along this spectrum (Granovetter, 1973). The hypothesis of Perry-Smith and Shalley's model is based on individuals' "position" in their network, as well as the strength of their relationships with other people in the network. Closeness centrality represents the distance within a person and all other individuals in the network. It is calculated as the average distance between an actor and all network members (Freeman, 2002). When it comes to promoting creativity, the authors argue that weak links between individuals are preferred to strong ones, and that more weak ties are generally preferable than a smaller number. Position in the network, both central and peripheral, is also important. Therefore, a position on the periphery of a network may indicate connections beyond the network which may enhance creativity.

CHAPTER II - The Creative Personality

As pointed out in the last chapter, there are numerous viewpoints on creativity, thus it is useful to assess the elements that constitute creativity. Is it about the quality of processes, products, or individuals? Clearly, it is each of them. According to Sternberg and Lubart's (1999) definition of creativity, processes of thinking, behaviour, as well as products may be either more or less capable to produce innovative and appropriate output or to be unique and acceptable, and hence they can be regarded as more or less creative. Similarly, individuals can have the skill and capacity to produce unique and appropriate work to a certain extent, and as a result, they might be regarded more or less creative. This last point is the issue we are going to address in this chapter. When interpreting the creative process as an abstraction, it can also be regarded as an expression of the individual. The creative process itself emphasizes forms of learning, social relationships, motivations, and emotional dynamics that are unique to each creative individual (Rubini, 1980).

According to some researchers, particularly those of the humanistic school such as Rogers, Maslow, and Bruner, one way to better comprehend the meaning of creativity is to examine the features that distinct a creative person from one who is not. On the other hand, the drawback of viewing creativity as a personality trait is that it could imply that everything a so-called "creative person" produces must be creative. This is why many researchers argue that it is significantly better to think of creativity as emerging from a certain activity and resulting in a specific product or idea. So, before delving into the topic, it is critical to quote Amabile (1988), who highlights that being creative is not having an eccentric personality. Truly innovative work is not merely novel, but also appropriate.

2.1. The Creative Personality and Inquiry Methods

The study of the creative person focuses on the characteristics that distinguish individuals from one another in terms of their ability to demonstrate creativity. It is also crucial to emphasize that, even if the same theoretical standpoint conciliates many academics on the definition of creativity, this does not necessarily apply to the suggested characteristics of a creative individual. Follows an example. As reported in the previous chapter, Rogers (1954) defines creativity as the manifestation of the desire to realize oneself and develop one's potential in productive ways. As a result, the creative person is motivated by the force of creativity, which drives the individual's psychological development. Therefore, according to Rogers, the main feature that define a creative individual is motivation. Bruner (1962) adopts a similar humanistic view in defining creativity. However, he claims that the creative

individual is characterized by a voluntary alienation from the ordinary. Indeed, what sets aside a creative person from a non-creative one is the capacity to reject the obvious and common. In other words, Bruner defines a creative person as someone who knows how to properly surprise others with the results of their work.

So, when studying a creative individual, the first step is to determine the criteria for selecting study subjects. Scholars provide two distinct way to assess the qualities of the creative person. The first is to consider the findings from the analysis of divergent cognitive processes combined with individual features (as Rogers suggests). The second alternative is to identify personal traits of creative individuals studying their well-known and high-quality artistic or innovative products (as Bruner claim). However, studying individuals who have already established globally recognized creative skills has some limitations. In first place, it is unclear if producing a significant contribution to scientific or artistic innovation can be considered as the sole outcome of creativity. Furthermore, in identifying success, social conditioning assumes an unpredictable but significant role. Finally, the psychological qualities of people recognized for their creations may be attributed to their celebrity rather than the subject's creativity.

Over the last few decades, researchers have developed and employed a number of instruments to investigate aspects of human nature in order to compile comprehensive inventory of creative personality traits. Many of these inventories, questionnaires, and checklists are self-assessment instruments. The majority of tests include a large number of statements describing an emotional state or behaviour. The subjects have to choose which statement they believe corresponds most to them. Some creativity assessment tools are a combination or a manipulation of personality inventories. The Creative Perception Inventory, provided by Khatena and colleagues (1976), includes the Something About Myself (SAM) and What Kind of Person Are You (WKOPAY) questions (Khatena, 1971). Another widely recognized checklist is Gough's (1952) Adjective Checklist (ACL), which is a broad list of adjectives and human characteristics. Later, Domino (1970) refined it to create a more comprehensive Creativity Scale. Furthermore, Treffinger et al. (2002) provide a comprehensive review of the major creativity assessment tools and methods based on personality tests. The California Personality Inventory, the Sixteen Factor Personality Questionnaire, and the Minnesota Multiphasic Personality Inventory are some examples.

The effort to elaborate an investigation approach that can highlight all of the key features of the creative personality continues. The investigation's actual orientation is to provide evidence that the psychological qualities of people who are deemed creative because they excelled are similar to those found in people who score high in divergent thinking evaluations. If so, the fundamental idea

that divergent thinking is a significant aspect of creative ability will be confirmed. Actually, it is commonly accepted that creative abilities exist in every human being, but individuals' creative potential can be exhibited in a variety of ways, including artistic, scientific, and literary expression.

2.2. The Psychological Profile of Creative Individuals

The next section advances the investigation of creative individuals by presenting some of the most prominent studies on creative personality. The subjects, the aim of the research, and the findings reached by the authors are mentioned. The primary goal of these studies is to provide an outline of what the psychological profile of a creative person might be. The reported research look mainly into the differences between people who are considered creative versus individuals who are not (assessed using the evaluation tools described in the prior paragraph). Furthermore, the literature reveals features of creative subjects that arise from specific conditions.

Initially, the investigations focused on the correlation between creativity and intelligence. However, some studies emphasize specific topics such as anxiety management, gender differences, and social behaviour. In a early study provided by Wallach and Kogan (1965), secondary school students were divided into groups based on whether they were more or less flexible in producing new ideas (fluidity), gender, and intelligence. The researchers focused on how subjects experience anxiety (defined as an unpleasant feeling of fear toward life episodes) and how they display defensive attitudes (defined as denying feelings of shame, inadequacy, or hostility). The findings suggest that when creativity is low, intelligence is related with low levels of anxiety. When intelligence is high, strong creativity is associated with low defensiveness. Few years later, Wallach and Wing's (1969) compared groups of students based on their level of creativity and intelligence. Additionally, the students were grouped by gender. In the tasks presented to them, only students with strong divergent skills shown to be more proactive in leadership. They resulted also more productive in the domains of literature, figurative arts, and sciences. There were no significant differences between males and females scores.

Subsequently, the research focused on more complex traits. They emphasize both the individual characteristics of creative subjects combined with their attitude toward the social domain. Bierly and colleagues (2009) showed a positive correlation among creativity and idealism. These findings suggest that highly creative persons adopt a caring as well as a pragmatic ethical decision-making approach. Radicalism is another characteristic shared by creative subjects. Creative individuals commonly recognize having distinct and unconventional self-image. Additionally, they are highly motivated to succeed in situations that call for independence. Tucker (2001) noticed that creative

individuals are interested in understanding why they accomplish things in the manner they do. They are, nonetheless, confirmed to be nonconformists and determined. The observation that creative individuals tend to be situationists (when situational elements are believed to impact their behaviour more than internal characteristics or motivations), and notably that they tend to be high in idealism and radicalism, appears to counter the line of argument that claims for a “creative personality” marked by social indifference.

Scholars have also assessed creative individuals based on their responses to emotions. Creative adults have been shown to be the most creative on days involving highly engaged positive emotions and improved well-being. On the other hand, they showed them being significantly less creative while dealing with unpleasant emotions. Furthermore, The Big Five Personality Dimension openness is the trait most strongly linked to creativity and creative performance (Kaufman et al., 2016). Individuals with higher levels of openness have more comprehension of their feelings regarding the overall daily creativity than those with lower levels of openness (Smith et al., 2022).

Individuals who are characterized as creative based on the innovative relevance of their socially acknowledged product have a particularly intense and complex psychological inner awareness. Indeed, Wang et al. (2021) found that, between different performances, creative individuals may exhibit different attention patterns in the early stages of creative product evaluation process. In other words, individuals with strong creativity levels may employ more effectively both cognitive and non-cognitive evaluative processing to assess the creative product.

To summarize, the creative subject is distinguished by an increased intensity and qualitative variety of psychological resources. Another feature that emerges from the literature is the ability to integrate adaptable mental-bearing structures using fewer pre-built boundaries. All of these qualities, albeit with individual variations, have been observed in men, women, adults, and youth. A portrait of a creative person can be drawn based on their capacity to enhance subjective requests. They also stand out through the ability to project these instances externally.

2.3. Evaluation of the relation between creativity and psychopathology

We already discussed how, in ancient times, the creative process was interpreted as a manifestation of divine inspiration as well as how, as time and understanding of creativity evolved, this vision was reinterpreted in vastly diverse models. The romantic movement in literature was one of the most significant trigger for identifying symptoms of clinical madness. As a result, it also prompted a logical causal relationship between creativity and insanity by deliberately adopting and revising Greeks

and Latin's cultural ideals. Therefore, it was alimented an explanation in which madness was both an exalted state that stood in opposition to what they believed to be uncomfortable normality. In other words, there was a prevalent belief that creativity comes from paradoxical processes including stability and disorder. It is also proposed that creativity and madness have long been related, although not totally, due to the phenomena of inspiration (Tomas, 1958). Furthermore, the intellectual assumptions about creative people and the dynamics of creativity were transformed into a framework that denied the possibility of mental health for the creative individual. The argument was so dominant that many romantics' declarations of mental agony and signs of psychosis may be viewed as mere conformity to a role expectation believed proper for artists, writers, as well as other creative individuals. Furthermore, Becker (2001) argued that the expectation of "madness" is part of a professional mindset that defines what it means to be truly creative. Considering this, it is not unreasonable to suppose that, rather than denying any relation to psychopathology, contemporary writers and artists may accidentally express evidence of mental illness in diagnostic and psychological evaluations.

The potential link between creativity and psychopathology has long been the focus of inquiry, and it remains so today. However, research findings in this area are varied and contradictory. The relationship between creativity alongside specific mental health issues has been verified and disproved throughout numerous studies. In a research examining the association between creativity and psychopathology, Chavez-Eakle et al. (2006) administered the Torrance Tests of Creative Thinking, Temperament and Character Inventory, and Symptom Check List-90 to participants. Highly creative individuals have low psychopathology scores. There were significant negative correlations between creativity and psychopathology on all subscales. Furthermore, psychopathology was more strongly associated with personality than creativity. Gostoli's et al. (2017) arguments are diametrically opposing. The authors suggest significant positive connection among creativity and bipolar disorder risk, particularly hyperthymia (upbeat, and action-oriented disposition) (Akiskal, 1992). Except for autonomy and personal growth, creativity was not significantly related to psychological well-being scales.

Thys and colleagues (2014) published a thorough analysis of the literature spanning from 1950, which included research publications on creativity and psychopathology. The focus is on the methodology and findings of the gathered studies. This review shows the methodological issues, as well as the variety of research designs and outcomes. Overall, the study findings confirm with caution the correlation between creativity and both bipolar and psychotic disorder. However, the authors confirm that the research on creativity and psychopathology is impeded by major methodological issues. Many scholars emphasized that the actual research's outcomes are to be regarded with caution

and that inquiries on the topic requires additional methodological rigor (Chavez-Eakle, 2006; Taylor, 2017; Feist, 2019).

As previously stated, the findings of a rising number of experimental and relatively strictly monitored clinical research have been inconsistent in terms of reliability of methodology. In response to these findings, other researchers employed big data and large sample meta-analysis methodologies resulting in outcomes that are, again, mainly discordant. It can be noticed strong both positive and negative relationships between creativity and psychopathology. Carson (2011), for example, found that highly creative individuals are more inclined to develop specific forms of psychopathology, such as mood disorders and alcoholism, than the average population. However, creativity is regarded as a trait related with positive, and sometimes very positive, individual features. Similarly, Holm-Hadulla et al. (2021) showed contrasting findings, suggesting that severe psychopathology impairs creativity. On the other hand, mild and moderate diseases can inspire and encourage creative endeavours, but they lead to novel and beneficial solutions if creative individuals are able to turn their emotional instabilities and cognitive incoherence into consistent and coherent conditions.

In recent years, the academic research on the subject is mostly concerned with determining whether the relationship between creativity and psychopathology is positive or negative. In this regard, Zhao et al. (2022) argue that the positive-negative nature of the relationship between creativity and mental health is mediated by the nature of creativity and its associated assessments. The correlation is negative whenever creativity is viewed or expressed as a disposition, but positive when creativity is addressed as an approach (for example, as an intervention approach or regulating activity). The results mentioned above support the findings of Acar et al. (2021), who confirmed that the ways of measuring creativity are responsible for the heterogeneity in the relationship between creativity and psychopathology. When creativity is assessed using instruments which emphasize on creative activity and behaviour, rather than divergent thinking tasks, the correlation is significantly positive.

Hoogman et al. (2022) conducted a review of various behavioural investigations on creativity and Attention-Deficit/Hyperactivity Disorder (ADHD), distinguishing between different research methods, age groups, and creativity assessments, as well as reflecting on the likely underlying brain mechanisms of both. There was evidence of higher divergent thinking among individuals with high ADHD scores (subclinical), but not in those with the disease (clinical). Both clinical and subclinical groups demonstrated high levels of creative abilities. The relationship between divergent thinking and ADHD may vary depending on the deficits associated with ADHD.

Despite the impressive tradition, it is improper to believe that all creative individuals are insane. Their novel products make sense, while the insane's art would not. This chapter concludes with

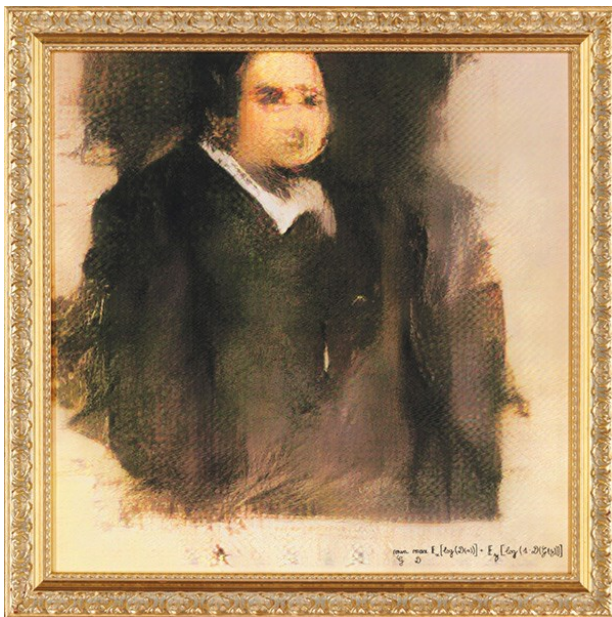
a provocation supplied by Tomas (1958), who states that when looking at psychotic paintings, it is evident that they all possess an expression of nightmare, insanity, or mania, which is missing, for instance, from Da Vinci's monstrous drawings or surrealism paintings.

CHAPTER III - Creativity, Artificial Intelligence and Art

The increasing volume of artistic products and research, resulting from the merging of artificial intelligence (AI) and art, emphasizes the necessity of considering the creative and exploratory possibilities of AI technology in creative arts. Since 2018, when the Obvious collective's AI artwork "Portrait of Edmond Belamy" (figure 1.) went on sale at Christie's auction for more than 400,000 dollars (BBC, 2018), there was an increasing interest in AI Art. As a result, the debates about the fundamental elements of creativity received relevance. The "Portrait of Edmond Belamy" instance, refocused attention on discussions about novelty, originality, and autonomy in AI creative artwork.

Figure 1

The Portrait of Edmond Belamy



3.1. Creativity and Artificial Intelligence

The principles underpinning AI output are briefly outlined in relation to the novelty of a creative work. The simplest kind of "concept creation", is random generation within a conceptual space (Boden, 2004). The main idea is to provide such a task to an artificial intelligence. Consider the following example. It is possible to imagine an artificial system capable of creating an entirely new poem using the 26 letters of the Latin-script alphabet, just like a human poet would. Within the given

space, a four-letter combination has almost 450 thousand (456,976) potential outcomes. Blind variation of this type is therefore capable of producing whole novel compositions (words and sentences that have never been read previously), and hence may be deemed creative. However, in order to be considered creative, the forms produced by blind generation must be assessed by humans for their appropriateness. Because not all combinations of letters or words make sense in a given language, it is evident that this technique for generating artificial creative poetry is likely to require vast computational capabilities, with a low probability of success. In this scenario, an evaluative approach is required to increase the chance of selecting the right combination of letters and words that make sense to the reader. So, AI and Machine Learning (ML) provide a way to obtain greater accessibility to appropriate novel products. Following the prior example, a system receives instructions that certain combinations of words and letters are “correct” and is trained to create innovative configurations that make sense in a specific language. By including an evaluation component, this algorithm prevents the billions of pointless letter combinations that are inherent in the virtually infinite number of permutations. The more rigorous the training, the more the AI recognizes poetic style, rules, and poetical themes. However, this entails the system analysing and limiting its own production, resulting in a decrease in novelty.

In terms of originality of the AI outcome, the most noteworthy contribution is the one made by Boden (1998). The author suggests that AI techniques can be used to enhance creativity in three ways: (1) combinational, (2) exploratory, and (3) transformational. The first category involves new (improbable) combinations of existing concepts. Many examples include poetic imagery and analogy, in which two newly related ideas have some intrinsic conceptual links. In terms of the second and third approaches, The former involves the development of new ideas by examining potential conceptual fields, which tends to result in patterns that are both innovative and unexpected. The latter entails changing (transforming) one or more dimensions of the conceptual space, allowing previously unimaginable ideas to emerge. The argument about originality focuses on exploratory and transformational approaches to creative production. The relevance of the transformation works as a parameter. The more significant the transformation, the more diverse the forthcoming forms will be. However, if the changes are too drastic, the relationship between both previous and current builds may not be immediately obvious. Indeed, it might require time for the relationship between the two notions to be acknowledged and widely accepted.

One of the core requirements for developing artificial intelligence creativity is the system’s level of autonomy. In this regard, Jennings (2010) proposes criteria that determine whether a system could be deemed creative.

1. Autonomous Evaluation: the system can assess its approving for a creation while not seeking feedback from an external source.
2. Autonomous Change: the system begins and guides modifications to its standards regardless of being explicitly instructed when and how to do so.
3. Non-randomness: the system's evaluations and standard adjustments are not completely random.

Autonomous evaluation implies that the system has the ability to independently adjust its definition of success. At the same time, it cannot just make predetermined alterations only once it receives instructions from another source. Ideally, a straightforward approach to meet the first and second criteria is to make randomized decisions at random times. However, as already discussed in this essay, coherence and appropriateness are essential qualities of a creative work. Meaningful results are unlikely to be produced if the system chooses variables at random, which is why the non-randomness condition is included.

The discussion regarding novelty, originality, and autonomy remains active. Additionally, as technology advances, more and more processing resources become available, enabling AI to function faster and more effectively. However, Cropley et al. (2023) assert that artificial systems can only achieve moderate degrees of incremental creativity. In other words, computational systems have mainly the ability to develop novel and effective variations on existing ideas, structures, and artifacts. Furthermore, it is suggested that, even with advancements and changes to AI technology, this capacity is unlikely to evolve into an autonomous potential for radical innovation, but rather into higher levels of incremental creativity at a reduced cost (Edmonds, 2022).

3.2. The Generative Art

The expanding use of AI technology in art production sparks debate concerning the creative identity of the artworks and their place in the evolution of visual arts. "Generative art" or G-art, defined as the form of art where the creation of the artwork is, at least partially, the result of a process beyond of the personal influence of the artist (Boden & Edmonds, 2009), has gathered theoretical and practical focus in academic literature (Dorin et al., 2012; McCormack et al., 2014).

Before discussing the subject of AI art, it is important to briefly outline the taxonomy proposed by Boden and Edmonds (2009). Eleven different categories of art are identified by the author's nomenclature: Ele-Art, C-art, D-art, CA-art, G-art, CG-art, Evo-art, R-art, I-art, CI-art, and VR-art. These

genres of art are generally defined in a broad way, and certain types of artworks may fit into more than one category. In particular scenarios, a category could be seen as a subclass of another. Appendix A contains a schematic outline of Boden and Edwards' (2009) taxonomy.

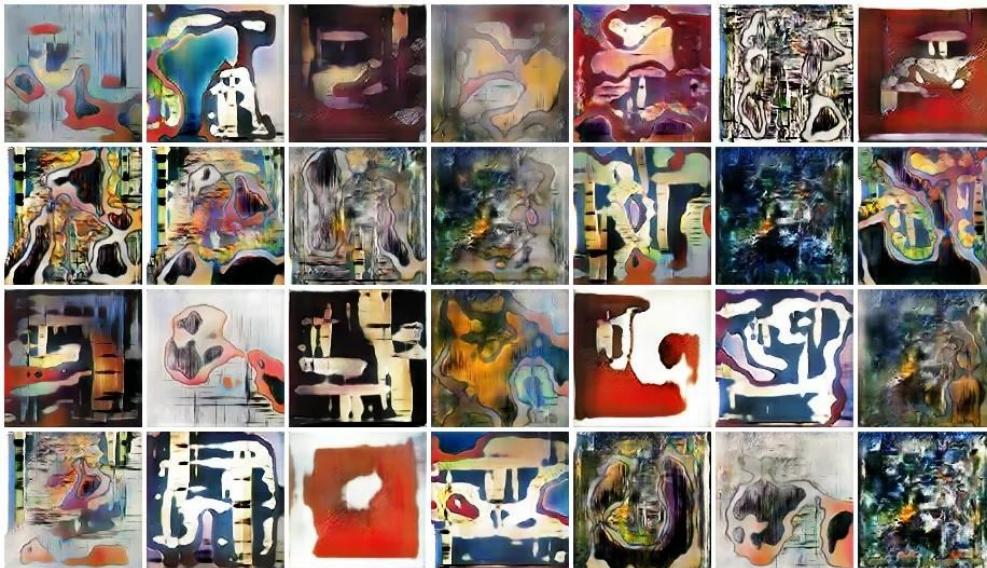
So, according to its definition, Generative Art typically identifies instances of art-making where relatively impersonal processes guide the outcomes. Additionally, personal control is purposefully reduced, if not completely given up. For a painter, an instance of an impersonal procedure could be throwing a six-sided die to determine the number of subjects to include in a portrait. Given that artificial intelligence is being addressed, it is indispensable to assume that computer employment is prevalent. Consequently, even if adopting digital devices is not implied by the definition of G-art, consideration is also given to Computer Art, or C-art, which is defined as the activity in which computers are used in the process of creating art (Boden & Edmonds, 2009). Two interpretive keys are provided by the definition of computer art. The first perspective regards the computer only as a tool for creating art. A typical instance is an illustrator who creates images using graphics devices and software. In the second interpretation of C-art, the computer is not used as a tool to express the artist's vision, rather, it is the source of the idea itself. It appears clear that C-art in this context is a type of generative art. It should be noted that artists may produce their artwork via formal rules generated by computers in place of biological, physiological, or psychological procedures. These are what is known as computer-generated art, or CG-art. A very rigorous definition of computer-generated art would require that the artwork is the product of a computer program that autonomously runs without any input from external sources.

3.3. Creating AI art

After discussing the various shapes of digital art, this section advances by presenting the process employed to produce it. That said, it is also interesting to examine how AI separates creativity from human agency while the AI creation process itself operates. Goodfellow et al. (2014) introduced the generative adversarial networks (GANs), which constitute a significant turning point in the effort to employ machines to generate artistic visual content. The primary operation of a GAN is to instruct two "competing" models: a generator and a discriminator. The generator's purpose is to capture an array of instances in the source sample and make realistic images. On the other hand, the discriminator is taught to classify images from the original sample as real and generated images as fake. Later on, other programmers and artists adopted GANs with various adjustments and distinctive training parameters to make their digital artwork. Currently, it is the most extensively used system in the AI art scene (Figure 2).

Figure 2

Generating Modern Art using Generative Adversarial Network (GAN) on Spell



Note. Spell is an end-to-end data science and machine learning platform that also provides the infrastructure to produce generated art. <https://towardsdatascience.com/generating-modern-arts-using-generative-adversarial-network-gan-on-spell-39f67f83c7b4>

The application of the Contrastive Language-Image Pre-training model (CLIP), a system pre-trained on an extensive database of image and text pairs (Radford et al., 2021), to a system enables AI to produce images from text descriptions (Reddy et al., 2021). Based on the CLIP model, the artificial intelligence identifies the images from its database according to the provided text. It matches the contents based on associations, which are subsequently assessed to be appropriate or not applying the evaluation method outlined in the preceding paragraph. The integration of the CLIP model to different generative models has recently become available in numerous open-source contexts. Thanks to the availability of various open source such as DALL·E, BigSleep and DeepDaze, the development and use of sophisticated text-to-image generation models to create art is spreading and is currently an emerging phenomenon in the AI art field (Cetinic & She, 2022).

Many considerations about AI and human creativity have been made throughout this essay. Indeed, arguing that human creativity may be replicated through machine language would probably be delusional; rather, both forms of creativity should be regarded as distinct processes. However, exploring the idea of an AI producing art on its own may give new perspectives about human creativity and potential partnerships with AI. Ultimately, the dynamic that arises between humans and AI in

creative processes stimulated broad questions about the moral issues that need to be taken into account while producing and distributing artificial intelligence artwork. On the other hand, the “Portrait of Edmond Belamy” was displayed as having been made independently by an AI system, but neither the system’s creators nor the network’s coder were given any official recognition.

DISCUSSION

Starting with a general description of creativity and analysing classic and modern models, we have identified some of the many qualities that define the creative individual. The distinction between current and classic creativity theory is based mainly on the structure and the topics around which creativity is conceptualized. It is evident that the phase model is the most conventional and apparently basic paradigm. However, this has no effect on its reliability. Mumford and colleagues (2011), for example, suggest an eight-phase model to structure the creative process applied to leadership. As a result, while modern models emphasize the conceptualization of creativity in a socioeconomic context, more traditional archetypes might still be relevant. A clear example is the associationist theory, which, in explaining human creativity, suffers the limitations that we examined in the first chapter. On the other hand, when considering the use of AI to create visual art, we can see how an in-depth analysis of the associationist model could be valuable for training text-image association systems (such as CLIP). A similar shift in research themes pertains to the study of the creative individual. This topic has traditionally been centred around the educational field, but it has recently gained relevance in the socioeconomic and management domain. It has been noted that whenever different less creative individuals interact on a creativity task collectively, they are prone to collaborate and improve their creative performances (Xue et al., 2019). This is an example of how current research is focusing on the potential collaboration of multiple individuals rather than the single subject's internal creative process. As an in-depth investigation, the potential relationship between creativity and psychopathology was briefly examined, providing results that were inconsistent, if not contradictory. Current research continues to raise questions about this correlation's relevance and implications. However, the majority of the papers advocate for greater uniformity in research methodology. It is believed that as our understanding of creativity advances, researchers will be able to come up with more consistent methodological approaches to research and, perhaps, more conclusive findings. Indeed, investigating this relationship could lead toward novel clinical application possibilities. In the final chapter, we look at one of the frontiers that has received a lot of attention in recent years: creativity and how it reveals itself in the artistic work of artificial intelligences. In particular, this section addresses the question of whether artificial intelligence may be deemed creative, and if so, under what conditions. The definition of creativity we presented at the beginning of this essay does not exclude the possibility that entities other than humans can be creative; but certainly in a different way. Witnessing technologies becoming effective in creative production, formerly thought to be an exclusive skill of living beings, raises several new questions. Notably, individuals show an initial scepticism of AI from their first engagement (Sheridan & Hennessy, 1984). However, increased interaction with AI systems, as well as their

prominence in mass media appearances, may raise a human's trust in the benefits and probability of employing an AI system even to create art. Artificial intelligence has an impact on artistic creativity, which influences our interpretation of art. The key factor is the agency that humans acknowledge to AI throughout the creative process. Concluding, with a final consideration. It is remarkable how, in common sense, an artificial intelligence is incapable of having human intellectual abilities. However, terminology such as "learn", "understand", "evaluate", "apprehend", and so on are used in both academic and non-academic discussions. These are all terms that commonly refer to humans. This apparent contradiction seem to be useful considering, and we recommend further investigation in future research. Admitting that creativity and art might have meaning beyond what is mankind might expand our understanding of human creativity and its forms of expression in art.

APPENDIX A

1. Ee-art involves electrical engineering and/or electronic technology.
2. C-art uses computers as part of the art-making process.
3. D-art uses digital electronic technology of some sort.
4. CA-art uses the computer as an aid (in principle, non-essential) In the art-making process.
5. G-art works are generated, at least in part, by some process that Is not under the artist's direct control.
6. CG-art is produced by leaving a computer program to run By itself, with minimal or zero interference from a human Being.
7. Evo-art is evolved by processes of random variation and selective Reproduction that affect the art-generating program itself.
8. R-art is the construction of robots for artistic purposes, where Robots are physical machines capable of autonomous movement And/or communication.
9. In I-art, the form/content of the artwork is significantly affected By the behaviour of the audience.
10. In CI-art, the form/content of some CG-artwork is significantly Affected by the behaviour of the audience.
11. In VR-art, the observer is immersed in a computer-generated Virtual world, experiencing it and responding to it as if it were Real.

REFERENCES

- Acar, S., Tadik, H., Myers, D., Van der Sman, C., & Uysal, R. (2021). Creativity and well-being: A meta-analysis. *The Journal of Creative Behavior*, 55(3), 738-751.
- Akiskal, H. S. (1992). Delineating irritable and hyperthymic variants of the cyclothymic temperament. *Journal of Personality Disorders*, 6(4), 326-342.
- Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in organizational behavior*, 10(1), 123-167.
- Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.
- BBC (2018). After a piece of art 'created' by an AI sold for \$430,000, Thomas Graham looks at what the age of the machine means for art. BBC, 12 December.
- Becker, G. (2001). The association of creativity and psychopathology: Its cultural-historical origins. *Creativity Research Journal*, 13(1), 45-53.
- Bierly, P. E., Kolodinsky, R. W., & Charette, B. J. (2009). Understanding the complex relationship between creativity and ethical ideologies. *Journal of business ethics*, 86, 101-112.
- Boden, M. A. (1998). Creativity and artificial intelligence. *Artificial intelligence*, 103(1-2), 347-356.
- Boden, M. A., & Edmonds, E. A. (2009). What is generative art?. *Digital Creativity*, 20(1-2), 21-46.
- Bruner, J. S. (1962). The conditions of creativity. In *Contemporary Approaches to Creative Thinking*, 1958, University of Colorado, CO, US; This paper was presented at the aforementioned symposium.. Atherton Press.
- Carson, S. H. (2011). Creativity and psychopathology: A shared vulnerability model. *The Canadian Journal of Psychiatry*, 56(3), 144-153.
- Cetinic, E., & She, J. (2022). Understanding and creating art with AI: Review and outlook. *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, 18(2), 1-22.
- Chavez-Eakle, R. A., Lara, M. D. C., & Cruz-Fuentes, C. (2006). Personality: A possible bridge between creativity and psychopathology?. *Creativity Research Journal*, 18(1), 27-38.
- Cropley, D. H., Medeiros, K. E., & Damadzic, A. (2023). The intersection of human and artificial creativity. In *Creative provocations: Speculations on the future of creativity, technology & learning* (pp. 19-34). Cham: Springer International Publishing.

- Cropley, D.H., Medeiros, K.E., Damadzic, A. (2022). The Intersection of Human and Artificial Creativity. In: Henriksen, D., Mishra, P. (eds) *Creative Provocations: Speculations on the Future of Creativity, Technology & Learning. Creativity Theory and Action in Education*, vol 7. Springer, Cham. https://doi.org/10.1007/978-3-031-14549-0_2
- Dewey, J. (1910). *How We Think*. *Continuity*, 3(40), 80.
- Domino, G. (1970). Identification of potentially creative persons from the Adjective Check List. *Journal of Consulting and Clinical Psychology*, 35, 48–51.
- Dorin, A., McCabe, J., McCormack, J., Monro, G., & Whitelaw, M. (2012). A framework for understanding generative art. *Digital Creativity*, 23(3-4), 239-259.
- Edmonds, E. (2022). AI, Creativity, and Art. In: Vear, C., Poltronieri, F. (eds) *The Language of Creative AI*. Springer Series on Cultural Computing. Springer, Cham. https://doi.org/10.1007/978-3-031-10960-7_4
- Eindhoven, J.A., & Vinacke, W.E. (1952). Creative Processes in Painting. *Journal of General Psychology*, 47, 139-164.
- Feist, G. J. (2019). The Function of Personality in Creativity: Updates on the Creative Personality. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge Handbook of Creativity* (pp. 353–373). chapter, Cambridge: Cambridge University Press.
- Freeman, L. C. (2002). Centrality in social networks: Conceptual clarification. *Social network: critical concepts in sociology*. Londres: Routledge, 1, 238-263.
- Fromm, E. (1959). The Creative Attitude. In Harold H. Anderson, (Ed.), *Creativity and Its Cultivation*. New York: Harper and Row, 1959, 44-54
- Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., Courville, A. & Bengio, Y. (2014). Generative adversarial nets. *Advances in neural information processing systems*, 27.
- Gostoli, S., Cerini, V., Piolanti, A., & Rafanelli, C. (2017). Creativity, bipolar disorder vulnerability and psychological well-being: a preliminary study. *Creativity Research Journal*, 29(1), 63-70.
- Gough, H. G. (1952). *Adjective Check List*. Palo Alto, CA:Consulting Psychologists Press.
- Granovetter, M. S. (1973). The strength of weak ties. *American journal of sociology*, 78(6), 1360-1380.
- Guilford, J. P. (1967). *The nature of human intelligence*. McGraw-Hill, New York.
- Holm-Hadulla, R. M., Hofmann, F. H., Sperth, M., & Mayer, C. H. (2021). Creativity and psychopathology: An interdisciplinary view. *Psychopathology*, 54(1), 39-46.

- Hoogman, M., Stolte, M., Baas, M., & Kroesbergen, E. (2020). Creativity and ADHD: A review of behavioral studies, the effect of psychostimulants and neural underpinnings. *Neuroscience & Biobehavioral Reviews*, 119, 66-85.
- Jennings, K. E. (2010). Developing creativity: Artificial barriers in artificial intelligence. *Minds and Machines*, 20, 489-501.
- Johnson, D. M. (1955). *The psychology of thought and judgment*.
- Journeaux, J., & Mottram, J. (2015). Creativity and Art Education Gaps Between Theories and Practices. In *Multidisciplinary Contributions to the Science of Creative Thinking* (pp. 281-299). Singapore: Springer Singapore.
- Kaufman, J. C. (2016). *Creativity 101*. Springer publishing company.
- Kaufman, S. B., Quilty, L. C., Grazioplene, R. G., Hirsh, J. B., Gray, J. R., Peterson, J. B., & DeYoung, C. G. (2016). Openness to experience and intellect differentially predict creative achievement in the arts and sciences. *Journal of personality*, 84(2), 248-258.
- Khatena, J. (1971). Something About Myself: A brief screening device for identifying creatively gifted children and adults. *Gifted Child Quarterly*, 15, 262–266.
- Khatena, J., & Torrance, E. P. (1976). *Khatena-Torrance Creative Perception Inventory*. Chicago, IL: Stoelting Company.
- Köhler, W. (1948). The mentality of apes, 1917. In W. Dennis (Ed.), *Readings in the history of psychology* (pp. 497–505). Appleton-Century-Crofts. <https://psycnet.apa.org/doi/10.1037/11304-054>
- Köhler, W. (1959). Gestalt psychology today. *American Psychologist*, 14(12), 727–734. <https://doi.org/10.1037/h0042492>
- MacKinnon, D. W. (1962). The nature and nurture of creative talent. *American psychologist*, 17(7), 484.
- MacKinnon, D. W. (1965). Personality and the realization of creative potential. *American Psychologist*, 20(4), 273.
- McCloy, W., & Meier, N. C. (1939). Re-creative imagination. *Psychological Monographs*, 51(5), 108–116. <https://doi.org/10.1037/h0093481>
- McCormack, J., Bown, O., Dorin, A., McCabe, J., Monro, G., & Whitelaw, M. (2014). Ten questions concerning generative computer art. *Leonardo*, 47(2), 135-141.
- Mednick, S. (1962). The associative basis of the creative process. *Psychological review*, 69(3), 220.

- Montanari, F., De Molli, F. (2020). L'organizzazione della creatività. In Buonocore Filomen, B. F., Montanari Fabrizio, M. F., Solari Luc, S. L. (ed.), *Organizzazione aziendale. Comportamenti e decisioni per il management*, 235- 260. De Agostini. Milano. <http://hdl.handle.net/10807/176711>
- Mumford, M. D., Robledo, I. C., & Hester, K. S. (2011). Creativity, innovation, and leadership: Models and findings. *The Sage handbook of leadership*, 405-421.
- Osborn, A. F. (1953). *Applied imagination*. Scribner's.
- Perry-Smith, J. E., & Shalley, C. E. (2003). The social side of creativity: A static and dynamic social network perspective. *Academy of management review*, 28(1), 89-106.
- Post, F. (1994). Creativity and psychopathology a study of 291 world-famous men. *The British Journal of Psychiatry*, 165(1), 22-34.
- Radford, A., Kim, J. W., Hallacy, C., Ramesh, A., Goh, G., Agarwal, S., Sastry, G., Askeel, A., Mishkin, P., Clark, J., Krueger, G., & Sutskever, I. (2021). Learning transferable visual models from natural language supervision. In *International conference on machine learning* (pp. 8748-8763). PMLR.
- Reddy, M. D. M., Basha, M. S. M., Hari, M. M. C., & Penchalaiah, M. N. (2021). Dall-e: Creating images from text. *UGC Care Group I Journal*, 8(14), 71-75.
- Rogers, C. R. (1954). Toward a theory of creativity. *ETC: A review of general semantics*, 249-260.
- Rossmann, J. (1931). *The psychology of the inventor*. Inventors Publ. Co.
- Rubini V. (1980). *La creatività. Interpretazioni psicologiche, basi sperimentali e aspetti educativi*. Firenze: Giunti.
- Runco, M. A., & Chand, I. (1995). Cognition and creativity. *Educational psychology review*, 7, 243-267.
- Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal*, 24(1), 92–96. <https://doi.org/10.1080/10400419.2012.650092>
- Sheridan, T. B., & Hennessy, R. T. (1984). Research and modeling of supervisory control behavior. Report of a workshop. National Research Council Washington DC Committee on Human Factors, Tech. Rep.
- Shrestha A. (2019). Generating Modern Art using Generative Adversarial Network (GAN) on Spell. Towards Data Science. [Photography] <https://towardsdatascience.com/generating-modern-arts-using-generative-adversarial-network-gan-on-spell-39f67f83c7b4>
- Smith, K., Pickering, A., & Bhattacharya, J. (2022). The creative life: A daily diary study of creativity, affect, and well-being in creative individuals. *Creativity Research Journal*, 34(4), 460-479.

- Sternberg, R. J., & Kaufman, J. C. (2012). When your race is almost run, but you feel you're not yet done: Application of the Propulsion Theory of Creative Contributions to late-career challenges. *The Journal of Creative Behavior*, 46(1), 66-76.
- Sternberg, R. J., & Lubart, T. I. (1991). An investment theory of creativity and its development. *Human Development*, 34(1), 1-31.
- Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. *Handbook of creativity*, 1(3-15).
- Taylor, C. L. (2017). Creativity and mood disorder: A systematic review and meta-analysis. *Perspectives on Psychological Science*, 12(6), 1040-1076.
- Thomson, P., & Jaque, S. V. (2019). *Creativity, trauma, and resilience*. Lexington Books.
- Thurstone, L.L. (1938). *Primary mental abilities*. University of Chicago Press: Chicago.
- Thys, E., Sabbe, B., & De Hert, M. (2014). Creativity and psychopathology: A systematic review. *Psychopathology*, 47(3), 141-147.
- Tomas, V. (1958). Creativity in art. *The Philosophical Review*, 67(1), 1-15.
- Torrance, E. P. (1977). *Creativity in the Classroom: What Research Says to the Teacher*. Washington DC: NEA.
- Treffinger, D., Young, G., Selby, E., & Shepardson C. (2002). *Assessing creativity: A guide for educators*. Storrs, CT: The National Research Center on the Gifted and Talented.
- Tucker, V. (2001). *Creativity for You: A training course in creativity through divergent thinking*. Better Yourself Books.
- Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children*.
- Wallach, M. A., & Wing Jr, C. W. (1969). *The Talented Student; A Validation of the Creativity-Intelligence Distinction*.
- Wallas, G. (1926). *The art of thought (Vol. 10)*. Harcourt, Brace.
- Wang, B., Zhou, H., Duan, H., Wang, X., Song, B., & Hu, W. (2021). Highly creative individuals process creative pictorial information more effectively: Evidence from an ERP Study. *Creativity Research Journal*, 33(2), 124-137.
- Welch, L. (1946). Recombination of ideas in creative thinking. *Journal of applied psychology*, 30(6), 638.
- Wertheimer, M. (1945). *Productive thinking*. Harper. New York.

Xue, H., Lu, K., & Hao, N. (2018). Cooperation makes two less-creative individuals turn into a highly-creative pair. *Neuroimage*, 172, 527-537.

Zhao, R., Tang, Z., Lu, F., Xing, Q., & Shen, W. (2022). An updated evaluation of the dichotomous link between creativity and mental health. *Frontiers in Psychiatry*, 12, 781961.