

UNIVERSITY OF TWENTE.

**Creativity – A Curse or a Blessing for People with Bipolar Disorder:
A Systematic Literature Review**

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Abstract

Background: Research on the relationship between bipolar disorder (BD) and creativity yield contradictory findings. On the one hand, a review of the year 2012 (Johnson et al., 2012) could not identify the nature of the relationship between BD and creativity, while Luken's review (2018) demonstrated a linear positive association between creativity and BD. Other set of studies found an inverted-U relationship between BD and creativity, however. This disparity in findings is due to problems and errors in sampling, methodology, and the presentation of results as well as conclusions. Therefore, the objective of this literature review was to systematically review the epidemiological evidence on the association between BD and creativity of the past 10 years and to identify the conditions and underlying mechanisms under which creativity and BD are correlated.

Method: A systematic literature search in the electronic databases Web of Science, PubMed, and PsychInfo was executed. 338 titles were reviewed resulting in 17 articles for the final review that met the inclusion criteria for qualitative synthesis.

Results: Overall, study results cautiously show that the link between creativity and BD follows an inverted-U relationship. Positive affect, extrinsic motivation, and ambition are possible factors affecting the relationship between creativity and BD, while dysfunctions in the dopaminergic systems and activity in the prefrontal cortex are biological mechanisms underpinning the relationship between creativity and BD.

Conclusions: Despite methodological shortcomings, the review gives insights into the relationship between BD and creativity. Furthermore, the review identifies research gaps and offers suggestions for future research. For instance, the exact underlying mechanisms of the relationship are yet to be established, the causality issue needs to be investigated further and more longitudinal studies are required. Moreover, the review confirms the methodological problems and heterogeneity of the study designs, especially regarding the conceptualization of creativity.

1. Introduction

The relationship between creativity and psychopathology has been a long focus of research over the past decades. Especially bipolar disorder (BD) was commonly linked to creativity (Murray & Johnson, 2010). However, there is a lot of contradictory evidence regarding the existence of such a link as well as about the type of the relationship, so the nature of this relationship is yet to be established. Furthermore, there is a lack of consensus about the underlying mechanisms of this relationship. The goal of this review is to provide an overview of the current state of creativity and bipolar disorder research, which could help to increase the awareness of existing research gaps and questions that need to be addressed in future research. Broadly speaking, the review might help to provide valuable insights into the field of creativity and its use for example in therapeutic settings. For instance, developing an accurate understanding of the underlying mechanisms of the relationship between bipolar disorder and creativity could further help to decide how to use creativity for example in the treatment of bipolar disorder.

1.1 Bipolar Disorder

The DSM-V defines different forms of bipolar disorder (BD) based on varying severity and duration of symptoms. In general, BD is a severe chronic mood disorder involving shifts in mood and levels of energy. Episodes of mania, hypomania, as well as alternating or intertwining episodes of depression, are the main characteristics of BD (American Psychiatric Association, 2013). The main symptoms of BD include extreme happiness, irritability, racing thoughts, excessive confidence, increased energy, and willingness to engage in reward-oriented behaviours without consideration of potential negative consequences (Johnson et al., 2012).

Depending on the severity of manic symptoms, the disorder is classified into bipolar I, bipolar II disorder, and cyclothymic disorder (American Psychiatric Association, 2013). Bipolar I disorder is defined by manic episodes lasting at least seven days. Concomitant episodes of depression usually occur as well and typically last at least two weeks. The milder form, bipolar II disorder, involves depressive episodes and periods of elevated mood (hypomania) that are typically less severe and therefore do not inhibit function. It differs from bipolar I disorder because the recurrent swings between subsyndromal depressive and manic symptoms do not develop into full-blown episodes (Severus & Bauer, 2013). Cyclothymic disorder is a cyclic disorder that causes brief episodes of hypomania and depression. Many individuals with bipolar II disorder or

cyclothymic disorder progress to a bipolar I diagnosis in course of their lifetime (Angst et al., 2003). These two milder forms of BD have been labeled as bipolar spectrum disorder to capture that they share features with BD I even though the criteria for a manic episode are not (yet) fulfilled (Berk & Dodd, 2005). All forms will be considered in the review (American Psychiatric Association, 2013).

1.2 Creativity

1.2.1 Definitions

Most research defines creativity as the process whereby new, original, effective and useful products are generated (Runco & Jaeger, 2012). Accordingly, it is often seen as the practice of thinking outside the box or as a concept that enables humans to see things in a different light without being restricted by rules or norms, leading to innovation (Runco & Jaeger, 2012). However, no one universal and coherent definition of creativity exists. Instead, there are multiple approaches and conceptualizations of creativity, from which a few will be reviewed in this section.

According to Guilford (1971), creativity is predominantly constituted of divergent and convergent thinking. Divergent thinking can be defined as the ability to generate multiple possible solutions to a single question with the aid of using fluency, flexibility, and originality (Kharkhurin, 2017). Convergent thinking, in contrast, occurs when one makes use of existing knowledge and logical reasoning to arrive at one solution to a problem (Runco, 2004).

Another widely used conceptualization for creativity is Kaufman and Beghetto's (2009) Four-C Model of creativity, which differentiates between four types of creativity: mini-c, little-c, Pro-C, and Big-C. The mini-c level of creativity, also called subjective creativity, refers to the new and personally essential and meaningful insights that individuals gain during learning and experience. In other words: the product or outcome may not be revolutionary but is new and meaningful to the creator. Little-c or everyday creativity refers to the creativity involved in daily activities and experiences and therefore reflects an extension from the mini-c level. At the Pro-C level or expert level, an individual can be creative at a professional level evolving from many years of cautious practice and training. At this level, some individuals might already make a living from their creative activity as individuals at the Big-C or eminent creativity level do. The Big-C can be defined as the revolutionary creativity that shapes culture and society.

Next to these conceptualizations of creativity, Rhodes (1961) proposed that creativity should be considered along the four Ps, namely the *person*, the *product*, the *process*, and the *place*. The *person* refers to the creative individual, the *process* involves the mental mechanisms that happen when the individual engages in the creative activity, the *product* refers to the result of the creative activity, and *place* refers to the environment or setting in which the activity takes place (Rhodes, 1961). Based on this model, more recent research suggests that the interplay between the four Ps together forms creativity (Amabile et al., 1996; Csikszentmihalyi, 1996).

1.2.2 Assessing Creativity

In the past, creativity was often assessed as part of intelligence (Getzels, & Jackson, 1962). Sternberg and O'Hara (1998) identified five different conceptions about the relationship between creativity and intelligence, for instance, creativity was assumed to be a subset of intelligence or in turn that intelligence is a subset of creativity. Furthermore, creativity and intelligence were assumed to be overlapping, disjoint sets, or to be coincident. Based on recent research, it can be concluded that the relationship between creativity and intelligence depends on the definition and assessment of both constructs. However, contemporary research shows that creativity is a psychological trait among the general population, according to which it is a construct that can be developed and measured on its own (Barbot, 2011). Creativity assessment makes use of four different types: process-based assessment (e.g., divergent thinking tests), person-based assessment by others, person-based assessment by oneself (self-assessment), and product-based assessment (e.g., consensual assessment technique).

In sum, creativity is a complex construct and lacks one coherent definition (Andreasen, 2008; Waddell, 1998). Consequently, there is a wide array of conceptualizations and therefore also approaches to assess creativity. This represents an issue in creativity research because the different approaches are often only modestly correlated, as investigated by Batey and Furnham (2008). Their results show that for instance divergent thinking assessment tools usually only correlate modestly with teacher or peer ratings of creativity and original thinking. Moreover, Batey and Furnham found that divergent thinking tools almost do not correlate with achieving eminence. Therefore, multiple assessment tools of creativity should be used to adequately assess creativity (Batey & Furnham, 2008).

1.3 Creativity and Mental Health

Creativity research has shown that creativity is linked to both well-being and psychopathology. Research revealed that creativity is related to societal, educational, and/or professional achievements, better psychological health as well as better physical health (Peterson & Seligman, 2004). For instance, individuals who regularly engage in creative activities tend to display decreased rates of cancer or heart disease and tend to be more resilient to stress (Eysenck, 1988). Moreover, from a positive psychological point of view, there is a positive relationship between creativity and well-being and creativity is a means to achieve psychological well-being and self-actualization (Seligman & Csikszentmihalyi, 2000). Furthermore, creativity has been shown to reinforce psychological adjustment as well as flourishing, life satisfaction, positive affect, self-efficacy, and happiness (Peterson & Seligman, 2004).

However, in the past, creativity was commonly linked to mental illness (Andreasen & Glick, 1988), having its roots in Romanticism. Romanticism is an intellectual and artistic movement of the late 18th and early 19th centuries that created the association between art and creativity by thematizing art, nature, the sublime, fantasy, imagination, horror, and madness, which lead to the development of the image of the mad genius (Glăveanu, 2018). The mad genius was considered to be a sick artist who struggles to find a place in society, and Vincent van Gogh is a commonly mentioned example (Netchitailova, 2019). The relationship between creativity and madness, therefore, received a great deal of concern and was investigated a lot (see Kaufmann, 2001). Romanticism especially thematized the misery associated with great creativity (Glăveanu, 2018). Later, this phenomenon was called the mad-genius hypothesis (Lombroso, 1895). According to this view, creativity is associated with some degree of psychological abnormality or even psychopathology. Thus, creativity is considered to be positively related to psychopathology (Andreasen, 1987). Multiple empirical studies provided evidence to support this view (Andreasen & Glick, 1988; Simonton & Song, 2009).

1.3 Creativity and Bipolar Disorder

It became apparent through reviews of biographical material and through retrospective biographical methods assessing potential diagnosable conditions in deceased eminent artists or creators that especially BD is significantly over-represented among samples of creative professions, such as authors, poets, and artists (Andreasen, 1987). It is estimated that 10% of artists

suffer from symptoms of BD in comparison to the general population prevalence of about 1% (Rothenberg, 2001). Creativity in those kinds of studies is often defined by the fame the individual has achieved or they are labeled as creative by people who are familiar with their work, such as mentors or peers. Biographical studies are prone to biases because the information based on which a psychological assessment takes place may be incomplete or inaccurate and a diagnosis is made retrospectively (Schulberg, 2001). Moreover, the diagnostic criteria being applied are often ill-defined and eminence is as difficult to define as the concept of creativity (Andreasen, 2008; Rothenberg, 2001; Waddell, 1998). Nevertheless, retrospective biographical studies are often used as evidence of the relationship between creativity and psychopathology or BD specifically (Rothenberg, 2001; Waddell, 1998), making the reliability of these results and therefore the link between creativity and bipolar disorder questionable. However, there is also evidence for the relationship between creativity and BD among non- eminent people (Schmidt et al., 2020), according to which non- eminent people diagnosed with BD appear to be more creative than healthy controls in that they work in creative professions or engage in creative hobbies such as painting more often.

When searching for literature, only two reviews were found that directly assessed the relationship between BD and creativity, namely the reviews from Johnson et al. (2012) and Lukens (2018). However, only the review conducted by Johnson et al. (2012) is peer-reviewed and published in an academic journal, emphasizing the need for a new and up-to-date review of the topic.

Johnson et al. (2012) conducted a review on the relationship between creativity and BD and were unable to conclude the type of relationship that exists. Moreover, their review shows that the relationship between BD and creativity is likely to change depending on what type of creativity is assessed. This is in line with the article of Simonton (2009), in which it is shown that more severe psychopathology correlates with artistic creativity more than scientific creativity. Thus, variations and distinctions within the concept of creativity are present, which is likely to influence the results of creativity research studies.

Lukens (2018) identified in his literature review thirty-one studies supporting the relationship between BD and creativity. He found that individuals with BD exhibited higher levels of creativity and that creative individuals in turn exhibit higher rates of BD. This suggests that a

reciprocal relationship between creativity and mania exists. Furthermore, there is some evidence that creative people are at higher risk for BD than the general population (Andreasen, 1987).

In contrast, multiple studies characterized the relationship between creativity and psychopathology as an inverted-U relationship (Acar & Runco, 2012; Acar & Sen, 2013; Richards et al. 1988), according to which more severe symptoms facilitate and increase creativity up to a certain threshold beyond which creativity then starts to diminish. Accordingly, the idea is that vulnerability to mania or the existence of hypomania is related to creativity, but that more severe expressions of symptoms and mania may interfere with lifetime accomplishment (Richards et al., 1988). Support for the inverted-U relationship can be seen in the differences in creativity levels of individuals when taking the severity of BD symptoms into account. BD I patients are more likely to experience greater dysfunction and impairment during mania, which diminishes the benefits of creativity during manic episodes. Conversely, patients with BD II experience less dysfunction and their hypomanic states often elicit states of flow, focus, and clarity (Bowins, 2008), thereby benefiting creativity. Thus, milder forms of BD, and therefore predominantly BD II, are more helpful to creativity than more severe forms of BD I (Richards et al., 1988). Furthermore, unaffected family members of bipolar persons exhibit higher creativity than those with the disorder (Chang et al., 2005).

Next to the contradictory evidence of the type of the relationship between BD and creativity, some researchers argue that most of the studies with evidence for the relationship between creativity and psychopathology are affected by problems and mistakes, such as in sampling, methodology, and the presentation of results and conclusions (Andreasen & Glick, 1988; Andreasen, 2008; Prentky, 2001; Richards & Kinney, 1990; Rothenberg, 2001; Santosa et al., 2007; Waddell, 1998). Based on this assumption, Waddell (1998) reviewed studies concerning the relationship between creativity and mental illness and concluded that there is not enough scientific evidence for this association. Furthermore, Pinson (2013) reviewed the relationship between creativity and bipolarity and concluded that a lot of studies are flawed because they assess some aspects of the bipolar spectrum disorders but fail to include more subtle parts of the bipolarity continuum, such as sub-syndromal symptoms of hypomania or hyperthymic temperament.

Overall, the literature shows contradictory evidence about the nature of the relationship between creativity and BD, presenting a large causality issue. This inconsistency in results can

again be attributed to the lack of a clear definition of creativity. In the review of Waddell (1998), 14 studies did not administer standardized measures of creativity or psychopathology.

1.4 Underlying Mechanisms

1.4.1 Biological

There is evidence that creativity and many disorders associated with creativity, such as bipolar disorder, are genetically heritable (Jamison, 1989). Therefore, it was assumed that creativity and disorders such as BD share genetic vulnerability factors. For instance, the finding that first-degree relatives of people with serious mental illness exhibit increased creativity (Andreasen, 1987; Kyga et al., 2011) could be explained by shared genetic vulnerability factors. Moreover, according to some case reports, creativity might be decreased by lithium, a medication that is administered to treat BD, and enhanced by hypomanic symptoms (Jamison et al., 1980; Richards & Kinney, 1990), which further supports the idea that creativity and BD share biological characteristics. In another study conducted by Power et al. (2015), researchers found a genetic connection between creativity and BD after analyzing 86,000 people to look for biological factors that increase the risk of BD and schizophrenia. Their findings show that creative individuals, as measured by their creative occupations such as acting, writing, etc. are 25% more likely than noncreative people to carry genes that are associated with BD and schizophrenia.

Carson (2011) proposed a shared vulnerability model according to which the vulnerabilities between creativity and psychopathology incorporate a proneness to transient cognitive disinhibition, which is related to variation in multiple DA- and H-HT-related genes. For instance, the genes DRD4 and SLC6A3 (the dopamine transporter gene) have been connected to bipolar disorder as well as to novelty seeking (Benjamin et al., 1996). Since novelty seeking is a significant factor in creativity (Reuter et al., 2005), variations in the availability of and sensitivity to DA may be determinants of the shared vulnerability between creativity and mental illness and bipolar disorder specifically (Carson, 2011). Furthermore, there exists a relationship between mesolimbic dopaminergic dysregulation and BD as well as creativity (Berk et al., 2007). Based on this relationship, Berk et al. (2007) base the assumption that abnormalities of dopamine function could be a biological vulnerability factor between creativity and BD.

1.4.2 Personality traits and other mechanisms

There are some shared personality traits and characteristics among creative individuals and BD patients. Carson (2011) discovered that creative people and people suffering from psychopathology have the same characteristics in common, which are namely cognitive disinhibition/latent inhibition, enhanced novelty seeking, emotional liability, and hyper-connectivity. Moreover, impulsivity and openness to experience bring individuals to choose a creative occupation and both personality characteristics are highly related to BD (Johnson et al., 2012).

Furthermore, Johnson et al. (2012) reviewed the relationship between creativity and BD and found that drive, ambition, and increased goal-directedness are highly related to creative endeavors and that these two traits are also commonly documented as related to BD as well as to the vulnerability to BD and risk-taking is a possible mediator of the link (Johnson et al., 2012). Furthermore, positive affectivity is correlated to both creativity and BD and might therefore be a mediator for the relationship (Murray & Johnson, 2010). Thus, personality, motivation, and mood state appear to be underlying factors of the link between creativity and BD.

1.5 Rationale for systematic literature review

Despite the many studies that investigate the relationship between creativity and BD, there remains a lack of consensus if a relationship exists and if yes, what kind of nature the relationship has. Furthermore, most studies are unable to explain the conditions under which creativity is associated with bipolar disorder. The aim of this study was therefore to conduct a comprehensive investigation of the recent epidemiological evidence on the link between creativity and BD of the past 10 years in order to update and extend the reviews conducted by Johnson et al. (2012) and Lukens (2018). The following research questions guided the review:

1. Is there a relationship between creativity and bipolar disorder and if yes, what type of relationship exists (causal, bidirectional, U-inverted, covarying, positive, or negative)?
2. What are the underlying mechanisms of the relationship between creativity and bipolar disorder?

2. Method

2.1 Literature search

First, the key terms of the research questions were extracted, namely *creativity* and *bipolar disorder*. These were the main search terms for the literature search. The databases used in this review were PubMed, Web of Science, and PsycINFO. The search was performed in May 2022. The corresponding search queries are displayed in Table 1. Boolean operators, nesting, and truncation were not used because the search queries were small and inclusive.

Table 1 Search queries and amount of hits per database

Date	Database	Search Query	Hits
23.05.2022	Web of Science	ALL=(creativity) AND ALL=(bipolar disorder)	143
23.05.2022	PubMed	(creativity) AND (bipolar disorder)	99
23.05.2022	PsychInfo	creativity AND bipolar disorder	96
Total			338

2.2 Inclusion/Exclusion Criteria

Specific inclusion and exclusion criteria have been defined in order to obtain eligible articles. The included articles were limited to empirical studies in peer-reviewed journals published in English from 2012 to 2022. Duplicates, book chapters, comments, reviews, art- and bibliography analyses, meta-analyses, and studies from which the full text was not accessible were excluded. Furthermore, articles focusing on schizophrenia, depression, or other mood disorders in general instead of bipolar disorder were excluded. No exclusions were set on populations, measurement instruments, interventions, or experimental manipulations.

Included were observational, quantitative, qualitative, or mixed-method studies that gathered data on the relationship between creativity and bipolar disorder respectively from the past 10 years (23.05.2012 - 23.05.2022). Studies that focused on the relationship between divergent thinking and BD were included as well since divergent thinking constitutes creativity.

Furthermore, studies that focused on subsyndromal symptoms of BD were included to avoid an incomplete assessment of the current state-of-the-art research between creativity and BD.

2.3 Study Selection

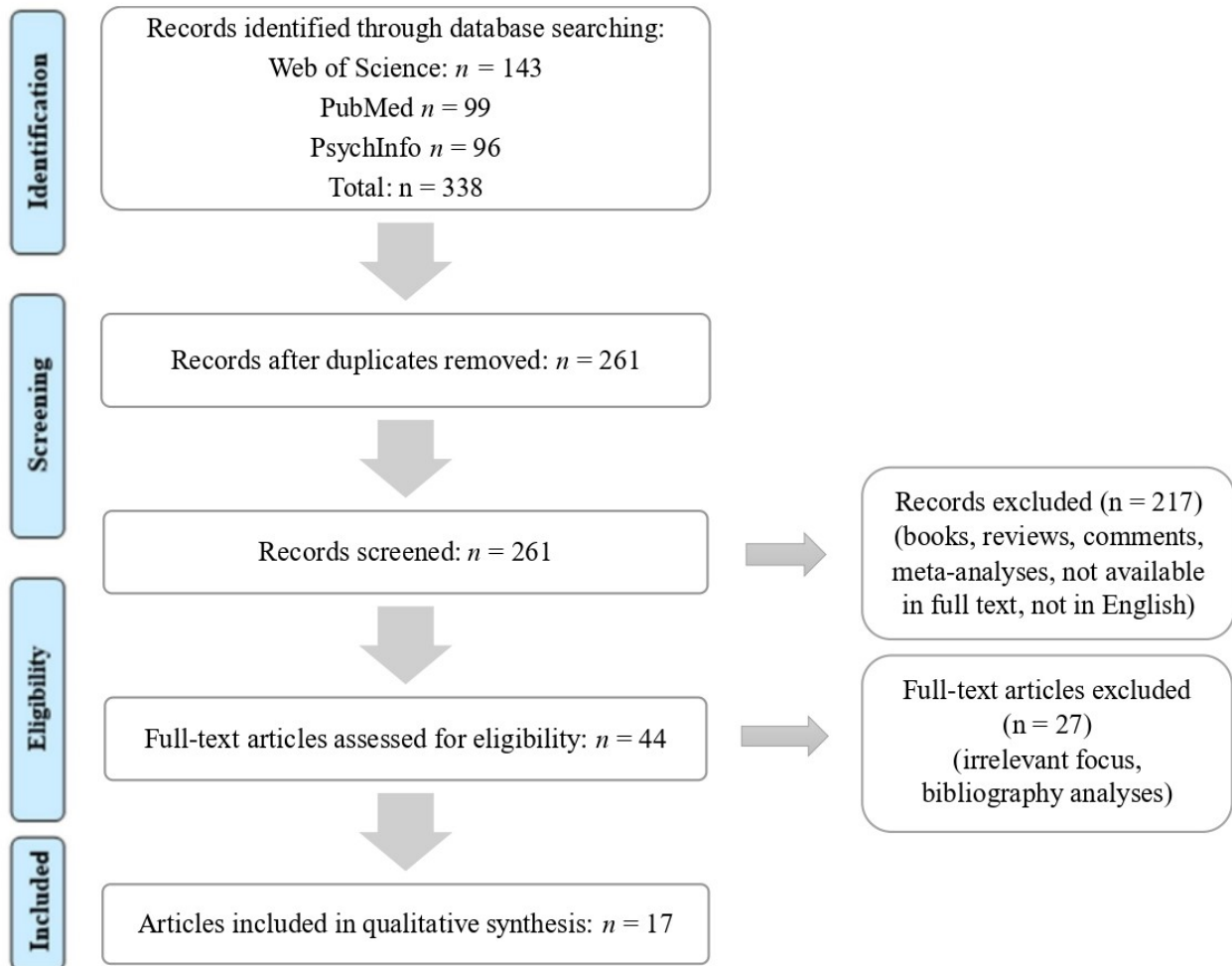
The search was directly limited to the past ten years to avoid including outdated articles in the review (time frame 23/05/2012 - 23/05/2022). After importing the articles from the databases to EndNote, duplicates were deleted which was followed by scanning the titles and abstracts of the articles. Titles and abstracts that did not include any of the keywords and therefore did not appear to answer the research questions or that met the exclusion criteria were excluded. Afterward, the screening entailed a more careful examination of the abstracts of the articles that appeared to suit the inclusion criteria and accordingly the focus of the research question. If the given information matched the interest of the review, these were saved for closer examination. The closer examination included the screening of the full text of the abstracts, with emphasis on the methods and results section. The full text of the articles was then checked according to the inclusion and exclusion criteria to select the final articles for the narrative synthesis.

2.4 Summary of included studies creativity and bipolar disorder

A total of 338 studies were identified through the database search process. The next step was to remove 77 duplicates using EndNote X9 so that 261 references remained to be screened according to suitability for selection, assessed based on eligibility criteria and information given in the title and abstract. 217 articles were excluded, and the remaining 44 articles were further assessed for selection by screening full articles, mainly focusing on the method and results sections. After checking the inclusion and exclusion criteria, 17 articles were selected for the systematic review. The 27 excluded articles were excluded because they did not measure the relationship between creativity and bipolar disorder, their methods did not fulfill the criteria and the full text was not available. Figure 1 gives an overview of the study selection process within the systematic literature search.

Figure 1

Flow diagram on the study selection process based on a systematic literature search.



2.5 Data Extraction

The selected articles were successively read, and relevant information was extracted. From each article, the following information was extracted: name of the authors, year and location of publication, participant descriptive data, study description, design, the intervention that was used, and key results. Then, the overall quality of the articles was evaluated before information to answer the research questions was extracted.

The quality of a study can be considered as the degree to which a study employs measures to minimize error and bias in its design, conduct, and analysis (Khan et al, 2003, p. 39). When the design, conduct, and analysis are robust to provide results that are credible, trustworthy, and generalizable, it can be considered to be a good quality study. The quality assessment of the 17

studies focused on the following biases: selection bias (is the sample representative of the population?), measurement bias (are the tests administered in the right manner; are the selected tests valid and reliable?), reporting bias (are all outcomes stated to be measured reported despite it being beneficial or not to the author?), sample size and study design. Prospective studies are considered to be of higher quality than case-control study. However, in the ranking of the study quality, the beforementioned biases are considered as well so that a cohort study with biases in the other domains could have a lower study quality than a case-control study that does not exhibit those biases. If biases in the studies are apparent, this can affect the generalizability, transferability, and thus the quality of the study.

3. Results

3.1 General Study Characteristics

This systematic literature review is based on 17 studies investigating the relationship between creativity and bipolar disorder. A summary of the study characteristics can be found in Table 2. One randomized controlled trial (RCT) was included, which focused on the effect of mood on the relationship between creativity and BD. Four studies had focus groups and interviews as their data collection method and engaged in thematic analyses. Three studies had a neuropsychological focus and included genotyping and magnetic resonance imaging in their investigation of the link between creativity and bipolar disorder. The rest were correlational studies. Some of them had a control group, whereas other studies did not. In 10 out of 17 of the included studies, the sample consisted of individuals with a BD diagnosis, while the other seven studies focused on non-clinical samples to investigate bipolar vulnerability/risk.

Table 2*Overview Characteristics of Included Studies Ordered by Study Quality*

	Article (Authors + year)	Interests/Study Aim	Country	Sample Information	Methodology (Data collection / creativity assessment tools)	Study Design	Study quality (high, moderate, low)
1	MacCabe, J. H., Sariaslan, A., Almqvist, C., Lichtenstein, P., Larsson, H., & Kyaga, S. (2018)	Relationship between creativity and severe adult mental disorders	Sweden	N (total) = 4 454 763 N (bipolar) = 28 293 (0.64%) Mean age (total) = 42.31 (13.06 sd) Mean age (bipolar) = 44.76 (12.44 sd)	Data from the following registers, via the unique registration number carried by all Swedish residents: LISA database Higher education register Military service conscription register Multigenerational register National patient register	Population- based case- control study	High
2	Soeiro-de- Souza, M. G., Post, R., Machado- Vieira, R., do Prado, C. M., Moreno, R. A., Akiskal, H., & Akiskal, K. K. (2014)	The role of Catechol-O- methyltransferase (COMT) functional polymorphism Val met in creativity scores of healthy controls, and BD patients in euthymia and during mood episodes	Brazil	N = 216 Index group: 119 BD I patients euthymia (N = 42), manic episode (N = 44) depressive episode (N = 33) Age range: 18-40 years Control group: 97 healthy subjects 45 males	Wechsler Abbreviated Scale of Intelligence (WASI) BWAS Genotyping	Association study	High

				52 females Mean age: 24.3 (SD=4.7) Age range 18-35 years			
3	Takeuchi, H., Kimura, R., Tomita, H., Taki, Y., Kikuchi, Y., Ono, C., . . . Kawashima, R. (2021).	Association between polygenic risk score for bipolar disorder and divergent thinking and brain structures in the prefrontal cortex	Japan	N = 1,558 healthy, right-handed individuals 659 males (42.30%) 899 females (57.70%) mean age: 20.77 (SD 1.74) age range: 18–27 years	Genotyping Neuropsychological tests of basic cognitive performance S-A creativity test Questionnaires for mood disorders Magnetic resonance imaging (MRI)	Association study	High
4	Tu, P.-C., Kuan, Y.-H., Li, C.-T., & Su, T.-P. (2017).	The structural correlates of creative thinking in patients with bipolar disorder and healthy controls	Taiwan	N = 115 Index group: 59 right-handed patients with <u>BD I</u> or <u>BD II</u> Mean age: 35.3 (SD=8.5) Control group: 56 age- and sex- matched controls	ATTA CWRAT Structural magnetic resonance imaging	Association study	High
5	Hoşgören Alici, Y., Devrimci Özgüven, H., Kale, E.,	Prefrontal cortex activity during divergent and convergent	Ankara, Turkey	N = 58 Index group: 31 BP subjects	AUT RAT PFC activity with fNIRS	Cross- sectional study	High

	Yenihayat, I., & Baskak, B. (2019).	creative thinking in bipolar subjects		10 males (32.26%) 21 females (67.74%)			
				Control group: 27 healthy subjects 9 males (33.33%) 18 females (66.67%) Mean age: 37.1 (SD=10.2)			
6	Johnson, S. L., Tharp, J. A., & Holmes, M. K. (2015).	Relationship between divergent thinking within the bipolar group and positive affectivity, ambition, medications, or depressive and manic symptom severity		N = 112 Age range: 18-65 years	CAQ UUT Reverse Digit Span (RDS) Beck Depressen Inventory Short Form (BDI) Altman Self-Rating Mania Scale (ASRM) Modified Hamilton Rating Scale for Depression (MHRSD) Young Mania Rating Scale (YMRS)	Case-control study	High
		Relationship between trait-like levels of positive affectivity, neurocognition, and ambition and divergent thinking or lifetime creative accomplishment within bipolar disorder		Index group 62 BP I subjects 35 female (56.5%) 27 male (44.5%) Mean age: 36.13 (SD=12.00)			
				Control group: 50 healthy subjects 26 males (52%) 24 females (48%)			
7	Fulford, D.,	The effect of	USA	N = 53	Hypomanic personality scale	Randomized	Good to

	Feldman, G., Tabak, B. A., McGillicuddy, M., & Johnson, S. L. (2013).	positive affect on the association of hypomanic personality and cognitive flexibility		25 males (47.17%) 28 females (52.83%) Mean age: 19 (SD = 1.03) Age range: 17-23 years	(HPS) DKEFS Mood and Anxiety Symptoms Questionnaire (MASQ) Vocabulary Subtest of the Wechsler Adult Intelligence Scale III (WAIS-III)	controlled trial	moderate
8	Kyaga, S., Landen, M., Boman, M., Hultman, C. M., Langstrom, N., & Lichtenstein, P. (2013).	Association between creative occupations and different psychiatric disorders Validation of previous findings of a familial association for creative professions with schizophrenia and bipolar disorder by using a larger dataset	Sweden	N (bipolar disorder subjects): 945 10 control subjects matched on sex and birth year were randomly selected from the MGR for each patient and each of their relatives	National Patient Register Cause of Death Register Multi-Generation Register Military Service Conscription Register National Register	Population- based longitudinal study	Moderate to good
9	Johnson, S. L., Murray, G., Hou, S., Staudenmaier, P. J., Freeman,	Involvement of ambition in creativity across the bipolar spectrum	Canada	Study 1: N = 22 11 BD I subjects 4 BD II subjects 1 unspecified milder form	Study 1: CAQ Willingly Approached Set of Statistically Unlikely Pursuits (WASSUP)	Cross- sectional study	Moderate to good

M. A., & Michalak, E. E. (2015).	<p>Study 1: Association between ambition and creativity among BP patients</p> <p>Study 2: Extension of research on ambition and creativity by testing the association to the sub-clinical end of the bipolar spectrum</p>	<p>1 rapid cycling 1 BD I & BD II 4 declined to answer</p> <p>5 males (22.7%) 15 females (77.3%) 2 excluded Mean age 42.05 (SD=12.73)</p> <p>BD diagnosis average of 11.45 years (SD=10.0, median=9), but they had been living with the disorder for an average of 26.57 years (SD=15.60, median=10)</p>	<p>Seven-up Seven-down scale Brief Quality of Life in Bipolar Disorder (brief QoL.BP)</p> <p>Study 2: WASSUP Fame WASSUP Financial success Proclivity for Improvisation Creativity scale Hypomanic Personality Scale (HPS) Affect rating</p>	<p>Study 2: N = 221 All participants were recruited from research participation pools of a large public university as part of a broader study on entrepreneurship</p>	10 Gostoli, S., Cerini, V., Piolanti, A., & Rafanelli, C. (2017).	Relationship between creativity, subclinical bipolar disorder symptomatology	Italy	N = 329 students attending the 4 th year of six different Italian colleges from artistic scientific study	TDF Temperament Evaluation of the Memphis, Pisa, Paris and San Diego Autoquestionnaire (TEMPS-A) Ryff's Psychological Well-	Cross-sectional study	Moderate
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	and psychological well-being		programs 163 males (49.5%) 166 females (50.5%) mean age 23.9 age range: 21 to 45	being Scale (PWB)			
11	Burkhardt, E., Pfennig, A., Breitling, G., Pfeiffer, S., Sauer, C., Bechdolf, A., . . . Leopold, K. (2019).	Relationship between creativity and clinical risk for bipolar disorder among individuals with a history of depressive disorder and varying risk for future (hypo-) manic episodes	Germany	N = 38 Inpatients and outpatients of the Department of Psychiatry and Psychotherapy and clients of the Early Recognition Centre for Mental Disorders at Universitätsklinikum Dresden Age range: 17-39 years All participants were currently diagnosed with a depressive disorder (84%) or had a history of depressive episodes (16%).	Schizophrenia Proneness Instrument Structured Interview for Prodromal Symptoms Scale of Prodromal Symptoms Bipolar Prodrome Symptom Interview and Scale-Prospective (BPSS-P) BWAS CAQ	Cross-sectional study	Moderate
12	Johnson, S. L., Moezpoor, M., Murray, G., Hole, R., Barnes, S. J., & Michalak, E. E. (2016).	Relationship between bipolar disorder, its mood states, its treatments and creativity	Canada	N = 22 5 males (22.73%) 17 females (77.27%) mean age = 42.05 (SD = 12.73)	Seven-up seven-down scale Brief Quality of Life in Bipolar Disorder (QoL.BD) CAQ	Qualitative focus group study	Moderate to good

				Participants reported that they had been living with BD for a mean of 26.6 years (median = 30, SD = 15.7 years), but diagnosed for a mean of 11.5 years (median = 9, SD = 10.0 years)			
13	McCraw, S., Parker, G., Fletcher, K., & Friend, P. (2013).	Differences of self-reported creativity across the BP subtypes	Australia	<p>N = 219 BP patients 130 females (59.4%) 89 males (40.6%) mean age 34.7 (SD=11.8)</p> <p>A smaller sample of 69 BP patients was available for qualitative analyses: 19 (27.5%) met BP I criteria (57.9% female, 35.6 mean age) and 50 (72.5%) met BP II criteria (58.0% female, mean age 35.5), with the BP II group age and gender-matched to the BP I group.</p>	<p>Mini International Neuropsychiatric structured interview (MINI) Quick Inventory of Depressive Symptomatology-Self Report (QIDS-SR16) Hypomanic Personality Scale (HPS) Items referring to creative pursuits during mood episodes</p>	Qualitative interview study	Moderate
14	Taylor, K., Fletcher, I., & Lobban, F. (2015).	The phenomenology of extreme mood and creative activity, including	UK	7 participants diagnosed with BD I	Interview	Phenomenological qualitative study	Moderate

		the ways in which people with BD appraise their experiences of mood and creativity					
15	Siwek, M., Dudek, D., Arciszewska, A., Filar, D., Rybicka, M., Cieciora, A., & Pilecki, M. W. (2013).	Bipolarity features in students of arts and students of technology	Poland	N = 120 subjects: Art students (n = 57): 22 males (38.6%) 35 females (61.4%) Mean age: 21.3 (SD=1.8) Technology students (n = 63): 38 males (60.3%) 25 females (39.7%) mean age: 20.5 (SD=1.2)	Catamnestic questionnaire Hirschfeld Mood Disorder Questionnaire (MDQ)	Cohort study	Moderate to poor
16	Miller, N., Perich, T., & Meade, T. (2019)	Association of bipolar disorder symptoms with differences in self-reported creativity in a sample of people living with bipolar disorder	Australia	N = 397 52 males (13.1%) 344 females (86.4%) 1 agender (0.3%) Mean age 38.61 (SD=11.22) Age range: 16-67	Altman Self-Rating Mania Scale (ASRM) Depression Anxiety Stress Scale (DASS-21) Creativity Domain Questionnaire Revised (CDQ-R)	Cross-sectional study	Moderate to poor
17	Ruiter, M., & Johnson, S. L.	The links between mania risk and	USA	N = 378	CAQ Adjective Checklist Creative	Cross-sectional	Moderate to poor

(2015)	<p>creativity, using a multifaceted approach of creativity that incorporated lifetime creative accomplishment, creative personality traits, and insight</p>	<p>124 males (32.80%) 254 females (67.20%)</p> <p>No information given about mean age and age range</p>	<p>Personality Scale (ACL-CPS) CRA Hypomanic Personality Scale (HPS) Altman Mania Self-Report (AMSR) Beck Depression Inventory-Short Form (BDI-SF) Positive Affect Negative Affect Schedule-Expanded Version (PANAS-X) Willingly Approached Set of Statistically Unlikely Pursuits (WASSUP) Aspiration Index (AI) Personality Research Form-Dominance scale (PRF-D) The Social Comparison Scale (SCS) Iowa Netherlands Comparison Orientation Measure (INCOM) Flow Scale The Shipley Institute of Living Scale-Vocabulary Test (SILS-V)</p>	study
	<p>The role of multiple forms of motivation as potential mediators of the link between mania and creativity</p>		<p>Randomly assigned experimental manipulation of extrinsic motivation in the insight task</p>	

3.2 Study Quality

The population-based case-control study conducted by MacCabe et al. (2018) tested the association between studying a creative subject and the later development of a mental disorder. The study has a very large sample size since they collected their data from population-based registries in Sweden, thereby ensuring the generalizability of the results. Their analysis is also complete and without bias. However, they do not use any explicit measurement of creativity but base creativity solely on the profession the subjects follow or the type of study at Universities they perform. Studying an artistic subject may not fully capture the attributes of artistic creativity. Nevertheless, the quality of the study is high and the reliability of the results are good.

The association study by Soeiro et al. (2014) genotyped 79 healthy volunteers and 120 individuals diagnosed with BD type I and tested them for creativity and intelligence. The sample size was large. The index group of bipolar patients was further divided into three subgroups of euthymia, depressive episode, and manic episode, allowing for comparisons within the bipolar disorder spectrum. Moreover, their control group exhibited a similar mean age and age range, so no selection bias is apparent. The control group presented higher IQ scores than the index group, which might be a confounding variable in the results. However, the researchers acknowledged this limitation. The measurement tools used exhibit good reliability and validity. Though the analysis and its reporting are complete concerning the relationship between the COMT Met allele and creativity, the researchers did not adequately state the significant relationship between bipolar disorder and creativity and solely indicated the relationship in a table. Nevertheless, they reported the most important findings for their study aim and, consequently, the study has high quality.

The association study by Takeuchi et al. (2021) had a very large sample size. The researchers used psychological analyses and whole-brain voxel-by-voxel analyses to examine the potential associations of BD-polygenic risk scores and creativity measured by the divergent thinking and regional gray and white matter volume. However, the generalizability of the results to the whole population is questionable since the sample only consisted of university students. Consequently, intelligence and the young mean age (20.77 years) are variables affecting the generalizability of the results to the whole population. The assessment tools used were valid and reliable and the analysis and reporting of data are complete. Therefore, the study shows high quality.

The association study by Tu et al. (2017) included voxel-based morphometry to investigate the structural correlates of creative thinking in people diagnosed with BD. The study had a sufficient sample size with a control group that matched the age and sex of the participants. The assessment tools they used in their study were reliable and valid. However, Goff & Torrance (2002) state that both administration and scoring of the Abbreviated Torrance Test for Adults (ATTA) may require some training, and Tu et al. (2017) did not state in their study to what extent the raters are already trained in the administration and scoring of the ATTA, which should be considered when taking the results into account. Nevertheless, did they adequately perform and report all analyses including the results, so that the study exhibits high quality.

In the cross-sectional study conducted by Hoşgören et al. (2019), the researchers measured prefrontal cortex activity in participants with remitted BD and healthy control participants with functional near-infrared spectroscopy during divergent and convergent thinking tasks. The study has a moderate sample size, and the index group and control group were almost the same, both consisting of almost 70% of female participants. The mean age of the sample was 37 and therefore is representative of the population. The index group consisted of only Type-1 bipolar patients. The measurement tools applied were reliable and valid and the reporting of the results was done very extensively. The authors also acknowledged the subjectivity bias in the assessment of the AUT/UUT and therefore followed the recommendations of Silvia et al. (2008). In that regard, they reported high interrater agreement and thus ensured the reliable handling of the scoring. Overall, the study has high quality.

The case-control study conducted by Johnson, Tharp & Holmes (2015) assessed creativity as measured by divergent thinking among participants diagnosed with BD Type I and healthy controls. The study has a good sample size, and the control group matches the index group regarding size and general sample characteristics. Furthermore, they used reliable and valid assessment tools and acknowledged the subjectivity bias of the Alternate Uses Test (AUT), also called Unusual Uses Task (UUT) in their study. Correspondingly, they followed the recommendations of Silvia et al. (2008) on how to avoid these biases and, as a result, reported high interrater agreement, thereby ensuring the reliability of results. However, the study did not include visual tasks or any real-world problem-solving tasks, which are relevant to divergent thinking, and might therefore not be completely representative of the relationship between divergent thinking and BD. In general, their data analysis and reporting of data are complete and no bias could be

detected so that their results are reliable and generalizable to the population. Thus, the study exhibits high quality.

The RCT study of Fulford et al. (2013) investigated whether positive affect moderated the relationship between risk for mania and cognitive flexibility. The study had a small sample size consisting of undergraduate students with an equal distribution of male and female participants. The mean age of the sample was very young (19 years), limiting the generalizability of the results to the whole population with a hypomanic personality. The study adequately assigned the participants randomly to the experimental conditions, which were either neutral or positive mood induction conditions. However, the participants in the positive mood group were aware that the goal was to improve their mood, which might have affected the validity of the mood induction. Otherwise, the researchers used valid and reliable scales and adequately conducted the analyses and reported their results. Therefore, the study still exhibits good to moderate quality.

The population-based longitudinal study conducted by Kyga et al. (2013) compared the occurrence of creative professions in people diagnosed with BD and their non-diagnosed relatives to a matched population control group. The study has a very large sample size. However, the control group was a lot smaller than their index group, which makes the results difficult to compare and interpret. The data was collected through Swedish databases, which implied that different diagnostic systems were used throughout the study. Their study raises the question of what kind of creativity was measured at all. They intended to measure pro-c creativity for individuals who are professional creators but have not yet reached an eminent status, but the definition of a creative occupation remains unclear. Therefore, a measurement bias might exist in the study. The analysis and reporting of data were complete. Overall, the study is of moderate to good quality.

The cross-sectional study by Johnson, Murray, Hou, Staudenmaier, Freeman, & Michalak (2015) included two studies that examined the involvement of ambition in creativity across the bipolar spectrum. In Study One it was assessed whether creativity and ambition correlated in creative participants who self-identified with BD. Study One has a small sample size with an unequal distribution of male and female participants. Therefore, the sample might not be representative of the whole BD population. Study Two tested the same association to the sub-clinical end of the bipolar spectrum. Study Two has a sufficient sample size, but the authors do not report any demographic characteristics of the sample so the confounding bias cannot be evaluated. Other than that, the researchers adequately performed the analysis and reported all results.

Moreover, they employed valid and reliable assessment tools. Consequently, the study quality can be considered moderate to good. However, the generalizability of the results of study One to the whole population needs to be questioned.

The cross-sectional study by Gostoli et al. (2017) investigated the relationship between creativity, subclinical BD symptomatology, and psychological well-being. The sample size of 329 participants is large but not representative of the population since it solely consists of students. Correspondingly, the mean age of the sample is relatively young (24 years). However, the distribution of male and female participants is almost 50:50, thereby limiting age as a confounding variable affecting the generalizability of the results. Even though the tests are administered in the right manner, Gostoli et al. (2017) did not give information about the validity and reliability of the Test of Divergent Feelings (TDF) in their study. Even though no reporting bias was detected, the study's results and conclusions should be considered cautiously since there is generally no research available on the reliability and validity of the TDF specifically, which might affect the assessment of creativity and the corresponding conclusions drawn. Therefore, the study quality can be judged as moderate.

The cross-sectional study conducted by Burkhardt et al. (2019) assessed creativity among individuals with a history of depression and varying risk for future hypo/manic episodes. The study had a relatively small sample size and consisted of patients with a history of depressive syndrome, thus presenting only one subgroup of the BD at-risk population, which limits the generalization of the results to the whole BD at-risk population. The researchers used valid and reliable measurements and adequately reported all results from their data analysis. Overall, the study exhibits moderate quality.

The qualitative focus group study by Johnson et al. (2016) researched how creative people with BD consider the role of symptoms and treatment in their creativity. The study exhibits a relatively small sample size with an unequal distribution of male and female participants. Participants that self-identified as living with BD and as being highly creative participated in focus groups and completed several questionnaires. Thematic analysis was applied to evaluate the data. Although the face validity of the study is very high due to the focus groups, the participants could have been subjective about their level of creativity and therefore there is no norm or comparison/control group based on which reliable conclusions can be drawn. The study rather gives insights into how BD-diagnosed individuals experience creativity but do not have scientific

value when assessing the concrete relationship between creativity and BD. Nevertheless, the analysis and reporting of results are transparent and do not exhibit any bias. Therefore, the study quality can be considered moderate to good.

In the qualitative interview study of McCraw et al. (2013), 219 participants with a BD diagnosis were asked about their creativity during hypo/manic episodes. The sample size was large with a relatively equal distribution of male and female participants. The measurements included were valid and reliable. However, the study did not include an explicit measurement of creativity. Instead, the participants were asked five questions related to creativity from the Hypomanic Personality Scale (HPS) and 69 participants additionally provided written responses about the types of creative activities they perform when having a hypo/manic episode as well as the perceived advantages and disadvantages of their creative activity. This raises the question if the concept of creativity was adequately captured in the assessment. The analysis and reporting of data are complete. All in all, the study has moderate quality.

The qualitative phenomenological interview study of Taylor et al. (2015) investigated the connection between extreme mood and creativity. The study has a very small sample size and does not employ any measures of creativity. The data is collected in interviews and the information is then analyzed by means of Interpretative Phenomenological Analysis (IPA). The data analysis and the reporting of data are complete and transparent. Consequently, the study quality is moderate.

The cohort study by Siwek et al. (2013) assessed the prevalence of BD symptoms among art and technology students. The study has a sufficient sample size, with a comparable number of subjects for the cohort art students and cohort technology students. However, the art student sample is slightly overrepresented by females, while the technology student sample consists of slightly more male participants. This might indicate a general trend of females engaging in more artistic studies and males engaging in more scientific studies and might therefore still be representative of art and technology students. However, the sample is not representative of the whole population. Although the used assessment tools are applied properly in their study, it can be questioned whether the used measurements are sufficient to identify and assess bipolarity features. Therefore, a measurement bias might be present. Furthermore, the study does not have a clear measurement of creativity but assumes that some faculties are more closely related to creativity than others. Consequently, it appears that the researchers do not consider problem-solving and divergent thinking to be part of creativity, since these are probably constructs that are also apparent

in scientific and technological studies. Although this implies that the researchers aimed to examine artistic creativity, they did not give a clear definition of creativity and therefore assessed a rather indirect form of creative capabilities. The results are adequately reported. To conclude, the study exhibits a moderate to poor study quality and the conclusions made might not be representative of the relationship between creativity and bipolarity features.

The cross-sectional study by Miller et al. (2019) investigated the relationship between self-reported creativity and symptoms of depression and mania. The study exhibits a large sample size, but females are overrepresented in the sample (86.4% females). The BD diagnosis of the participants was self-reported and not confirmed via an objective clinical interview and the study did not include a control group to detect differences in creativity levels to non-clinical samples. Therefore, the generalizability of the results is questionable. Apart from that, there does not seem to be any bias in the analysis and reporting of results. Therefore, the quality of the study is moderate to poor, and conclusions should be considered with caution.

The cross-sectional study by Ruiter & Johnson (2015) tested the association of bipolar risk with multiple creativity measures. The study is based on a large convenient sample consisting of undergraduate students that are overrepresented by female participants (67.20%). Therefore, the sample is not representative of the whole population, especially because only a few students would be expected to have severe manic symptoms, which the study aimed to assess. General demographic characteristic data of the sample were not reported so a confounding bias cannot be refuted. Moreover, the researchers applied a cross-sectional design although formal tests of mediation require a longitudinal design. Consequently, the study exhibits moderate to poor quality.

In conclusion, seven out of the 17 selected studies can be considered high-quality studies. The rest of the studies yielded some problems regarding sample size, methodology, or data analysis, which compromises the quality of the studies to some degree.

3.2 Conceptualization and Assessment of Creativity

Indeed, none of the selected studies gave a clear definition of what kind of creativity they are focusing on. Based on the assessment tools that were used (see Table 2 for the summary), it was possible to guess what kind of creativity the researchers intended to focus on. Four studies focused on artistic creativity, three studies on divergent thinking, two on problem-solving, one on cognitive flexibility, and one on both convergent and divergent thinking. The rest of the studies

did not use a specific assessment tool so it remained unclear which definition of creativity they based their study on. The studies of MacCabe et al. (2018), McCraw et al. (2013), Kyga et al. (2013), Siwek et al. (2013), and Taylor et al. (2015) relied on person-based assessment or took the participant's profession as indicative of creativity instead of using a measurement tool of creativity at all. Thirteen different scales in total were used in the other studies to assess creativity. The used scales are described and discussed in the section below.

The Creative Achievement Questionnaire (CAQ; Carson et al., 2005) is a self-report measure of lifetime creative accomplishment in ten domains, which are namely visual arts, music, creative writing, dance, drama, architecture, humor, scientific discovery, invention, and culinary domains. It is a valid and reliable instrument and demonstrates good discriminant validity to IQ, showing that it can be differentiated from intelligence (Carson et al., 2005). Five out of the 17 selected studies used the CAQ to measure creativity, making it the most used assessment tool of creativity in this review.

The Adjective Checklist Creative Personality Scale (ACL-CPS; Gough, 1979) is a self-assessment scale that was used in the study of Ruiter & Johnson (2015). Participants were presented with 30 creative and 30 non-creative adjectives or phrases for which they had to indicate which of those adjectives applied to them. Specific items reflect higher creativity. Higher total points indicate higher creativity. The scale is reliable and has shown to be correlated to other creativity measures (Carson et al., 2005).

The Alternate Uses Test (AUT), also called Unusual Uses Task (UUT; Guilford, 1971) is a test that measures divergent thinking ability that is correlated with the severity of subsyndromal mania (Furnham et al., 2008). During the test, participants must think of many and especially unusual uses for common objects, such as a screwdriver or a sheet of paper. The assessment of the responses and their level of creativity is then based on subjective ratings, which might bias the reliability and validity of the results. To avoid these biases, Silvia et al. (2008) gave instructions and recommendations on the evaluation and rating of the AUT/UUT.

The Creativity Domain Questionnaire-Revised (CDQ-R; Kaufman et al., 2010) measures participants' perceptions about their level of creativity in drama, math/science, arts, and interaction. Participants must rate their creativity based on 21 items on a six-point scale. Silvia et al. (2012) reported high Cronbach's alpha scores among all four domains (from 0.78 to 0.89).

The S-A creativity test (Minds, 1969) is a valid and reliable instrument to measure creativity in the form of divergent thinking (Takeuchi et al., 2010). In this test, participants are asked to generate as many answers as possible to several open-ended questions, which are then scored along the dimensions of fluency, originality, elaboration, and flexibility.

The Remote Associates Test (RAT; Mednick, 1962) does not measure creative thinking directly but rather the capacity to think creatively. Thus, it measures creative convergent thinking. Participants are presented with three words and are asked to find a fourth word that is associated with all the three other stimulus words. Scores are calculated based on the number of correct answers. Results of the study of Lee et al. (2014) show that the RAT measures cognitive processes like those from a variety of other analytical and convergent thinking tests, proving its validity. Furthermore, the RAT shows high to very high reliability scores in terms of parallel test, scoring, and differential reliability (Jellen & Urban, 1989).

The Chinese Word Remote Associates Test (CWRAT; Huang et al., 2012) was used by Tu et al. (2017) in their study. The CWRAT was developed based on the RAT (Mednick, 1962) and is a reliable and valid tool for measuring remote association ability and creative potential (Huang et al., 2012). Participants are presented with three common stimulus words that appear to be unrelated. The participants are then asked to generate a fourth word that is related to the three other words. Scores are then calculated based on the number of correct answers given.

The Delis-Kaplan Executive Functioning System Sorting Test (DKEFS; Delis et al., 2001) was used in the study of Fulford et al. (2013) to measure cognitive flexibility. Participants are asked to sort stimulus cards into groups based on shared semantic or perceptual principles. The number of correct answers constitutes the score, with higher scores reflecting greater cognitive flexibility. The DKEFS Sorting Test shows high construct validity with other measures of cognitive flexibility in clinical samples as well as high reliability (Parmenter et al., 2007).

The Barron Welsh Art Scale (BWAS; Barron, 1963) consists of 86 black and white images that subjects are asked to rate with “like” or “dislike” and is used to assess the subjects’ preference for symmetrical and simple figures or asymmetrical and complex figures. Artists exhibit a greater preference for latter figures. However, BWAS scores are not limited to visual arts, but Barron & Hall (1972) showed that individuals that are creative in other disciplines than arts also score high on the scale since it involves both visual and affective processing and is therefore also connected

to emotionality. Moreover, it measures creative talent unaffected by intelligence, gender, and age (Barron & Hall, 1972).

Gastoli et al. (2017) used the Test of Divergent Feelings (TDF) from the Creativity Assessment Packet (CAP; Williams, 1980) in their study. The test measures an individual's disposition toward problem-solving tasks regarding curiosity, imagination, risk-taking, and complexity via a questionnaire constituted of 50 multiple-choice questions. Williams (1980) stated test-retest reliability of 0.60 of the CAP, indicating an acceptable level of reliability. Concerning the validity of the CAP, Williams (1980) reported correlations between students' test performance and parent and teacher ratings of creativity of 0.59 and 0.67. However, no evidence for the reliability and validity of the TDF specifically is known, which might influence the reliability of the study's results.

Johnson et al. (2015) used the Proclivity for Improvisation Creativity Scale (Hmieleski and Corbett, 2006) in their second study of the article to measure entrepreneurship and creativity in business environments. More specifically, the scale assesses trait-like tendencies to find creative solutions to problems in the workplace. It consists of 9 items on which participants must rate how often they could be described in that way on a scale from 0 to 100. In their study, Johnson et al. (2015) report high internal consistency with an alpha value of .95. Other than that, they do not indicate the reliability or validity of the scale.

The Compound Remote Associates (CRA; Browden & Jung-Beeman, 2003) measures participants' creative insight in problem-solving. It consists of 144 items that are created according to the items in the Remote Associates Test (RAT; Mednick, 1962). Participants are presented with three stimulus words and are asked to generate a fourth word, which, when combined with the other three words, would result in word pairs. In their study, Ruiter & Johnson (2015) did not give any information on the reliability and validity of the assessment tool and there is no information given on the psychometric properties of the test by Browden & Jung-Beeman (2003).

The Abbreviated Torrance Test for Adults (ATTA; Goff & Torrance, 2002) was developed based on the Torrance Tests of Creative Thinking, which measures creative thinking abilities. Tu et al. (2017) used the Chinese version of the ATTA in their study to measure divergent thinking. Participants are asked to generate novel responses to verbal or figurative stimuli. The test is a valid and reliable measurement tool.

3.3 Relationship Between Creativity and Bipolar Disorder

Overall, the 17 studies included in the review show contradictory findings regarding the relationship between creativity and BD, which is consistent with the findings of previous reviews. The findings can be divided into three subsets: studies showing a positive relationship, studies showing no significant relationship, and studies showing a negative relationship. A short summary of the study findings are summarized in Table 3.

3.3.1 Positive Relationship

Kyga et al. (2013) found a significant positive association between bipolar disorder and overall creative professions and can support previous research findings with the finding that authors specifically were associated with BD. Moreover, they can also support the finding that first-degree relatives of patients with BD are more likely to be creative, as indicated by their creative profession, thereby supporting the U-inverted relationship. Accordingly, persons diagnosed with BD and their family members are more likely to choose artistic professions. Likewise, Soeiro et al. (2014) showed a positive relationship between creativity and BD, with lesser degrees of bipolarity being more likely to be associated with creativity, thereby also giving support for the inverted U-relationship between creativity and BD.

Gostoli et al. (2017) give evidence for a significant correlation between creativity and certain features of bipolar disorder. Their results show that having a creative personality is positively associated with cyclothymic traits (such as mood and thinking instability) and hyperthymic ones (higher mood, decreased need for rest, great energy). Johnson, Murray, Hou, Staudenmaier, Freeman, & Michalak (2015) also found a positive relationship between mania risk and creativity, with the additional finding that milder symptoms and family history are advantageous for creativity, indicating an inverted-U relationship between creativity and BD. This finding as well as the inverted U-relationship is supported by Takeuchi et al.'s (2021) results showing that a moderately high genetic risk of BD is associated with high levels of creativity.

Johnson et al. (2016), McCraw et al. (2013) and Taylor et al. (2015) do not give statistical evidence for a positive relationship between creativity and BD but collected data about how participants experienced the relationship and their participants reported similar experiences. Their answers suggest a positive relationship between creativity and BD. The subjects in the study of Johnson et al. (2016) report heightened and intensified creativity levels when having manic

episodes. In the sample of McCraw et al. (2013), 82% of the BD subjects reported being more creative when having hypo/manic states. The subjects who reported enhanced creativity during hypo/mania also reported a more creative personality type in general (McCraw et al., 2013). Consequently, their findings imply that BD does not directly cause creativity but rather helps individuals to express their creativity during hypo/manic episodes. Taylor et al. (2015) show that participants perceive creativity and BD as a dynamic and interdependent relationship.

Regarding the connection between creativity and bipolar disorder vulnerability/risk, MacCabe et al. (2018) found that students of artistic subjects at university are at increased risk for developing BD in adulthood. Similarly, Siwek et al. (2013) reported a positive significant association between artistic talents or creativity and bipolar spectrum disorders.

3.3.2 No significant relationship

Johnson, Tharp, and Holmes (2015) found that manic symptoms were not significantly related to better divergent thinking in BD patients in comparison to healthy controls. In their study, persons diagnosed with BD I, who were in a euthymic period at the time of assessment, did not exhibit a higher mean level of divergent thinking as measured by the AUT/UUT and CAQ. However, the BD group showed more variability in CAQ scores than the control group, suggesting that some but not all individuals diagnosed with BD demonstrate extraordinary creativity levels.

Tu et al. (2017) report no significant differences in the ATTA and CWRAT performances between patients and healthy controls in their study and therefore cannot report a relationship between BD and creative thinking. Fulford et al. (2013) also did not find significant effects of mania risk on creative cognition.

Miller et al. (2019) found that individuals who reported hypo/mania symptoms over the past week did not report significantly higher scores in creativity in any domain compared to those who did not report any symptoms, thereby negating the positive relationship between hypo/mania and creativity. However, they acknowledged the possibility of the inverted U-relationship between creativity and BD, where those with milder hypo/manic symptoms experience an enhanced level of creativity than those at either end of the hypo/mania symptom spectrum. Nevertheless, is their study unable to prove the inverted-U relationship due to the limited range of hypo/mania scores in their sample.

The studies conducted by Burkhardt et al. (2019) and Ruitter & Johnson (2015) display contradictory findings. Burkhardt et al.'s (2019) results show evidence of increased creativity, but not of higher creative achievements, in persons at risk of BD. Ruitter & Johnson (2015) report an association between mania risk and self-reported creative achievement and positive self-ratings of creative abilities but did not find a significant relationship between mania risk and performance on the CRA, which measures creative insight in problem-solving.

3.3.3 Negative relationship

In the study conducted by Hoşgören et al. (2019), BD patients displayed lower performance than the healthy controls in divergent and convergent creativity, thereby presenting evidence for a negative relationship between creativity and BD. However, important to notice is that their sample consisted of only Type-1 bipolar subjects, which might reduce performance in both the AUT and RAT due to more severe symptoms. This finding then gives support for the inverted-U relationship between creativity and BD.

3.4 Underlying Mechanisms

3.4.1 Biological

Soeiro et al. (2013) found that COMT rs4680 (allele Met) had a positive effect on creativity scores in healthy controls but did not in BD. They attribute these differences in results to dysfunctions in the dopaminergic system that characterize BD. Their interpretation of the findings is that creativity is more likely to be associated with lesser degrees of BD symptoms, thereby suggesting an inverted-U relationship between creativity and BD. However, they were not able to statistically give evidence for that inverted- U relationship.

Supporting the inverted-U relationship, the study of Takeuchi et al. (2021) found that a moderate genetic risk of BD is associated with enhanced creativity which is also associated with increased facilitation of the dopaminergic system and activation in the prefrontal cortex. Furthermore, greater BD polygenic risk scores were associated with greater divergent thinking fluency, lower total mood disturbance, and a greater regional grey matter volume in the right inferior frontal gyrus and regional white matter volume in the left middle frontal gyrus. Results show that the BD polygenic risk score was associated with a greater regional white matter volume in the left middle frontal gyrus, which has been suggested to play a central role in the increased

creativity associated with the risk of BD (Takeuchi et al., 2021). Furthermore, Tu et al. (2017) show that the medial prefrontal cortex plays a major and positive role in creative thinking in patients with BD and that patients with BD have different structural correlates of creative thinking in comparison to healthy controls.

Similarly, Hoşgören et al. (2019) report that higher activity in the prefrontal cortex may be the functional neuroanatomical correlate of the low convergent creativity performance in BD in their study. They show a hierarchical postero-anterior dissociation of cortical activity within the lateral surface of the frontal cortex during divergent and convergent creativity. Lower behavioural performance in the index group consisting of BD I subjects in comparison to the control group was associated with higher activity in the anterior prefrontal cortex. The prefrontal cortex is a brain region that is structurally and functionally disturbed among individuals with BD. Thus, higher activity in the anterior prefrontal cortex may be the functional neuro-anatomical correlate of low convergent creativity performance in BD.

3.4.2 Personality characteristics and other

The results of the two studies conducted by Johnson, Murray, Hou, Staudemaier, Freeman & Michalak (2015) show that ambition and creativity are connected among people on the BD spectrum. They found enhanced ambition for fame in highly creative individuals with BD in comparison to a normative sample of people with BD and participants with no mood disorder. Furthermore, ambitions for fame within the creative bipolar sample were associated with higher self-reported creative accomplishment. However, the findings of Study Two show that the link between mania risk and creativity is not completely about ambition and suggest that perhaps other mechanisms such as motivation should be investigated.

Taylor et al. (2015) found that participants perceived their elevated confidence during hypo/manic episodes as the main determinant for their creative accomplishment. Takeuchi et al. (2021) found that mania risk is associated with elevated levels of creativity through idea fluency as a result of good moods.

Ruiter & Johnson (2015) identify high motivation to achieve extrinsically oriented awards as a mediating factor in the link of mania risk with creativity. In their study, highly ambitious goals for creativity mediated the link of mania risk with lifetime creative accomplishments as measured by the CRA. Additionally, they found social dominance motivation, referring to the desire to be

seen positively by others, to be a mediating factor in the relationship between mania and the tendency to consider oneself to be creative.

3.4.3 Mood state

Multiple studies included in the review support previous research that mood affects the relationship between creativity and BD. Miller et al. (2019) found that self-reported creativity was significantly higher among subjects in hypo/manic mood in comparison to depressed BD subjects at the time of assessment and Burkhardt et al. (2019) also show that distinct mood swings highly influenced the relationship between creativity and BD in their sample. They found even higher BWAS mean scores of subjects with hypomanic features of mood swings, such as increased activity and euphoric episodes, than those of subjects with BD and creative controls in previous studies.

Taylor et al. (2015) state that their whole sample perceived shifts in mood as fuelling their creativity by providing flexibility in thinking and reported extreme moods as a source for divergent thinking. Important to notice is that participants also recognized that creativity can be used to regulate their mood and that creativity can mediate mood symptoms in BD. Therefore, the causality of the relationship between creativity and BD remains unclear.

Gostoli et al. (2017) confirm the finding that elevated positive mood might be an important feature that is associated with creativity and BD. They suggest hyperthymic temperament to be the connecting factor between BD vulnerability and creativity by both sharing the same biological susceptibility, namely the tendency toward transient disinhibition.

Siwek et al. (2013) found that art students are more prone to experiencing mood changes, suggesting that mood might be a mediator of the found significant relationship between creativity and BD in art students.

4. Discussion

The systematic review aimed to assess the current state of the art in the relationship between creativity and bipolar disorder as well as the conditions and underlying mechanisms under which creativity correlates with BD. The review was based on the discrepancy of results regarding the relationship of creativity with BD. Furthermore, it was criticized that creativity research and especially the research on the relationship between creativity and psychopathologies are biased

due to problems and mistakes in sampling, methodology, and the presentation of results and conclusions.

4.1 Main Findings

Based on the reviewed articles, it is not possible due to contradictory findings to give one clear answer to the first research question of whether a relationship between creativity and bipolar disorder exists and of what kind of nature this relationship is. Only two studies found direct support for a linear positive relationship between creativity and BD, eight studies found evidence for a positive relationship between bipolar vulnerability/risk and creativity, six studies give contradictory findings or did not find a relationship, and one study found a negative relationship between creativity, measured as divergent and convergent thinking, and BD.

The findings of the review show that, overall, lesser degrees of bipolarity are correlated with higher creativity levels and that first-degree relatives are more likely than BD patients to be creative. Thus, the findings of the studies indicate that a link between creativity and BD in form of an inverted-U relationship exists. In most studies, this was not directly found but this follows indirectly from making inferences based on their results. For instance, the negative relationship between BD and divergent and convergent thinking found by Hoşgören et al. (2019) is a finding from which support for the inverted-U relationship can be inferred because their sample consisted of only Type-1 bipolar subjects, who exhibit more severe symptoms that are more likely to interfere with their cognitive abilities and creativity than Type-2 bipolar patients. Thus, their performance in the AUT and RAT might be reduced due to the expression of more severe symptoms. Presumably, their findings might also be an indication of a reversed negative causation, in a way that severe BD leads to decreases in divergent and convergent thinking. Another factor that possibly affected the relationship between creativity and BD in this sample was the use of medication among the subjects. 21 of the 31 participants in this study took lithium and lithium is associated with decreased creativity performance (Andreasen & Glick, 1988), which might have been the case in this study as well.

Furthermore, the findings of Burkhardt et al. (2019) that persons at-risk of BD show increased creativity but not higher creative achievements might be explained by social and socioeconomic factors. For instance, Carson et al. (2005) showed that creative achievements are not only dependent on factors such as creativity, talent, cognitive abilities, personality, and

motivation, but also factors such as familial and institutional support as well as economic security. Therefore, the findings of Burkhardt et al. (2019) indicate that persons at-risk for BD might have high innate creativity that does not necessarily lead to recognized creative output due to external influences such as economic and familial status.

Especially the longitudinal research designs suggest a causal relationship between creativity and BD, thereby giving primarily support for the linear positive relationship between BD and creativity, such as in the study of Kyga et al. (2013). However, the issue of causation makes the interpretation of results and the establishment of the nature of the relationship between creativity and BD difficult. On the one hand, there might exist inverse causation, also called the Sylvia Plath effect, in which BD originates from creative endeavors (Kaufman, 2001). Accordingly, Kaufman (2001) suggests that especially creative writing increases the risk for mood disorders. Moreover, many creative professions have attributes that may increase the risk of symptoms for people diagnosed with BD, such as high levels of stress, alcohol and substance use/abuse, irregular sleep and activity schedules, and extremes of goal achievement on the one side and frustration on the other side (Murray & Johnson, 2010). Thus, students such as in the study of Kyga et al. (2013) might develop a risk for BD due to their creative studies.

On the other hand, there might be reverse causation in which the career choices of people diagnosed with BD may be influenced by the disorder itself. For instance, the creative occupation as an artist or musician may be used as a form of therapy for the individual itself (Murray & Johnson, 2010), or creative occupations, in general, might be more compatible with BD than an ordinary nine-to-five job. Thus, the causation issue is yet to be addressed because the BD symptoms may have influenced the decision to pursue an artistic occupation or study, even if university courses are usually completed before the onset or diagnosis of BD.

Furthermore, the causality issue of BD and creativity might also explain the inverted-U relationship. As established before, creativity might lead to the development of BD and when BD symptoms become more severe, this, in turn, might block and inhibit creative performance. Thus, there might be a positive association between creativity and BD until up to a certain threshold of symptom severity. Then, the causality would change into a negative association.

Regarding the second research question about the underlying mechanisms and conditions of the relationship between creativity and BD, both biological mechanisms and mechanisms regarding personality characteristics were identified. Biological mechanisms include dysfunctions

in the dopaminergic system among people diagnosed with BD as well as differences in the activity of the prefrontal cortex between BD subjects and healthy controls. These findings are consistent with prior research. For instance, Soeiro-de-Souza et al. (2011) found that the putative hyperdopaminergic state of mania links creativity and BD.

Regarding personality characteristics, the review shows that ambition, extrinsic motivation, and elevated confidence, were mechanisms affecting the relationship between creativity and BD, which are also mechanisms that were identified in prior research (Murray & Johnson, 2010).

Mood state, and especially positive affect, was proven to be an important mediator in the relationship between creativity and BD in this review. This finding is consistent with previous findings that mood appears to be the most significant factor linking creativity and BD (Srivastava et al, 2010). Fulford et al. (2013) identified the interaction between a hypomanic personality style and positive affect as a predictor for cognitive flexibility, which is a core element of the creativity process. They found that without a mood induction, people that are at risk for developing mania may underperform on measures of cognitive flexibility. Thus, people that are at risk for mania may underperform in measures of creative cognition when they are not in a positive mood, emphasizing the significance of mood for the relationship between creativity and BD. Furthermore, their findings are consistent with prior studies showing that without a mood induction, participants showed deficits in cognitive flexibility (Clark et al., 2005; Dickstein et al., 2007).

4.2 Unanticipated Findings

It became apparent that problems and mistakes in sampling and methodology remain issues in recent creativity research, thereby giving support for previous criticism. The studies of the past ten years face similar challenges as identified in Johnson et al.'s (2012) literature review, since 10 out of the 17 included studies in this review showed problems in sampling or methodology, thereby affecting the reliability of the results of the research. Even though issues in sampling and methodology were evident in this review, all the 17 included studies presented their results and conclusions adequately.

This review also shows that there is a lack of a clear and explicit definition of creativity, being the main issue in creativity research. Creativity is a multifaceted construct and is therefore based on a multitude of definitions and theories. Consequently, creativity is assessed in many

ways. Without an explicit definition of creativity, measuring and fully capturing creativity becomes an almost impossible task. BD is correlated with creativity across multiple domains, but it is more correlated with artistic creativity than scientific creative achievement (Simonton, 2009), which might be a reason for the diversity in results. All the 17 selected studies of the literature review oversaw the importance of providing an explicit definition of creativity, which constitutes a major problem for creativity research. Consistent with this is the finding of Plucker et al.'s (2004) content analysis that only 34% of articles published in two major creativity research journals gave an explicit definition of creativity.

However, a unitary definition for such a multifaceted construct as creativity would mean that not all forms of creativity will be recognized, which would in return cause the encouragement of only the one right way of being creative. Accordingly, Glăveanu (2018) proposed a few questions that creativity research should focus on, such as what the definitions of creativity imply, and which facets of creativity are recognized or ignored in each creativity definition. Researchers also need to consider what the definition and the corresponding measurement tools they use in their research mean in practice.

4.3 Limitations

One major limitation of the literature review concerns the literature search. Firstly, the literature search is not exhaustive because no alternative search terms, synonyms, related words, or broader search terms were identified to keep the number of search hits manageable, thereby limiting the number of hits in the different databases. Secondly, the search did not include search terms for the underlying mechanisms of the relationship between creativity and bipolar disorder because that would have exceeded the scope of the research. Future research should try to make the literature search more exhaustive by including synonyms such as “bipolar illness” or “bipolar spectrum disorders” and other synonyms in the search query.

Next, this review is based on the literature search from only one researcher and consequently does not exhibit any interrater reliability. Interrater reliability in reviews enhances their quality to a great extent (Bornmann et al., 2010). Consequently, future research should consider conducting such a review with multiple researchers to enhance the review's overall expressive power and quality.

Another limitation is the small final sample of included records in the review. The exclusion of literature based on language or restricted access limits the transparency of the available research on the relationship between creativity and BD. The option that potentially valuable records were not included in the review limits the reliability of the results to a great extent.

The last limitation concerns the quality of the included studies in the review. The study quality was assessed at the end of the study instead of before including them in the review, which decreases the overall quality of this review. However, the quality assessment at the end allowed for a real representation of the currently available research on the relationship between creativity and BD. Furthermore, the study quality was not sufficiently acknowledged in the results and discussion section because the review did not consider the quality differences between studies. Thus, the results of the articles were almost equally weighted in the results section and the hierarchy of study quality was not considered so the conclusions drawn in this review might be biased.

4.4 Suggestions for Future Research

Based on the results of this review, I believe that further research on the link and especially the type of relationship between creativity and BD is important and necessary. A few of the reviewed studies suggest that milder symptoms have a larger effect on creativity than more severe symptoms as in BD I. Other studies showed that creativity levels are enhanced in first-degree relatives of BD patients and in individuals that are at risk for BD but do not experience full-blown hypo/manic episodes. Thus, the exact nature of the relationship between creativity and BD remains yet to be established, emphasizing the need for future research.

It happens to be the case that people suffering from BD believe that their creativity stems from their manic episodes, which may influence their decision for treatment seeking or medication adherence. Johnson and Fulford (2008) found nonadherence to medication and specifically to lithium to protect creativity in individuals diagnosed with BD. Thus, the causality issue between creativity and BD needs to be investigated further, which could have a huge impact on the treatment of BD. Moreover, the multitude of possible factors affecting the relationship between BD and creativity, there is reason to suggest that creativity may change/shift throughout the disorder due to fluctuations for instance in mood or symptoms or medication intake. Thus, research on the link between creativity and BD should give special attention to variability within BD,

medication profiles, personality characteristics, and comorbid conditions, since these are all possible determinants of the relationship between creativity and BD. To disentangle these effects, longitudinal research is necessary.

Lastly, I believe future research should try to develop a multifaceted, multimodal assessment system to measure creativity, as proposed by Batey and Furnham (2008). Therefore, future studies should include multiple instruments and measures of creativity to get a complete assessment of the complex construct of creativity.

5. Conclusion

Despite some contradictory findings, the results of the review imply that the link between creativity and BD follows an inverted U-relationship. However, more longitudinal research is required to be able to draw adequate conclusions about the causality of this relationship. To be more precise, longitudinal research designs can be used to determine whether creativity leads to the development of BD or whether BD elicits creativity in the first place up until a certain threshold until the symptoms inhibit creativity. Furthermore, the review identified dysfunctions in the dopaminergic system among people diagnosed with BD as well as activity of the prefrontal cortex as biological mechanisms underlying the relationship between BD and creativity. Other underlying mechanisms that the review identified are ambition, extrinsic motivation, and elevated confidence, and mood state, especially positive affect. The heterogeneity in the results of the studies and the connected difficulty to draw a comprehensive conclusion about the relationship between creativity and BD results from a lack of a clear definition of creativity along with uncoherent creativity assessments among the different studies.

Table 3

Review of Results Concerning the Relationship between Creativity and Bipolar Disorder Ordered by Study Quality

Author/Date	Conceptualization of Creativity	Conclusions	Limitations
MacCabe, J. H., Sariaslan, A., Almqvist, C., Lichtenstein, P., Larsson, H., & Kyaga, S. (2018).	Artistic creativity	The association with mental illness for core creative subjects supports the idea that mental disorder is associated with creativity in general. The results show that students of artistic subjects at university are at increased risk of developing schizophrenia, bipolar disorder and unipolar depression in adulthood.	Studying an artistic subject may not capture the attributes of originality or external endorsement that are often seen as central to creativity. The sibling-comparison approach increases measurement error, which generally attenuates the effect sizes. Using occupation as the exposure is problematic because the career choices of people with mental disorders may be influenced by the disorder itself: Subclinical psychotic symptoms or abnormal mood states may have influenced the decision to pursue artistic studies.
Soeiro-de-Souza, M. G., Post, R., Machado-Vieira, R., do Prado, C. M., Moreno, R. A., Akiskal, H., & Akiskal, K. K. (2014).	No definition given, but the assessment tools used indicate that artistic creativity is researched	The COMT Met allele positively influenced creativity scores in healthy controls but not in BD subjects during mood episodes and euthymia. However, there was a significant relationship between euthymia and mania and creativity. Thus, there is support for a positive relationship between creativity and bipolar disorder. However, the results show that creativity is more likely to be associated with lesser degrees of bipolarity.	The conclusion are only based on the BWAS. The control group presented higher IQ scores. The euthymic group was under medication use.

<p>Takeuchi, H., Kimura, R., Tomita, H., Taki, Y., Kikuchi, Y., Ono, C., . . . Kawashima, R. (2021).</p>	<p>No clear definition was given but measurement tools indicate that divergent thinking in form of fluency, originality, elaboration, and flexibility is being measured</p>	<p>Results show that a moderately high genetic risk of BD is associated with high levels of creativity through greater idea fluency through good moods. Neuroimaging analyses revealed that the BD-PRS was associated with a greater rWMV in the left middle frontal gyrus, which has been suggested to play a central role in the increased creativity associated with the risk of BD with creativity. These findings suggest a relationship between the genetic risk of BD and creativity measured by divergent thinking and prefrontal cortical structures among young educated individuals. However, the study does not investigate the direct relationship between creativity and bipolar disorder.</p>	<p>There is questionable generalizability of results due to study sample that consisted of university students: It has been suggested that above-average intelligence is necessary, albeit not sufficient, for higher creativity. No participants diagnosed with BD.</p>
<p>Tu, P.-C., Kuan, Y.-H., Li, C.-T., & Su, T.-P. (2017).</p>	<p>Divergent thinking</p>	<p>The findings indicate that medial prefrontal cortex plays a major and positive role in creative thinking in patients with BD. By contrary, creative thinking involves more diverse structures, and the prefrontal cortex may have an opposite effect in HCs. There was no significant difference in the ATTA and CWRAT performance between BD patients and HCs in this study. Consequently, the behavioral results do not support that patients with BD have higher performance of creative thinking.</p>	<p>The BD participants in this study were receiving various dosages of antipsychotics, antidepressants and mood stabilizer, which were all found to modulate GMV in previous VBM studies. The method did not measure brain function directly.</p>

<p>Hoşgören Alici, Y., Devrimci Özgüven, H., Kale, E., Yenihayat, I., & Baskak, B. (2019).</p>	<p>Creativity as being constituted of convergent and divergent thinking</p>	<p>The study confirmed previous models that suggested a hierarchical posteroanterior dissociation of cortical activity within the lateral surface of the frontal cortex during two different creativity domains in two groups. However, the results do not show a higher creative performance in subjects with BD: patients displayed lower performance than healthy control subjects in divergence and convergence measures of creativity. Therefore, the study offers support against the relationship between creativity and bipolar disorder.</p>	<p>The sample consisted of subjects with remitted BD so that the results may not be generalized to all subjects with BD. Creativity is represented by a broader network including some brain regions that were not investigated in this study. The index group was older, had a lower educational level, and lower IQ and ACT scores compared to the control group.</p>
<p>Johnson, S. L., Tharp, J. A., & Holmes, M. K. (2015).</p>	<p>Divergent thinking</p>	<p>Persons diagnosed with BD I did not evidence a higher mean level of creative cognition across any of the UUT indices. The mean level of lifetime creative accomplishment was not higher in the bipolar group than in the control group. Consequently, manic symptoms were not significantly related to better divergent thinking.</p>	<p>No inclusion of visual tasks, real-world problem-solving, insight, or multiple cognitive processes relevant to divergent thinking.</p>
<p>Fulford, D., Feldman, G., Tabak, B. A., McGillicuddy, M., & Johnson, S. L. (2013).</p>	<p>focus is on cognitive flexibility as a precursor of creativity Creativity has been defined as</p>	<p>Findings suggest a mood-dependent link between hypomanic personality and one potential component of creative cognition. The results suggest that the interaction between hypomania and positive affect may contribute to creative cognition. However, there were no direct effects of mania risk on creative cognition in this nonclinical sample.</p>	<p>The participants were aware that the goal was to improve their mood, which might have affected the validity of the induction and the sample size was small. Current hypomanic symptoms were not measured and the study examined only one theorized element of cognitive processes associated with creativity: cognitive flexibility, and did not</p>

	divergent thinking leading to both original and adaptive ideas that are novel, useful, and appropriate to a given situation	Therefore, the relationship between creativity and bipolar disorder is not supported in this study.	measure a battery of creativity precursors nor lifetime creative achievement. The links between manic vulnerability and creative thinking may not necessarily translate into an ability to realize creative achievements.
Kyaga, S., Landen, M., Boman, M., Hultman, C. M., Langstrom, N., & Lichtenstein, P. (2013).	Pro-c for “individuals who are professional creators, but have not reached eminent status”	Results show a positive association between bipolar disorder and overall creative professions. Moreover, the results show a familial association with overall creative professions for bipolar disorder. The findings show that associations to creativity peak in first-degree relatives of patients with BD rather than in the patients themselves. Therefore, the study gives support for the link between creativity and bipolar disorder.	There was no direct measurement tool for creativity used. Instead, researchers used scientific and artistic occupations as a proxy for creativity. The index group had higher rates of missing data than the control group. Different diagnostic systems were used throughout the study.
Johnson, S. L., Murray, G., Hou, S., Staudenmaier, P. J., Freeman, M. A., & Michalak, E. E. (2015).	Artistic creativity and improvisation	<p>Study 1: WASSUP scores were significantly elevated compared to normative levels in BD, and WASSUP scores were correlated with lifetime creative accomplishment within the artistic sample.</p> <p>Study 2: Mania risk was related to greater ambition and creativity, and ambition was also directly related to greater creativity.</p> <p>Results show that milder symptoms and family history are advantageous for creativity. The study gives support for the</p>	Study 1 relied on a single creativity measure and neglect of other forms of creativity. Furthermore, there was a lack of control over mood state and the sample was too small to examine the influence of the severity levels on relative creative accomplishment. Study 2 used a single self-report measure of ambition and mania risk was solely studied by subsyndromal symptoms.

		positive relationship between mania risk and creativity.	
Gostoli, S., Cerini, V., Piolanti, A., & Rafanelli, C. (2017).	An individual's disposition towards problem-solving tasks (creativity as being constituted of curiosity, imagination, risk-taking, and complexity)	Positive significant correlation between creativity and certain features of bipolar disorder vulnerability: Having a creative personality was positively linked with cyclothymic traits (such as mood and thinking instability) and hyperthymic ones (higher mood, decreased need of rest, great energy). Hyperthymic temperament seems to be the connecting factor between bipolar disorder vulnerability, creativity, and psychological well-being.	There was a volunteer composition of the sample and a use of self-report measures to evaluate risk of psychopathology and creativity. There was no consensus on how to properly assess creativity.
Burkhardt, E., Pfennig, A., Breitling, G., Pfeiffer, S., Sauer, C., Bechdorf, A., . . . Leopold, K. (2019)	No clear definition given	There is evidence of increased creativity, but not of higher creative achievements, in persons at-risk of bipolar disorder. Persons at-risk for BD might have a high innate creativity that does not necessarily lead to recognized creative output. However, the study does not prove a positive relationship between creativity and bipolar disorder.	The sample of clients with a history of a depressive syndrome represents one subgroup of the BD at-risk population. Thus, findings cannot be generalized for the population of help-seeking young people. The study had a small sample size and quantifying creativity is controversial, even though BWAS and CAQ have proven good reliability and address different aspects of creativity.
Johnson, S. L., Moezpoor, M., Murray, G., Hole, R., Barnes, S. J.,	No clear definition of creativity given but the recruitment of participants centered around creative people	The study was unable to prove the relationship between bipolar disorder, its mood states, its treatments and creativity and solely discussed pros and cons of manic energy, benefits of altered thinking, the relationship between creativity and	The study had a small sample size and the recruitment was based on self-identification of BD diagnosis and creativity. Findings are based on the views of highly motivated, highly creative sample and may not be generalizable to all individuals with BD.

<p>& Michalak, E. E. (2016).</p>	<p>such as musicians, artists, writers, performers, and designers, suggesting that the authors take artistic creativity as a reference</p>	<p>medication creativity as central to one's identity with BD, and the importance of creativity in reducing stigma and improving treatment.</p>	<p>There was no measurement of creativity and psychopathology and no control group.</p>
<p>McCraw, S., Parker, G., Fletcher, K., & Friend, P. (2013).</p>	<p>None given → subjects could decide by themselves what they consider to be creative</p>	<p>Results imply that BP disorder does not directly cause creativity, but rather individuals so inclined toward being creative experience may simply have an enhanced drive to express these traits and abilities when in a hypo/manic state. Thus, a BP high will not spontaneously induce creativity in a person but may allow creative individuals to fully express their inherent capabilities.</p>	<p>The patients' self-reported likelihood of engaging in different types of creative activities, their ideas or work were not judged for novelty, quality and originality as against productivity so that the degree to which the subjects truly possessed the ability to transcend traditional ideas and create meaningful new ideas is uncertain. Furthermore, patients with bipolar disorder often become more grandiose in their reporting when hypo/ manic. However, most patients were depressed at the time of reporting. Therefore, if a mood bias were present, it would be more likely to influence the patients in the way of underreporting their creative talents rather than overrating them. No determination of the impact of current mood state on responses, which may have biased patient's responses. Lack of non- bipolar group of creative controls within the study design for comparison purposes.</p>

Taylor, K., Fletcher, I., & Lobban, F. (2015).	Artistic creativity	Participants' perceptions demonstrate a dynamic and interdependent relationship between extreme moods and creative thoughts and activities, such as increased motivation and divergent thinking. Shifting alternate mood states fuelled the creative process by offering them flexibility of thought and contrasting perspectives to generate original ideas. However, the study does not offer statistical evidence for the relationship between creativity and bipolar disorder.	The participants were self-selecting and no measurement of creativity was used.
Siwek, M., Dudek, D., Arciszewska, A., Filar, D., Rybicka, M., Cieciora, A., & Pilecki, M. W. (2013).	No clear definition is given	The prevalence of bipolarity features in art students along with higher rates of mood swings, mental health service utilization, and the more widespread use of psychotropic medications or psychoactive substances, indicate a significant association between artistic talents or creativity and the bipolar spectrum disorders.	Study assumed that some faculties are more closely related to creativity than others. Thus, only certain features exhibited by the students of arts or technology were analyzed, rather than expressions of creativity themselves. Thus, there was an indirect analysis of creative capabilities. Furthermore, the focus was on soft bipolar features instead of the clinical (full-blown) forms of BD.
Miller, N., Perich, T., & Meade, T. (2019).	No clear definition is given	Those reporting symptoms of depression over the past week reported significantly lower scores on the creativity measure than all other participants. However, those who reported hypo/mania symptoms over the past week did not report significantly higher scores in creativity on any domain compared to those who did not report any symptoms. Consequently, the study offers no support for	The cross-sectional design limits conclusions regarding causal inference. BD diagnoses were self-reported and not confirmed via objective clinical interview. The sample consisted predominantly of females and mood state was determined via self-report. There was no control group, limiting comparisons. Self-reports scales were chosen

Ruiter, M., & Johnson, S. L. (2015)	No clear definition is given, but the measurement tools indicate that creativity in the form of problem-solving was assessed.	<p>the relationship between hypo/mania and creativity and therefore negates the relationship.</p> <p>Results show that mania risk is associated with self-reported creative achievement and positive self-ratings of creative abilities. However, mania risk was not significantly related to performance on the CRA (test to measure creative insight in problem-solving) and therefore, the study presents contradictory findings to draw an adequate conclusion about the relationship between creativity and bipolar disorder. Creativity findings have seemed strongest for those with less severe forms of the bipolar disorder and those at risk. Results show that mania risk relates to high motivation to achieve extrinsically oriented rewards, to a desire to attain recognition and respect from others, and to high ambitions for creative accomplishment. Therefore, highly ambitious goals for creativity not only predicted lifetime creative accomplishments, but statistically mediated the link of mania risk with this outcome.</p>	<p>to better understand the subjective experience of creativity in BD populations.</p> <p>The insight task only measured creative insight in problem-solving but was unrelated to other creativity measures. There is no evidence that experimental manipulation of extrinsic motivation in the insight task was effective. The focus was on mania risk measure rather than diagnosis. The cross-sectional design limits evidence because formal tests of mediation require a longitudinal design.</p>
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References

- Acar, S., & Runco, M. A. (2012). Psychoticism and creativity: A meta-analytic review. *Psychology of Aesthetics, Creativity, and the Arts*, 6(4), 341–350. <https://doi.org/10.1037/a0027497>
- Acar, S., & Sen, S. (2013). A multilevel meta-analysis of the relationship between creativity and schizotypy. *Psychology of Aesthetics, Creativity, and the Arts*, 7(3), 214–228. <https://doi.org/10.1037/a0031975>
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, 39(5), 1154–1184. <https://doi.org/10.5465/256995>
- American Psychiatric Association. (2013). Bipolar and related disorders. In *Diagnostic and statistical manual of mental disorders* (5th ed.). <https://doi-org.ezproxy.frederick.edu/10.1176/appi.books.9780890425596.dsm03>
- Andreasen, N.C. (1987). Creativity and mental illness: Prevalence rates in writers and their first-degree relatives. (1987). *American Journal of Psychiatry*, 144(10), 1288–1292. <https://doi.org/10.1176/ajp.144.10.1288>
- Andreasen, N. C., & Glick, I. D. (1988). Bipolar affective disorder and creativity: Implications and clinical management. *Comprehensive Psychiatry*, 29(3), 207–217. [https://doi.org/10.1016/0010-440x\(88\)90044-2](https://doi.org/10.1016/0010-440x(88)90044-2)
- Andreasen, N. C. (2008). The relationship between creativity and mood disorders. Dialogues in *Clinical Neuroscience*, 10(2), 251–255. <https://doi.org/10.31887/dcns.2008.10.2/ncandreasen>
- Angst, J., Gamma, A., Benazzi, F., Ajdacic, V., Eich, D., & Rössler, W. (2003). Toward a re-definition of subthreshold bipolarity: Epidemiology and proposed criteria for Bipolar-II, minor bipolar disorders and hypomania. *Journal of Affective Disorders*, 73(1-2), 133–146. [https://doi.org/10.1016/s0165-0327\(02\)00322-1](https://doi.org/10.1016/s0165-0327(02)00322-1)
- Barbot, B. (2011). Assessing creativity in the classroom. *The Open Education Journal*, 4(1), 58–66. <https://doi.org/10.2174/1874920801104010058>
- Batey, M., & Furnham, A. (2008). The relationship between measures of creativity and Schizotypy. *Personality and Individual Differences*, 45(8), 816–821. <https://doi.org/10.1016/j.paid.2008.08.014>
- Barron, F. (1963). Barron–Welsh Art Scale, A Portion of the Welsh Figure Preference Test. *PaloAlto, CA: ConsultingPsychologistsPress*.
- Barron, F., & Hall, W. B. (1972). *Artists in the making*. Seminar Pr.

- Benjamin, J., Li, L., Patterson, C., Greenberg, B. D., Murphy, D. L., & Hamer, D. H. (1996). Population and Familial Association between the D4 dopamine receptor gene and measures of novelty seeking. *Nature Genetics*, *12*(1), 81–84. <https://doi.org/10.1038/ng0196-81>
- Berk, M., & Dodd, S. (2005). Bipolar II disorder: A Review. *Bipolar Disorders*, *7*(1), 11–21. <https://doi.org/10.1111/j.1399-5618.2004.00152.x>
- Berk, M., Dodd, S., Kauer-Sant'Anna, M., Malhi, G. S., Bourin, M., Kapczinski, F., & Norman, T. (2007). Dopamine dysregulation syndrome: Implications for a dopamine hypothesis of bipolar disorder. *Acta Psychiatrica Scandinavica*, *116*(s434), 41–49. <https://doi.org/10.1111/j.1600-0447.2007.01058.x>
- Bornmann, L., Mutz, R., & Daniel, H.-D. (2010). A reliability-generalization study of journal peer reviews: A multilevel meta-analysis of inter-rater reliability and its determinants. *PLoS ONE*, *5*(12). <https://doi.org/10.1371/journal.pone.0014331>
- Bowden, E. M., & Jung-Beeman, M. (2003). Normative data for 144 compound remote associate problems. *Behavior Research Methods, Instruments, & Computers*, *35*(4), 634–639. <https://doi.org/10.3758/bf03195543>
- Bowins, B. (2008). Hypomania: A depressive inhibition override defense mechanism. *Journal of Affective Disorders*, *109*(3), 221–232. <https://doi.org/10.1016/j.jad.2008.01.028>
- Burkhardt, E., Pfennig, A., Breitling, G., Pfeiffer, S., Sauer, C., Bechdorf, A., . . . Leopold, K. (2019). Creativity in persons at-risk for bipolar disorder-A pilot study. *Early Intervention in Psychiatry*, *13*(5), 1165-1172. doi:10.1111/eip.12748
- Carson, S. H., Peterson, J. B., & Higgins, D. M. (2005). Reliability, validity, and Factor Structure of the creative achievement questionnaire. *Creativity Research Journal*, *17*(1), 37–50. https://doi.org/10.1207/s15326934crj1701_4
- Carson, S.H. (2011). Creativity and psychopathology: A shared vulnerability model. *The Canadian Journal of Psychiatry*, *56*, 144– 153. <https://doi.org/10.1177/070674371105600304>
- Chang, K., Simeonova, D., Strong, C., & Ketter, T. (2005). Creativity in familial bipolar disorder. *Journal of Psychiatric Research*, *39*(6), 623–631. <https://doi.org/10.1016/j.jpsychires.2005.01.005>
- Clark, L., Sarna, A., & Goodwin, G. M. (2005). Impairment of executive function but not memory in first-degree relatives of patients with bipolar I disorder and in euthymic patients with Unipolar Depression. *American Journal of Psychiatry*, *162*(10), 1980–1982. <https://doi.org/10.1176/appi.ajp.162.10.1980>
- Cropley, A. J. (1967). Creativity. Longman.

- Csikszentmihalyi, M. (1996). On Runco's problem finding, problem solving, and creativity. *Creativity Research Journal*, 9(2-3), 267–268. <https://doi.org/10.1080/10400419.1996.9651177>
- Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). Delis-Kaplan Executive Function System. *PsycTESTS Dataset*. <https://doi.org/10.1037/t15082-000>
- Dickstein, D., Nelson, E., McClure, E., Grimley, M., Knopf, L., Brotman, M., et al. (2007). Cognitive flexibility in phenotypes of pediatric bipolar disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46(3), 341–355. <https://doi.org/10.1097/chi.0b013e31802d0b3d>
- Eysenck, H. J. (1988). Personality, stress and cancer: Prediction and prophylaxis. *British Journal of Medical Psychology*, 61(1), 57–75. <https://doi.org/10.1111/j.2044-8341.1988.tb02765.x>
- Folkman, S., Moskowitz, J. T., Ozer, E. M., & Park, C. L. (1997). Positive meaningful events and coping in the context of HIV/AIDS. *Coping with Chronic Stress*, 293–314. https://doi.org/10.1007/978-1-4757-9862-3_11
- Fulford, D., Feldman, G., Tabak, B. A., McGillicuddy, M., & Johnson, S. L. (2013). Positive affect enhances the Association of Hypomanic Personality and cognitive flexibility. *International Journal of Cognitive Therapy*, 6(1), 1–16. <https://doi.org/10.1521/ijct.2013.6.1.1>
- Furnham, A., Batey, M., Anand, K., & Manfield, J. (2008). Personality, hypomania, intelligence and creativity. *Personality and Individual Differences*, 44(5), 1060–1069. <https://doi.org/10.1016/j.paid.2007.10.035>
- Getzels, J. W., & Jackson, P. W. (1962). Creativity and intelligence: Explorations with gifted students. *AAUP Bulletin*, 48(2), 186. <https://doi.org/10.2307/40223437>
- Glăveanu, V. P. (2018). Educating which creativity? *Thinking Skills and Creativity*, 27, 25–32. <https://doi.org/10.1016/j.tsc.2017.11.006>
- Goff, K., & Torrance, E. P. (2002). *Abbreviated Torrance Test for Adults manual*. Bensenville, IL: Scholastic Testing Service, Inc.
- 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. doi:10.1080/10400419.2017.1263511
- Gough, H. G. (1979). A creative personality scale for the adjective check list. *Journal of Personality and Social Psychology*, 37(8), 1398–1405. <https://doi.org/10.1037/0022-3514.37.8.1398>
- Guilford, J. P. (1971). *The nature of human intelligence*. McGraw-Hill.

- Hmieleski, K. M., & Corbett, A. C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. *Journal of Small Business Management*, 44(1), 45–63. <https://doi.org/10.1111/j.1540-627x.2006.00153.x>
- Hosgoren Alici, Y., Devrimci Ozguven, H., Kale, E., Yenihayat, I., & Baskak, B. (2019). Prefrontal activity measured by functional near infrared spectroscopy during divergent and convergent thinking in bipolar disorder". *Archives of Neuropsychiatry*. <https://doi.org/10.29399/npa.23203>
- Huang, P.S., Chen, H.C., & Liu, C.H., 2012. The development of chinese word remote associates test for college students. *Psychol. Test*. 59, 581–607.
- Jamison, K. R. (1989). Mood disorders and patterns of creativity in British writers and artists. *Psychiatry*, 52(2), 125–134. <https://doi.org/10.1080/00332747.1989.11024436>
- Jamison, K. R., Gerner, R. H., Hammen, C., & Padesky, C. (1980). Clouds and silver linings: Positive experiences associated with primary affective disorders. *American Journal of Psychiatry*, 137(2), 198–202. <https://doi.org/10.1176/ajp.137.2.198>
- Jellen, H. G., & Urban, K. K. (1989). Assessing creative potential world-wide: The first cross-cultural application of the test for creative thinking—drawing production (TCT-DP). *Gifted Education International*, 6(2), 78–86. <https://doi.org/10.1177/026142948900600204>
- Johnson, S. L., Moezpoor, M., Murray, G., Hole, R., Barnes, S. J., & Michalak, E. E. (2016). Creativity and Bipolar Disorder: Igniting a Dialogue. *Qualitative Health Research*, 26(1), 32–40. doi:10.1177/1049732315578403
- Johnson, S. L., Murray, G., Fredrickson, B., Youngstrom, E. A., Hinshaw, S., Bass, J. M., Deckersbach, T., Schooler, J., & Salloum, I. (2012). Creativity and bipolar disorder: Touched by fire or burning with questions? *Clinical Psychology Review*, 32(1), 1–12. <https://doi.org/10.1016/j.cpr.2011.10.001>
- Johnson, S. L., Murray, G., Hou, S., Staudenmaier, P. J., Freeman, M. A., & Michalak, E. E. (2015). Creativity is linked to ambition across the bipolar spectrum. *Journal of Affective Disorders*, 178, 160–164. doi:10.1016/j.jad.2015.02.021
- Johnson, S. L., Tharp, J. A., & Holmes, M. K. (2015). Understanding Creativity in Bipolar I Disorder. *Psychology of Aesthetics Creativity and the Arts*, 9(3), 319–327. doi:10.1037/a0038852
- Kharkhurin, A. V. (2017). Does the eye of the beholder construct beauty? contributions of self-efficacy factors to divergent thinking traits. *Creativity Research Journal*, 29(4), 370–376. <https://doi.org/10.1080/10400419.2017.1376493>

- Kaufman, J. (2001). The sylvia plath effect: Mental illness in eminent creative writers. *The Journal of Creative Behavior*, 35(1), 37–50. <https://doi.org/10.1002/j.2162-6057.2001.tb01220.x>
- Kaufman, J. C., & Beghetto, R. A. (2009). Beyond big and little: The Four C model of creativity. *Review of General Psychology*, 13(1), 1–12. <https://doi.org/10.1037/a0013688>
- Kaufman, J. C., Waterstreet, M. A., Ailabouni, H. S., Whitcomb, H. J., Roe, A. K., & Riggs, M. (2010). Personality and Self-Perceptions of Creativity across Domains. *Imagination, Cognition and Personality*, 29(3), 193–209. <https://doi.org/10.2190/IC.29.3.c>
- Kinney, D. K., & Richards, R. L. (2007). Artistic Creativity and Affective Disorders: Are They Connected? In C. Martindale, P. Locher, & V. M. Petrov (Eds.), *Evolutionary and neurocognitive approaches to aesthetics, creativity and the arts* (pp. 225–237). Baywood Publishing Co.
- Kyaga, S., Lichtenstein, P., Boman, M., Hultman, C., Långström, N., & Landén, M. (2011). Creativity and mental disorder: Family study of 300 000 people with severe mental disorder. *British Journal of Psychiatry*, 199(5), 373–379. <https://doi.org/10.1192/bjp.bp.110.085316>
- Kyaga, S., Landen, M., Boman, M., Hultman, C. M., Langstrom, N., & Lichtenstein, P. (2013). Mental illness, suicide and creativity: 40-Year prospective total population study. *Journal of Psychiatric Research*, 47(1), 83-90. doi:10.1016/j.jpsychires.2012.09.010
- Lee, C. S., Huggins, A. C., & Therriault, D. J. (2014). A measure of creativity or intelligence? examining internal and external structure validity evidence of the remote associates test. *Psychology of Aesthetics, Creativity, and the Arts*, 8(4), 446–460. <https://doi.org/10.1037/a0036773>
- Lombroso, C. (1895). *The man of genius* (Vol. 16). W. Scott.
- Lukens, T. (2018). Relationship between creativity and bipolar disorder. (78). ProQuest Information & Learning, Retrieved 24th of May 2022 from <http://ezproxy2.utwente.nl/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2017-43828-116&site=ehost-live>
- MacCabe, J. H., Sariaslan, A., Almqvist, C., Lichtenstein, P., Larsson, H., & Kyaga, S. (2018). Artistic creativity and risk for schizophrenia, bipolar disorder and unipolar depression: a Swedish population-based case-control study and sib-pair analysis. *British Journal of Psychiatry*, 212(6), 370-376. doi:10.1192/bjp.2018.23
- McCraw, S., Parker, G., Fletcher, K., & Friend, P. (2013). Self-reported creativity in bipolar disorder: prevalence, types and associated outcomes in mania versus hypomania. *Journal of Affective Disorders*, 151(3), 831-836. doi:10.1016/j.jad.2013.07.016

- Mednick, S. (1962). The associative basis of the creative process. *Psychological Review*, 69(3), 220–232. <https://doi.org/10.1037/h0048850>
- Miller, N., Perich, T., & Meade, T. (2019). Depression, mania and self-reported creativity in bipolar disorder. *Psychiatry Research*, 276, 129–133. doi:10.1016/j.psychres.2019.05.006
- Minds, S. F. C. (1969). Manual of S-A creativity test. Tokyo, Japan: Tokyo Shinri Corporation.
- Murray, G., & Johnson, S. L. (2010). The clinical significance of creativity in bipolar disorder. *Clinical Psychology Review*, 30(6), 721–732. <https://doi.org/10.1016/j.cpr.2010.05.006>
- Netchitailova, E. (2019). The mystery of madness through art and mad studies. *Disability & Society*, 34(9-10), 1509–1515. <https://doi.org/10.1080/09687599.2019.1619236>
- Parmenter, B. A., Zivadinov, R., Kerenyi, L., Gavett, R., Weinstock-Guttman, B., Dwyer, M. G., Garg, N., Munschauer, F., & Benedict, R. H. (2007). Validity of the Wisconsin card sorting and Delis–Kaplan Executive Function System (DKEFS) sorting tests in multiple sclerosis. *Journal of Clinical and Experimental Neuropsychology*, 29(2), 215–223. <https://doi.org/10.1080/13803390600672163>
- Peterson, C., & Seligman, M.E. (2004). Character strengths and virtues: A handbook and classification. Vol. 1. New York: Oxford University Press.
- Pinson, C. D. (2013). The relationship between temperament and facets of creativity. <https://doi.org/10.33915/etd.3493>
- Power, R., Steinberg, S., Bjornsdottir, G. et al. (2015). Polygenic risk scores for schizophrenia and bipolar disorder predict creativity. *Nature Neuroscience*, 18, 953–955. <https://doi.org/10.1038/nn.4040>
- Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? potentials, pitfalls, and Future Directions in creativity research. *Educational Psychologist*, 39(2), 83–96. https://doi.org/10.1207/s15326985ep3902_1
- Prentky, R. A. (2001). Mental illness and roots of genius. *Creativity Research Journal*, 13(1), 95–104. https://doi.org/10.1207/s15326934crj1301_11
- Reuter, M., Panksepp, J., Schnabel, N., Kellerhoff, N., Kempel, P., & Hennig, J. (2005). Personality and biological markers of creativity. *European Journal of Personality*, 19(2), 83–95. <https://doi.org/10.1002/per.534>
- Rhodes, M. (1961). An Analysis of Creativity. *The Phi Delta Kappan*, 42, 305–310.
- Richards, R., Kinney, D. K., Lunde, I., Benet, M., & Merzel, A. P. C. (1988). Creativity in manic-depressives, cyclothymes, their normal relatives, and control subjects. *Journal of Abnormal Psychology*, 97(3), 281–288. <https://doi.org/10.1037/0021-843x.97.3.281>

- Richards, R., & Kinney, D. K. (1990). Mood swings and creativity. *Creativity Research Journal*, 3(3), 202–217. <https://doi.org/10.1080/10400419009534353>
- Rothenberg, A. (2001). Bipolar Illness, Creativity, and Treatment. *Psychiatric Quarterly*, 72, 131–147. <https://doi.org/10.1023/A:1010367525951>
- Ruiter, M., & Johnson, S. L. (2015). Mania risk and creativity: A multi-method study of the role of motivation. *Journal of Affective Disorders*, 170, 52–58. doi:10.1016/j.jad.2014.08.049
- Runco, M. A. (2004). Creativity. *Annual Review of Psychology*, 55, 657–687. <https://doi.org/10.1146/annurev.psych.55.090902.141502>
- Runco, M.A. (2007). A hierarchical framework for the study of creativity. *New Horizons in Education*, 55, 1–9.
- 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>
- Santosa, C. M., Strong, C. M., Nowakowska, C., Wang, P. W., Rennie, C. M., & Ketter, T. A. (2007). Enhanced creativity in bipolar disorder patients: A controlled study. *Journal of Affective Disorders*, 100(1-3), 31–39. <https://doi.org/10.1016/j.jad.2006.10.013>
- Schmidt, A., Rodrigues, R. S., Pipa, C. C., Brandalise, L. N., Lorenzi, T. M., & Lara, D. R. (2010). Emotional and affective temperament in 23 professional areas. *Journal of Affective Disorders*, 126(1-2), 49–54. <https://doi.org/10.1016/j.jad.2010.03.020>
- Schulberg, D. (2001). Six subclinical spectrum traits in normal creativity. *Creativity Research Journal*, 13(1), 5–16. https://doi.org/10.1207/s15326934crj1301_2
- Seligman, M. E., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5–14. <https://doi.org/10.1037/0003-066x.55.1.5>
- Severus, E., & Bauer, M. (2013). Diagnosing bipolar disorders in DSM-5. *International Journal of Bipolar Disorders*, 1(1). <https://doi.org/10.1186/2194-7511-1-14>
- Silvia, P. J. (2008). Another look at creativity and intelligence: Exploring higher-order models and probable confounds. *Personality and Individual Differences*, 44(4), 1012–1021.
- Silvia, P. J., Winterstein, B. P., Willse, J. T., Barona, C. M., Cram, J. T., Hess, K. I., Martinez, J. L., & Richard, C. A. (2008). Assessing creativity with divergent thinking tasks: Exploring the reliability and validity of new subjective scoring methods. *Psychology of Aesthetics, Creativity, and the Arts*, 2(2), 68–85. <https://doi.org/10.1037/1931-3896.2.2.68>
- Silvia, P. J., Wigert, B., Reiter-Palmon, R., & Kaufman, J. C. (2012). Assessing creativity with self-report scales: A review and empirical evaluation. *Psychology of Aesthetics, Creativity, and the Arts*, 6(1), 19–34. <https://doi.org/10.1037/a0024071>

- Simonton, D. K. (2009). Creativity. In S. J. Lopez & C. R. Snyder (Eds.), *Oxford handbook of positive psychology* (pp. 261–269). Oxford University Press. <https://doi.org/10.1016/j.paid.2007.10.027>
- Simonton, D. K., & Song, A. V. (2009). Eminence, IQ, physical and mental health, and achievement domain. *Psychological Science*, 20(4), 429–434. <https://doi.org/10.1111/j.1467-9280.2009.02313.x>
- Siwek, M., Dudek, D., Arciszewska, A., Filar, D., Rybicka, M., Cieciora, A., & Pilecki, M. W. (2013). The analysis of the bipolarity features in students of arts and students of technology. *Psychiatria Polska*, 47(5), 787–796. doi:10.12740/PP/18236
- Soeiro-de-Souza, M. G., Dias, V. V., Bio, D. S., Post, R. M., & Moreno, R. A. (2011). Creativity and executive function across manic, mixed and depressive episodes in bipolar I disorder. *Journal of Affective Disorders*, 135(1-3), 292–297. <https://doi.org/10.1016/j.jad.2011.06.024>
- Soeiro-de-Souza, M. G., Post, R., Machado-Vieira, R., do Prado, C. M., Moreno, R. A., Akiskal, H., & Akiskal, K. K. (2014). Association study between COMT (158)Met and creativity scores in bipolar disorder and healthy controls. *Revista de Psiquiatria Clinica*, 41(2), 29–33. doi:10.1590/0101-60830000000006
- Sternberg, R. J., & O'Hara, L. A. (1998). Creativity and intelligence. *Handbook of Creativity*, 251–272. <https://doi.org/10.1017/cbo9780511807916.015>
- Takeuchi, H., Taki, Y., Sassa, Y., Hashizume, H., Sekiguchi, A., Fukushima, A., & Kawashima, R. (2010). Regional gray matter volume of dopaminergic system associate with creativity: Evidence from Voxel-based morphometry. *NeuroImage*, 51(2), 578–585. <https://doi.org/10.1016/j.neuroimage.2010.02.078>
- Takeuchi, H., Kimura, R., Tomita, H., Taki, Y., Kikuchi, Y., Ono, C., . . . Kawashima, R. (2021). Polygenic risk score for bipolar disorder associates with divergent thinking and brain structures in the prefrontal cortex. *Human Brain Mapping*, 42(18), 6028–6037. doi:10.1002/hbm.25667
- Taylor, K., Fletcher, I., & Lobban, F. (2015). Exploring the links between the phenomenology of creativity and bipolar disorder. *Journal of Affective Disorders*, 174, 658–664. doi:10.1016/j.jad.2014.10.040
- Tu, P.-C., Kuan, Y.-H., Li, C.-T., & Su, T.-P. (2017). Structural correlates of creative thinking in patients with bipolar disorder and healthy controls—A voxel-based morphometry study. *Journal of Affective Disorders*, 215, 218–224. doi:10.1016/j.jad.2017.03.036
- Waddell, C. (1998). Creativity and mental illness: Is there a link? *The Canadian Journal of Psychiatry*, 43(2), 166–172. <https://doi.org/10.1177/070674379804300206>

Williams, F. (1980). Creativity assessment packet. Buffalo, NY: DOK.