Creativity and Disability and Difference

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Abstract

Creativity is a cornerstone of human innovation, influencing numerous disciplines and captivating both academics and practitioners. Despite extensive research, the connection between creativity and disability has been relatively unexplored. This paper seeks to bridge this gap by investigating the interplay between creativity, disability, and difference through the lens of "mental foraging." This conceptual framework compares cognitive exploration to how animals forage for food, suggesting that disabilities and differences can act as catalysts rather than barriers to creative thought and breakthroughs. By combining qualitative case studies with a thorough literature review, the study delves into the complex interactions between mental health conditions such as schizophrenia and ADHD, and physical disabilities like deafness and blindness, with creativity. It aims to provide new insights into the experiences and challenges faced by individuals with disabilities in their creative endeavors, highlighting how these unique cognitive landscapes can foster novel problem-solving approaches and innovation. Through understanding how disabilities influence creative processes, the paper underscores the importance of embracing cognitive and experiential diversity to enrich the creative landscape.

Creativity has long been a subject of interest and the center point of questions across various disciplines, ranging from psychological functioning to how to create the next big AI tool. Understanding the factors that contribute to creative breakthroughs is crucial for both academic research and practical application. Throughout this paper, the intricate relationship between creativity and disability and difference will be explored, aiming to explain how individuals with impaired cognitive and physical abilities navigate the creative process.

The intersection of creativity and disability opens up a wide realm of possibilities for exploring unique perspectives and approaches to problem-solving. While traditional views might perceive disability as a hindrance, this paper adopts the framework of "mental foraging" (Hills and Todd, 2020) to examine how disability and difference can act as catalysts for creative thinking. Creativity often thrives in environments where individuals face challenges and constraints (Krogh & Bansal, 2023). By exploring how disability shapes creative thinking, we may uncover novel approaches to problem-solving and innovation. Similarly, "Creativity as Strategic Foraging" framework posits that creativity is an exaptation of mental foraging mechanisms. The "Creativity as Strategic Foraging" framework posits that creativity evolved by co-opting neural processes originally designed for spatial navigation, allowing for exploration within abstract idea spaces. The framework distinguishes between two creativity types: divergent thinking, which involves generating a multitude of ideas, and convergent thinking, focused on identifying a singular optimal solution. Each type employs distinct foraging strategies; divergent creativity relies on broad exploration, while convergent creativity necessitates precise, targeted searches (Malaie, Spivey, and Marghetis, 2024). These insights have the potential to inspire breakthroughs not only in assistive technologies but also in various fields where creativity plays a crucial role (Simonton, 2012). By understanding the distinct ways individuals with disabilities

or differences approach problem-solving and creativity, researchers and innovators can develop new tools and methods that leverage these unique cognitive strengths to the best of their abilities. When disabilities encourage mild increases in exploratory behavior, such as in cases of Bipolar Disorder, they can positively impact creativity, allowing individuals to experiment with new ideas and approaches. In contrast, when a disability leads to a complete abandonment of exploitative behavior, such as in extreme cases of Schizophrenia, where the individual is solely focused on exploration without leveraging existing knowledge, producing practical innovations becomes challenging, if not impossible. Exploration involves seeking out new information and experiences, while exploitation refers to utilizing and refining existing knowledge and resources. Balancing these two approaches is crucial for fostering effective and innovative problem-solving.

Creativity emerges from the dynamic interplay of cognitive, emotional, and neural factors, with research revealing how various brain regions interact to produce creative thought (Abraham, 2013). This complexity enhances our understanding of creativity because it provides a detailed map of how different elements come together to foster creative processes. By examining these intricate interactions, we can better explore how creativity intersects with disability and mental illness, offering insights into how unique cognitive and emotional profiles contribute to creative expression. Rather than obfuscating understanding, the complexity allows for a more nuanced exploration of how diverse factors influence creativity, leading to more comprehensive and individualized approaches to supporting creative potential. Disability fosters the production of difference, an essential piece for novel forms of creative expression, challenging conventional paradigms and asserting that disability can act as a catalyst for creativity (Erevelles & Minear, 2011). Similarly, while acknowledging the historical association between mental illness and creative genius, we shouldn’t romanticize mental illness. Rather,

emphasis is needed on providing comprehensive support systems to ensure the well-being of creative individuals experiencing mental health challenges, recognizing that appropriate support is crucial for harnessing this potential positively (Neihart et al., 2014). Together, these insights underscore the importance of embracing cognitive and experiential diversity to foster a richer, more inclusive creative landscape.

Theoretical Proposal

The theoretical underpinning of this paper tries to make sense of the notion that disability and difference shape individuals' cognitive foraging processes. Drawing from Hills and Todd's (2020) concept of "mental foraging," this project aims to understand how disabilities and differences influence this exploration.

Mental foraging refers to the cognitive processes involved in the exploration of a space of ideas. Drawing from Hills and Todd's (2020) framework, this project views memory, creativity, and related mental processes as a form of search through this space, allowing individuals to discover and develop novel solutions or ideas. By adopting their framework, this paper aims to provide a holistic understanding of how individuals with disabilities navigate the space of ideas in their minds. Using Hills and Todd's framework as a guiding lens, this study explores their conceptual model, which posits that mental processes involve a form of foraging through a space of ideas. This approach sheds light on the mechanisms underlying creative thinking.

According to the framework of mental foraging, when we search for an idea in our mind, we use processes that are similar — perhaps even identical — to processes that evolved for searching through literal space for rewards. Just as animals explore their environments to find food or other resources, humans navigate the "space of ideas" to uncover creative solutions and novel concepts. This involves a balance between exploring new mental territories and exploiting

known cognitive strategies, akin to the "explore vs. exploit" trade-off observed in physical foraging (March, 1991). The mental landscape is rich with potential insights and connections, requiring that the brain utilizes optimization techniques, such as gradient descent, to minimize cognitive errors and hone in on useful ideas (Rumelhart et al., 1986). However, just as a forager might settle for a local food patch instead of the best one available, creative thinkers often find local optima — solutions that are effective but not the best possible (Wolpert & Macready, 1997). Where the ultimate goal is to identify a global optimum, which is the most valuable idea or solution in the entire cognitive landscape, which can be challenging due to the vast and complex nature of the mental search space (Goldberg, 1989). Barriers such as cognitive biases and psychological constraints can obstruct this search, much like physical obstacles in the environment hinder a forager's path (Runco & Jaeger, 2012). The recognition of "blocked" foraging leads to similar constraints. When disabilities or differences impede one's access to certain ideas or solutions, individuals are compelled to explore alternative regions within the possibility space as means to increase creative output. This adaptive response to limitations may foster the emergence of novel approaches and creative breakthroughs, as individuals navigate around obstacles to find solutions (Hills & Todd, 2020). Understanding these mental foraging processes highlights the underpinnings of creativity and problem-solving, emphasizing the importance of adaptive strategies in navigating both literal and figurative spaces.

The mental foraging framework provides a lens through which to interpret these findings (Fig. 1). Mental foraging theory posits that creativity involves exploring various cognitive territories to find novel ideas and solutions. For instance, Attention Deficit Disorder (ADD), characterized by persistent issues with attention and concentration, often leads individuals to focus intensely on specific tasks or ideas. This heightened persistence can result in a more

sustained exploitation of particular regions within the possibility space—essentially, a focused approach to exploring and developing a narrower set of ideas or solutions. Individuals with ADD might engage deeply with a few selected concepts, leveraging their concentrated efforts to achieve creative breakthroughs within these areas. In contrast, schizophrenia, a mental disorder marked by symptoms such as hallucinations, delusions, and disorganized thinking, often leads to a broader exploration of the possibility space. Due to the fragmented and less coherent nature of thought processes in schizophrenia, individuals might generate a wide array of novel ideas but struggle to focus on or develop any single idea extensively. This can result in a more expansive yet less targeted approach to creativity, where the exploration of diverse and sometimes disconnected ideas takes precedence over the detailed development of any single concept.

Similarly, physical disabilities can impose unique constraints on an individual's interaction with the world, compelling them to engage in alternative cognitive strategies (Lubart, 2017). These constraints often necessitate a shift in the exploration of the mental landscape, pushing individuals to navigate less conventional paths to uncover creative solutions (Vygotsky, 1997). Just as barriers in a physical environment can lead a forager to explore new routes, physical disabilities may redirect cognitive foraging processes, fostering innovation by forcing individuals to find novel ways to overcome challenges. This adaptive exploration can lead to breakthroughs that might not occur within more typical cognitive pathways, as individuals learn to leverage their unique experiences and perspectives.

These differing dynamics reflect variations in how individuals with different disabilities or conditions navigate and explore the cognitive landscape. This framework helps to explain the U-shaped pattern observed in some studies: mild to moderate symptoms of mental health disorders may enhance mental foraging by encouraging unconventional thinking, while severe

symptoms could overwhelm cognitive processes, leading to a decrease in the ability to focus and synthesize creative ideas. Research on bipolar disorder suggests that mild symptoms can boost creativity through increased divergent thinking, while severe episodes may impair cognitive function (Johnson & Murray, 2020). Similarly, certain schizotypal traits in schizophrenia promote novel idea generation, but severe symptoms can disrupt coherent thought processes (Folley & Park, 2022).

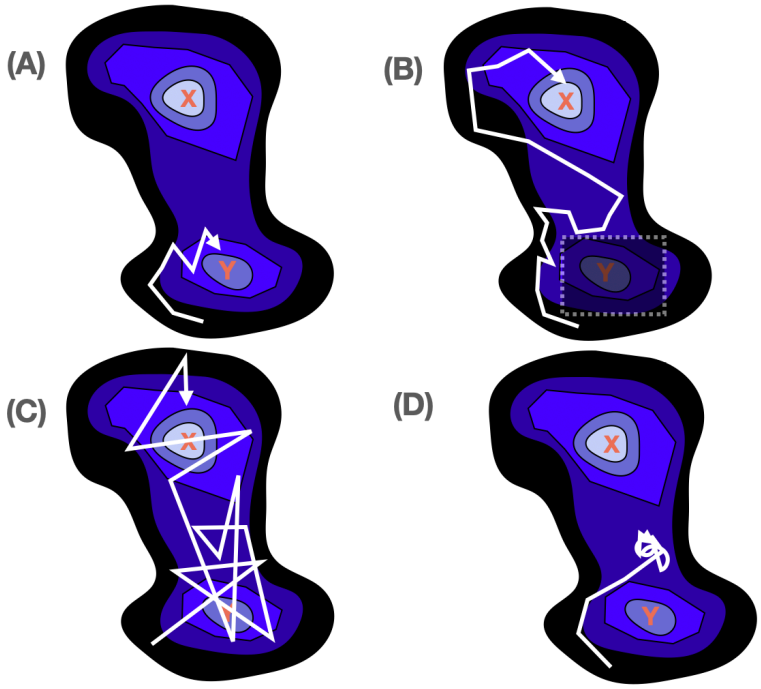

Figure 1: Creativity as mental foraging, as shaped by disability and difference. *(A) Typically, mental foraging operates as a kind of "gradient descent," with the search path gradually descending toward a local minimum (i.e., the best solution or idea in that region). Here, the search trajectory gradually settles on solution Y, which is the best solution in that region of the problem space, but is not as good as the global optimum at X. (B) When disability or difference blocks the search from a particular region of the problem space, the perceived best solution in the area may not be available to the individual. What comes from this is the disability or difference encourages the individual to explore alternative pathways, leading to the global optimum at X. (C) When disability or difference changes the foregoing dynamic for the search from a particular region of the problem space, the perceived best solution in the area many not be immediately available to the individual. Individuals will have sporadic exploration tendencies, bouncing from one place to another without any set plan. And while they still end up at the global optimum at X, they don't have much understanding of how they got there. (D) When a disability or difference causes an individual to hyper focus on a given outcome, it can lead to the correct solution not being considered, as other pathways are taken in an attempt to find the global optimum at X, regardless of if that optimum is ever found.*

The figure illustrates how disabilities and differences influence creative problem-solving by altering mental foraging processes. Panel (A) depicts a typical "gradient descent," where individuals follow familiar paths to a local minimum (Y), often missing the global optimum (X). This represents a tendency to settle for suboptimal solutions without exploring further. In panel (B), disability or difference blocks certain pathways, compelling individuals to explore alternative routes, potentially leading to better solutions (X). This demonstrates how constraints can drive creativity by encouraging exploration beyond familiar territory. Panel (C) shows sporadic exploration, where disruptions in conventional search processes result in unpredictable but potentially fruitful paths to the optimal solution (X). Although chaotic, this approach underscores how creative insights can emerge from non-linear thinking. This aligns with the idea that mild increases in exploration, as seen in conditions like Bipolar Disorder, can enhance creativity by balancing exploration and exploitation. Lastly, panel (D) highlights the impact of hyper-focus, where intense concentration on specific outcomes prevents consideration of better alternatives (X), illustrating how fixation can limit creative potential. This reflects how extreme conditions, such as severe Schizophrenia, can lead to excessive exploration, hindering useful innovation.

The U-shaped curve phenomenon proposes that an optimal level of symptom intensity enhances creativity, whereas extremes—whether too mild or too severe—could act as barriers to creative expression (Sass & Schaffer, 2018). This phenomenon explores the known relationship between symptom intensity and creativity, which can be particularly seen in conditions like schizophrenia, where the more intense the individual's symptoms, the less creative the individual tends to be (Abraham, 2014). By examining this phenomenon through the lens of mental

foraging, the underlying mechanisms behind this nonlinear relationship are explained, exploring the interplay between disability, symptomatology, and creative processes (Carruthers, 2011).

This theoretical synthesis posits that disability and difference contribute to unique foraging patterns within the cognitive space, leading to diverse creative outputs. This synthesis serves as the foundation for understanding how various conditions influence the exploration and exploitation of the possibility space, offering a unified framework for interpreting distinct literatures on creativity within the realms of mental health and physical disability.

Case Studies of the Impact of Disability and Difference on Creativity

Throughout history, there have been many cases of historically influential individuals who experienced disabilities or other differences. As a result, this section will be used to shed light on the interplay between disability, difference, and creativity in these specific cases. This study illuminates the multifaceted nature of creativity amidst disability by exploring the nuanced ways individuals navigate the cognitive landscape in the face of adversity. By exploring the experiences of those with various disabilities, the multitude of ways creativity manifests across different cognitive landscapes is uncovered.

By integrating concepts from mental foraging theory with empirical evidence from diverse fields, clarification on how disability and difference shape individuals' cognitive processes and creative outputs will be explored. Individuals with disabilities often develop unique cognitive profiles as they adapt to their challenges, which can enhance these mechanisms in distinctive ways. For instance, the necessity to find alternative strategies and solutions can foster heightened divergent thinking, as they are regularly required to think outside conventional norms (Fig. 2). Associative processing may also be enriched, as individuals with disabilities may draw connections between diverse experiences and ideas to navigate their environments. This

theoretical framework not only informs our understanding of creativity but also informs interventions aimed at nurturing creative potential in diverse populations.

Disability and Creativity in the Sciences

Stephen Hawking was a preeminent theoretical physicist whose work profoundly impacted the field of cosmology, particularly through his contributions to our understanding of black holes and the universe's fundamental nature. His groundbreaking theory of Hawking radiation, which posited that black holes could emit radiation due to quantum effects near the event horizon, revolutionized the scientific community's perception of these enigmatic entities (Hawking, 1974). His seminal work, *A Brief History of Time*, not only clarified complex scientific phenomena for the general public but also deepened the understanding of many readers, making advanced ideas more accessible and engaging (Hawking, 1988). After being diagnosed with Amyotrophic Lateral Sclerosis (ALS) at the age of 21, Hawking faced immense physical challenges that left him nearly completely paralyzed and dependent on a speech-generating device for communication (Ferguson, 2011). Despite these limitations, his relentless pursuit of knowledge and work as a theoretical physicist was extremely impactful to the community. While the use of mobility and speech-assisting technologies limited his ability to do physics in the standard way, Hawking still paved the way for some of the most important research in his field ever done. His contributions to fields such as cosmology, quantum gravity, and the nature of singularities further illustrate his profound impact on modern science.

Applying the mental foraging framework to the case of Stephen Hawking offers insight into the connection between his disability and his creative accomplishments. Stephen Hawking's experience with ALS created significant physical barriers, preventing him from using the typical tools and techniques of theoretical physics, such as writing out long mathematical derivations.

This might seem like it should have hindered him from conducting high-level research. Yet, it didn't, following naturally from the Creativity as Mental Foraging framework. Hawking's physical disability forced him to adapt and use a more graphic and conceptual approach, steering away from traditional methods. His inability to rely on conventional techniques may have actually released him from well-established thought patterns and local optima—solutions that others might have gravitated toward. Instead, his disability compelled him to explore alternative approaches, pushing him into previously uncharted territories in the solution space. This necessity to innovate could have allowed Hawking to transcend local optima, uncovering paths that led closer to a global optimum. By navigating these unexplored cognitive regions, he was able to achieve groundbreaking discoveries, such as Hawking radiation. From this perspective, his disability did not merely challenge him but also enriched his creative process, driving him to pursue ideas that others might overlook. Suggesting that Hawking may have been creative because of his physical disability, not in spite of it.

Isaac Newton was a central figure in the scientific revolution, renowned for formulating the laws of motion and universal gravitation, which fundamentally shaped classical mechanics. Newton's intellectual endeavors were marked by extensive and significant advancements in mathematics and physics, wherein he navigated and expanded their boundaries. His magnum opus, "Philosophiæ Naturalis Principia Mathematica," or more commonly known as "Principia," stands as a testament to his ability to create groundbreaking work and significant contributions to scientific knowledge (Westfall, 1980). In Principia, Newton articulated the three laws of motion that we abide by today, which describe the relationship between a body and the forces acting upon it, and the body's motion in response to those forces, as well as the law of universal gravitation. The work he conducted through these principles moved beyond what many would

consider the “desirable outcomes” to attain global scientific achievements, fundamentally altering the scientific landscape. Newton's contributions to mathematics, including the independent development of calculus and significant advancements in optics, further underscore his profound impact (Brewster, 1855). Despite these scientific advancements, Newton experienced periods of mental instability, likely due to bipolar disorder or mercury poisoning from his alchemical experiments, causing episodes of depression, paranoia, and emotional distress (Whiteside, 1974). His work exemplifies the intricate interplay between intellectual exploration and the pursuit of scientific knowledge, demonstrating how cognitive and emotional challenges can coexist and lead to exceptional creative and scientific achievements.

Isaac Newton’s psychological challenges created significant mental barriers, often obstructing his cognitive processes and blocking his path to new insights. Periods of mental instability hindered his ability to use conventional cognitive tools and techniques, forcing him to rely on unconventional methods much different than those with sustained mental stability would’ve explored. This intense focus, analogous to how disabilities or differences can drive individuals to hyper-focus on specific outcomes, may lead them down unconventional pathways in pursuit of solutions, potentially missing the global optimum, where his disability simply prompted him to explore other regions in the space of ideas. His psychological struggles allowed him to transcend local optima—the solutions that other scientists might have adopted—and achieve global scientific advancements. For instance, during periods of intense focus and isolation, Newton delved into the development of calculus independently, laying down the mathematical principles that would revolutionize the analysis of change and motion. Moreover, Newton's investigations into optics, where he formulated the theory of color based on observations that a prism decomposes white light into the colors of the visible spectrum, expose

his ability to navigate the cognitive space of ideas innovatively. These periods of intense intellectual exploration and creativity, often occurring with periods of isolation and mental turmoil, suggest that his psychological challenges may have facilitated a deeper, more unorthodox engagement with complex scientific problems.

Disability and Creativity in the Arts

Django Reinhardt, a Belgian-born Romani-French jazz guitarist who lived from 1910 to 1953, is universally acclaimed as one of the greatest jazz guitarists in history. His innovative work with the Quintette du Hot Club de France, co-founded in 1934 with violinist Stéphane Grappelli, revolutionized jazz by pioneering the use of string instruments into the genre (Wrembel, 2008). Over his long and distinguished career, he recorded hundreds of tracks, including songs like "Minor Swing," "Daphne," and "Nuages," which remain staples in the broader jazz collection. His contributions to the development of the “gypsy jazz” genre and his collaboration with major figures such as Duke Ellington further cement his legacy as a pivotal figure in music history (Morton, 2000). Reinhardt's promising career once faced a significant obstacle when at the age of 18 he suffered severe injuries in a fire, which resulted in the paralysis of two fingers on his left hand. Though, after the injury, Reinhardt remarkably adapted his technique to accommodate his disability, using his remaining functional fingers to develop a unique and virtuosic playing style. This adaptation redefined the jazz guitar genre, leaving a profound and enduring impact (Vickers, 2005). Reinhardt's resilience and innovation turned a potential career-ending injury into a catalyst for creative genius, influencing many musicians with his groundbreaking approach and unparalleled skill.

Despite the physical barriers imposed by two paralyzed fingers on his left hand, Django Reinhardt epitomized how disabilities can act as catalysts for creative breakthroughs within the

mental foraging framework. His adaptation to limited mobility revolutionized jazz guitar playing by transcending traditional techniques and pioneering a new style. Reinhardt's exploration of alternative fingerings and chord voicings were the result of exploring the space of musical ideas, driven by the necessity to innovate around his physical limitations. Rather than his injury blocking further creation, Reinhardt exploited his remaining functional abilities to explore novel approaches, ultimately achieving a global optimum in jazz guitar technique, using his two functional fingers to play rapid, fluid solos and complex chords. As well as playing three-note chord shapes and using his thumb to fret bass notes, allowing for him to play complex harmonies despite his limited finger mobility. Reinhardt's playing style illustrates how disabilities can help to exploit creative exploration beyond what may be considered the local optima, demonstrating transformative contributions in artistic expression and innovation through disability.

Joni Mitchell, born in 1943, is a Canadian singer-songwriter and painter celebrated for her poetic lyrics and eclectic musical style that incorporates aspects of folk, rock, jazz, and pop. She emerged as an influential figure in the 1960s and 70s, releasing career-defining albums such as "Blue" (1971) and "Court and Spark" (1974), both of which were deeply influential in the shaping of contemporary music (Harris, 2003; Yaffe, 2017). Her innovative approach to songwriting and her distinctive voice have culminated in her receiving numerous awards, including nine Grammy Awards and being inducted into the Rock and Roll Hall of Fame. Mitchell's journey has been marked by significant health challenges, contracting polio at the age of nine, resulting in her being temporarily paralyzed and a weakened left hand, which profoundly impacted her ability to play musical instruments, affecting her dexterity and mobility in her hands and fingers when she began making music (Wilkie, 2009). Through this, she developed unconventional methods of fretting chords and executing melodies that accommodated her

restricted hand mobility. Even after having to accommodate for this new playing style, Mitchell continued to release music, releasing albums such as "Hejira" (1976) and "Mingus" (1979), exploring and building upon jazz influences in her later work. Her legacy is further cemented by her influence on countless artists across multiple genres, making her one of the most innovative and enduring musicians of her time.

Joni Mitchell's encounter with polio at the age of nine presents a compelling example of how disabilities can catalyze creative insights through the mental foraging framework. Mitchell's journey was marked by an ongoing exploration of guitar tunings and playing techniques that accommodated her diminished hand mobility, illustrating her adeptness at navigating the space of musical ideas. This exploration involved experimenting with alternative fingerings and positions on the fretboard, allowing her to achieve complex chord voicings and melodic lines despite her constraints. Mitchell also adapted through the use of unique guitar tunings, such as playing her guitars with open chord tunings, often lowering the tension and making it easier to fret chords and execute intricate fingerpicking patterns. Her development of open chord tunings, born out of necessity, served as a pivotal opening for exploring harmonic complexity and emotional resonance in her music, shifting towards a global optimum in her artistic expression. This exemplifies how disabilities can foster creative resilience and innovation by pushing artists to explore beyond local optima, ultimately contributing to Mitchell's legacy as an influential and pioneering musician whose work continues to resonate across generations.

Robert Schumann, the acclaimed German composer, pianist, and influential music critic of the mid-1840s, exemplifies the intriguing interplay between mental health and creativity. Schumann’s bouts of severe depression, interspersed with periods of "exaltation" and delusional ideas, are now thought to be indicative of bipolar disorder. Weisberg (1994) scrutinized

Schumann's compositional productivity and found that his manic episodes did not necessarily enhance the quality of his work but did increase its quantity. This insight shatters the notion that mania directly fuels genius, suggesting instead that manic episodes result in a higher volume of work, not necessarily of better quality. Highlighting the nuanced and often misunderstood relationship between mental states and artistic productivity, this illustrates that creativity under the influence of bipolar disorder is more complex than just mere bursts of brilliance.

Vincent van Gogh, a Dutch post-impressionist painter, lived from 1853 to 1890 and is revered for his profoundly emotional and visually captivating artworks. His works of art include iconic pieces such as "Starry Night," "Sunflowers," and "Irises," showcasing his mastery of color, texture, and expressive brushstrokes (Blumer, 2002; Callow, 1990). Van Gogh's artistic achievements extend beyond his innovative techniques; his paintings often explore themes of nature, human suffering, and the inner confusion of the human psyche. Throughout his life, van Gogh struggled with severe mental health issues, including experiencing episodes of depression, anxiety, and psychotic breaks; all of which profoundly influenced his artistic process and subject matter as the disorders impacted him more (Blumer, 2002). Despite these periods of intense psychological struggle, van Gogh's ability to transform his inner struggles into visual poetry remains a testament to his enduring impact through art and his status as a visionary artist.

Vincent van Gogh's struggles with mental illness, including severe depression and psychotic episodes, offer a profound lens through which to understand the intersection of creativity and mental health within the mental foraging framework. Van Gogh's artistic journey was marked by a relentless exploration of emotional landscapes and intense visual experimentation. His mental health challenges, often perceived as barriers to conventional stability, paradoxically fueled his artistic exploration by pushing him to navigate beyond local

optima. Rather than being blocked by his psychological turmoil, van Gogh's experiences enabled him to delve deeper into the space of ideas, harnessing raw emotions to create works that resonate with intense, personal authenticity. His ability to exploit his inner struggles through expressive brushstrokes and intense, vivid imagery allowed him to achieve a global optimum of artistry, shaping a unique visual language that continues to captivate and inspire.

Pablo Picasso, a Spanish painter and sculptor, lived from 1881 to 1973 and stands as one of the most revolutionary figures in 20th-century art history. Known for co-founding the Cubist movement with Georges Braque and pioneering numerous artistic styles throughout his career, Picasso's contributions to modern art are monumental (Richardson, 1991). Original pieces of his include "Les Demoiselles d'Avignon," "Guernica," and "The Weeping Woman," each reflecting his unparalleled ability to distort form and challenge traditional perspectives (Hughes, 1991). Beyond his technical innovations, Picasso's art often delves into exploring human identity, politics, and the complexities of existence. Throughout his life, Picasso grappled with periods of emotional volatility, with his psychological challenges including episodes of depression and anxiety (O'Brian, 1994). These periods were intrinsic to Picasso's artistic evolution, driving him to continuously explore new aesthetic possibilities and push the boundaries of artistic expression. His ability to channel inner turmoil into radical artistic visions shaped the trajectory of visual culture for generations.

Pablo Picasso's pioneering contributions to modern art can be illuminated through the same mental foraging framework as van Gogh, highlighting how his psychological complexities served as catalysts for creative innovation. Picasso's career was characterized by a relentless exploration of form, perspective, and symbolism, challenging the boundaries of traditional artistic norms. His periods of emotional volatility, which included bouts of intense depression

and anxiety, could be viewed as initial barriers. However, these challenges prompted Picasso to explore unconventional approaches and perspectives within the vast space of artistic ideas. By transcending local optima and embracing experimentation, Picasso exploited his psychological states to redefine artistic conventions and achieve global optima in artistic expression. His ability to navigate and reshape the space of ideas through Cubism and other revolutionary styles exemplifies how psychological complexity can fuel artistic breakthroughs.

Summary of Historical Case Studies

Throughout history, the cases of influential figures like Stephen Hawking, Joni Mitchell, and Pablo Picasso illustrate the profound interplay between disability, difference, and creativity. These individuals demonstrate how disabilities and physical or psychological challenges can act as catalysts for creative breakthroughs, pushing them to explore beyond conventional cognitive pathways. Their unique adaptations and innovations reveal how constraints can foster divergent thinking and associative processing, leading to groundbreaking contributions in their respective fields. These real-life examples support the argument that disability and difference can enhance creative capacities through a mental foraging framework. By navigating uncharted cognitive landscapes, these figures reached new creative areas, underscoring the potential for adversity to fuel innovation. While these historical incidents support our account of disability and mental foraging, they represent just a few examples chosen to illustrate our framework. In the next section, we survey the published literature to offer a more systematic, evidence-based evaluation of our theoretical framework.

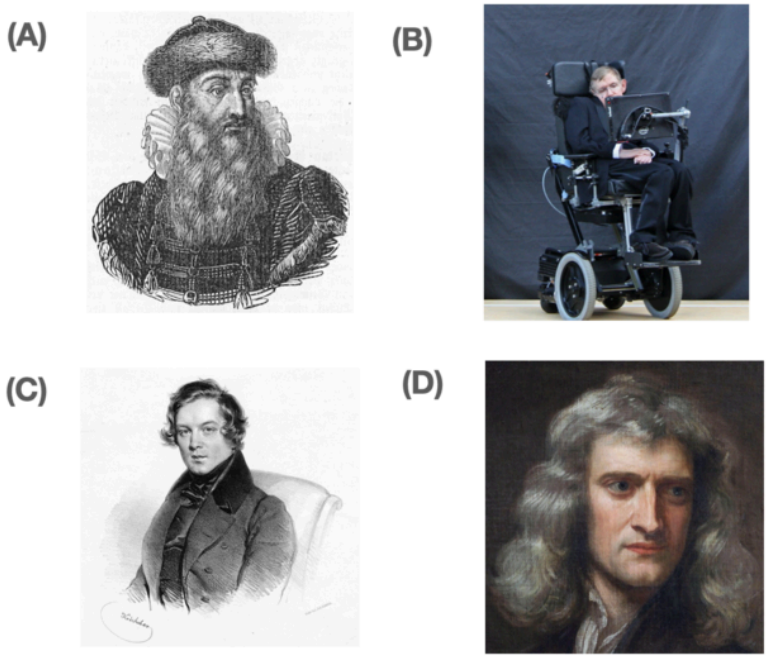

Figure 2: Creativity as mental foraging, as shaped by disability and difference, shown through case study. *(A) Johannes Gutenberg [31] was an inventor in the mid 1400's who was the creator behind the printing press. Gutenberg, while not experiencing any physical or mental disabilities, explored the space of ideas as a means of finding the best way to improve printing items. Where mental foraging operated as a kind of "gradient descent," with the search path gradually descending toward a local minimum that he landed upon. (B) Stephen Hawking's [65] experience with ALS created significant physical barriers, preventing him from using the typical tools and techniques of a theoretical physicist, such as writing out long mathematical derivations. When disability or difference blocks the search from a particular region of the problem space, individuals are challenged to explore alternative pathways, ultimately aiming for the global optimum at X. (C) Schumann's [55] compositional productivity was analyzed, revealing that his manic episodes increased the quantity rather than the quality of his work, challenging the romanticized belief that mania enhances genius. This insight suggests that while manic phases lead to a higher volume of output, they do not necessarily improve its overall quality. When disability or difference alters this dynamic within the problem-solving process, individuals may exhibit erratic exploration patterns, moving between various regions of the problem space without a clear strategy. Despite this sporadic approach, they may still reach the global optimum at X without having a comprehensive understanding of their path to get there. (D) For instance, during periods of intense focus and isolation, Newton [29] delved into the development of calculus independently, laying down the mathematical principles that would revolutionize the analysis of change and motion. This intense focus, analogous to how disabilities or differences can drive individuals to hyper-focus on a specific outcome, may lead them down unconventional pathways in pursuit of solutions, potentially missing the global optimum at X in their search.*

Reinterpreting past research on disability and creativity through the lens of mental foraging

In this section, published literature on the relationship between disabilities and creativity is surveyed, examining how various conditions influence mental foraging processes and creative potential. The focus is on how cognitive and physical differences can lead to unique forms of exploration, enhancing creativity when there is a balance between exploring new ideas and utilizing existing knowledge. The concept of cognitive diversity is highlighted as a driver of innovative thinking, where mild increases in exploratory behavior often lead to creative breakthroughs. This exploration fosters environments where diverse perspectives thrive, challenging conventional notions and demonstrating that limitations can paradoxically enhance creativity. The section emphasizes the importance of understanding how different cognitive experiences contribute to the broader landscape of creativity and innovation.

Mental Health

Schizophrenia is defined as a complex mental disorder that is characterized by hallucinations, delusions, and disorganized thinking (American Psychiatric Association, 2013). The disorder has long intrigued researchers due to its association with creativity and individuals' creative processes. With studies having highlighted the unique cognitive processes and neural mechanisms involved in individuals with schizophrenia, shedding light on their creative potential (Abraham, 2014; Eysenck, 1995). Recent exploration of links between schizophrenia and creativity reveals that divergence from traditional thinking within schizophrenia can foster creativity by forcing individuals to exploit non-traditional cognitive paths. Exemplifying how mild increases in exploration, facilitated by the disorder, can lead to innovative outcomes.

This is a similar experience to those who suffer from depression and bipolar disorder, which are complex mental health conditions that have been associated with both creative struggles and bursts of creative insight (Andreasen, 1987; Ludwig, 1995). Research in this area sheds light on the intricate relationship between mood disorders and creative processes, with heightened schizotypy traits observed during depressive episodes suggesting a loosening of cognitive constraints, widening the scope of mental foraging. The U-shaped pattern observed in creativity—where moderate mood fluctuations are associated with optimal creative performance—reflects a balance akin to efficient mental foraging, where neither excessive rigidity nor chaotic instability dominates the creative process. Several studies support this pattern, like Eysenck's work on personality and creativity, which found that moderate neuroticism (emotional instability) could enhance creativity compared to extreme levels (Eysenck, 1995). Kaufman and Baer's research on mood disorders indicated similar results, where individuals with bipolar disorder often showed higher creativity during hypomanic episodes, while extreme mood phases negatively affected creativity (Kaufman & Baer, 2002). Mental health issues such as bipolar disorder, depression, anxiety, and neuroticism all play roles in this dynamic: bipolar disorder can enhance creativity during hypomanic states, while severe depression or excessive anxiety might impair it. Moderate fluctuations provide an optimal level of emotional intensity, allowing for flexible and adaptive cognitive processes, which are crucial for effective creative exploration and problem-solving (Eysenck, 1995; Kaufman & Baer, 2002).

Understanding the relationship between mood states and creativity can reveal how cognitive fluctuations impact innovative thinking. Recent research examining cognitive patterns in bipolar patients fluctuating with mood states noted that depressive episodes are associated with lower inhibition scores and heightened schizotypy traits (Janusz and Klonowska, 2011).

Lower inhibition, in particular, is often linked to increased creativity because it allows for more divergent thinking and less constrained cognitive processing. This can foster environments conducive to innovative thinking. The heightened schizotypy traits, which reflect unusual perceptual experiences and cognitive disturbances, may also contribute to creative processes by enabling novel connections and ideas, although this connection is less direct. Direct evidence supporting the link between mood dysregulation and enhanced creative abilities includes studies on mood disorders where individuals in hypomanic or mildly depressive states demonstrate increased creativity compared to those in more extreme mood states (Hershman, 2010). These mild fluctuations can create optimal conditions for divergent thinking and critical evaluation of work, leading to higher-quality creative outcomes. Embracing the idea that mood fluctuations can positively influence creativity challenges traditional views that see mood disorders primarily as obstacles to cognitive stability. Similarly, individuals who experience extreme states of manic-depression may not foster creativity to a noticeable level, but when experiencing more mild mood variations, such as mild mania or depression, environments that are conducive to innovative thinking appear. This phrase suggests that under certain conditions—specifically, during periods of mild mania or depression—individuals might find or create settings that naturally promote or support creative thinking (Hershman, 2010). These fluctuations encourage individuals to engage in divergent thinking and critically evaluate their work, where rather than mood fluctuations being viewed solely as hindrances to stability and cognitive processes, the mental foraging framework suggests that varying mental states can catalyze creative exploration.

Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD), characterized by difficulties in attention regulation, hyperactivity, and impulsivity, may paradoxically enhance cognitive flexibility and stimulate unconventional thinking, aligning with

the notion that diverse cognitive states can foster innovative insights (Barkley, 2015). With a growing perspective is that these conditions can actually enhance creativity under certain circumstances (White & Shah, 2006). The high distractibility and impulsivity seen in individuals with ADHD tend to align with optimal foraging theory, favoring exploration over exploitation. The preference for novelty-seeking behavior, often thought to cause attentional issues, actually mirrors the principles of divergent thinking. By prioritizing exploration, individuals with ADHD can uncover unconventional solutions, fostering an environment conducive to creative breakthroughs (Barack et al., 2024). Mild to moderate ADHD symptoms might enhance creativity by encouraging exploration, while severe symptoms could impair it, causing excessive foraging at the expense of exploitation. This suggests that individuals with ADHD are naturally inclined to explore a wide array of mental "patches" to gather ideas. Their high distractibility and impulsivity enable them to shift between different concepts and perspectives efficiently, leading to the generation of novel and diverse ideas. This enhanced ability to forage mentally can thus facilitate creativity, explaining why the cognitive traits associated with ADHD can result in creative advantages, particularly in divergent thinking and innovative problem-solving.

Similarly, recent research revealed that individuals with LD and ASD can exhibit extraordinary creative abilities despite their cognitive divergences (Pring et al., 2012; Shondrick et al., 1992; Pennisi et al., 2020). Savant syndrome, which involves remarkable abilities or talents in specific areas such as music, art, or mathematics, often co-occurring with developmental conditions like autism (Treffert, 2014) is vital to understanding how those with ASD and LD explore creative landscapes. Varied performances in creativity tests among individuals with autism may reflect different mental foraging patterns influenced by other cognitive factors like language proficiency. When exploring diverse groups—including art

students, savants, individuals with ASD, and those with moderate learning disabilities (MLD)—it seems that art students excelled in creative tasks and savant artists showed unique outcomes on non-drawing assessments. This challenges conventional definitions of creativity, suggesting that specialized skills in savants translate into broader cognitive abilities (Pring et al., 2012). The lack of significant creativity differences between savants, individuals with ASD, and those with MLD highlights that neurodiversity fosters varied forms of creative thinking. The exceptional creativity of savants can be explained by their specialized foraging strategies that allow deep exploration in specific domains, demonstrate exceptional skills in said specific domains and leading to broader cognitive insights (Treffert, 2014). Research has found that despite lower scores in problem formulation and consequential thinking among students with learning disabilities (LD), there were no significant differences in verbal or nonverbal creativity measures compared to their non-disabled peers (Shondrick et al., 1992). Those with a learning disability might foster alternative cognitive pathways for creativity, suggesting that the mental foraging they engage in might bypass conventional problem-solving routes, resulting in unique creative outputs when exploration and exploitation are balanced.

Comparably, despite being less commonly associated with creativity, Hyperphantasia, which refers to an exceptionally vivid imagination, where individuals experience mental imagery as intensely as if it were real, enhancing creative visualization (Zeman et al., 2020) and Aphantasia, the inability to voluntarily visualize mental images, leading individuals to rely on other cognitive strategies and potentially fostering unique creative approaches (Zeman et al., 2015) provide insights into how diverse cognitive profiles can foster unconventional mental foraging strategies. These conditions may initially present various life challenges, allowing for unconventional thought processes and problem-solving approaches to be discovered and used. In

the realm of cognitive disorders, the viewed relationship between hyperphantasia, aphantasia, and creativity suggest that individuals with hyperphantasia often gravitate towards creative professions, while those with aphantasia are more inclined towards computing, mathematics, and science. This contrast highlights the distinct cognitive experiences that can lead to varied creative outlets. Aphantasia, with its challenges in face recognition and personal memory, contrasts sharply with hyperphantasia's vivid imagery and synesthesia (Zeman et al., 2020). Individual differences in cognitive processing styles are crucial when examining the link between disability and creativity. Differences, such as personality traits like openness and extraversion, can lead to unexpected and profound creative breakthroughs. These differences progress our understanding of visual imagery vividness, and based on what is seen as the optimal choice of fit, how the psychological and occupational impacts are processed and explored differently (Milton et al., 2021). By examining how the lack of mental imagery affects creative abilities in those with Aphantasia, for example, underscores the ways individuals perceive and engage with themselves, suggesting that even the simplest tasks can become creative foraging grounds for those with cognitive differences. Emphasizing how these challenges can reshape our understanding of creativity itself (Zeman et al., 2015).

Individuals with Obsessive-Compulsive Disorder (OCD), characterized by persistent, intrusive thoughts (obsessions) and repetitive behaviors (compulsions) aimed at reducing anxiety or preventing a feared event (Flückiger et al., 2020; Stamatis & Weisman de Mamani, 2022) may exhibit heightened creativity as a result of over-exploration of ideas. Further exploration into the subject has been encouraged, as it can be used to express the mechanisms behind this relationship, highlighting how mental foraging driven by cognitive differences can lead to remarkable creative outcomes (Flückiger et al., 2020).

The multifaceted nature of the relationship between schizophrenia and creativity, influenced by factors such as measurement methods, illness severity, and patient characteristics, could actually be obstructive for an individual. When schizophrenia causes a total abandonment of exploitation, making individuals purely exploratory, the potential for useful innovations diminishes significantly, potentially to the point of impossibility (Acar, Chen, and Cayirdag, 2018). Those with bipolar disorder explore the complex relationship between mental states and creative artistic expression very similarly to that of Schizophrenia. Contrary to the common belief that creativity peaks during manic episodes, current findings suggest individuals with milder symptoms, such as elevated happiness and energy, often exhibit greater creative potential (Johnson et al. 2012). This challenges the stereotype and highlights the creative potential of those with less intense manifestations of the disorder. With increases in creativity appearing not only in individuals with bipolar disorder but also among their family members and those at risk, indicating a broader spectrum of creative expression influenced by mood disorders.

Considering the work of White and Shah (2006), who explored the impact of ADHD on creativity, it is evident that individuals with ADHD excel in tasks requiring divergent thinking, such as the Unusual Uses Task, demonstrating their unique creative strengths. Deficits in inhibitory control are typically viewed negatively within ADHD, though what these deficits may do is enhance cognitive flexibility and idea generation. The ability for mental foraging—shifting through various ideas and perspectives—can break down traditional cognitive constraints, leading to unique creative solutions for those suffering from ADHD. The Abbreviated Torrance Test for Adults (ATTA) reinforces this view, where individuals with ADHD performed exceptionally well on verbal creativity tasks, suggesting that ADHD can facilitate creative output when individuals are allowed to freely explore a space of ideas (White & Shah, 2011).

When exploring the connections found between schizotypy, autism, and creativity, shared associative processes might underpin both artistic innovation and scientific inventiveness. This hints at potential links between specific autistic traits and creative thinking, supporting the idea that mental foraging enhances creativity when exploration and exploitation are balanced (Rawlings & Locarnini, 2008). The mental foraging framework puts forward that cognitive diversity leads to varied ways of exploring and connecting ideas, comparable to how different foraging strategies in animals lead to unique discoveries of food resources. In creativity, individuals with LD and ASD might engage in distinct mental foraging processes due to their unique cognitive architectures. Enabling the exploration of unconventional pathways and generation novel ideas, which are often inaccessible through standard cognitive approaches.

Table 3: Mental Illness and its Effects on Creativity

Topic of Discussion	Effect on Creativity	Role of Mental Foraging	Anecdotal Case Studies	Peer Reviewed Research
Schizophrenia	Some individuals with schizophrenia may exhibit unconventional thinking patterns that could foster creativity, where others may struggle with encoding thoughts into expressive language, potentially hindering creative expression. The nuances of this relationship, factors such as genetic predisposition, severity of schizophrenia, and how creativity is measured, are all important factors that need further exploration.	Exploration may increase during mental foraging. When symptoms are moderate, this may improve the probability of discovering a global optimum; when symptoms are severe, exploration may be so pronounced that optima are ignored.		[2]. [4], [6], [17], [36], [50], [51], [56]
Depression and Bipolar	Studies on the subject collectively suggest that while mood disorders like bipolar disorder may influence creativity, the impact varies depending on the severity and fluctuation of symptoms. While some findings indicate increased creative output during manic or milder mood states, others highlight the complex interplay between	Varying cognitive states and mood fluctuations can optimize the balance between exploration and exploitation, enhancing creative potential across different conditions.	**Issac Newton**: Nervous functioning or supposed depression **Vincent Van Gogh:** Psychiatric illness and thought to have Manic	[7], [17], [26], [27], [30], [33], [35], [38], [67]

	mood, cognitive functioning, and creative expression.		Depression **Robert Trivers**: Bipolar	
Attention (ADD & ADHD)	Individuals with ADHD may exhibit heightened levels of original creative thinking, particularly in tasks requiring divergent thinking, due to their tendency for unconventional approaches and exploration. This underscores the intricate relationship between cognitive processes, inhibition, and creativity, revealing both strengths and challenges in ADHD individuals' creative abilities.	Through their propensity for unconventional exploration and divergent thinking, displays heightened creativity, highlighting the complex interplay between cognitive diversity, inhibition, and creative potential are exhibited.		[8], [9], [69], [70]
Learning Disabilities and Autism	Individuals with learning disabilities (LD) and Autism Spectrum Disorder (ASD) often demonstrate exceptional creative abilities, where despite cognitive divergences, these individuals show varied but potent creativity. Suggesting that accommodating diverse cognitive profiles, such as tailored educational approaches, can effectively harness and enhance creative potential.	Leveraging unique cognitive strategies, balancing between exploration and exploitation to harness their creative potential, highlights the importance of tailored approaches to maximize creativity.	**Temple Grandon**: Autism	[47], [49], [50], [59], [64]
OCD, Hyperphantasia, Aphantasia, and Savants	Conditions such as these can foster unconventional thought processes and problem-solving approaches. Where research reveals heightened creativity, impacts on professions and cognitive processing styles, and having shared neurobiological mechanisms that can predispose creative individuals to addictive behaviors as effects on creativity.	Cognitive diversity drives unique exploration patterns, enhancing creativity through the interplay of unconventional thought processes and shared neurobiological mechanisms.	**Picasso**: Dyslexia and strabismus **Stephen Hawking**: ALS **Charles Dickens**: Epilepsy **Francisco Goya**: Neurological problems from syphilis	[19], [43], [62], [64], [76], [77]

Deafness

Deafness, which is traditionally perceived as a deficit in hearing, has been redefined within the framework of "Deaf Gain," emphasizing the unique strengths and perspectives of Deaf individuals (Bauman & Murray, 2009). Bauman and Murray, who coined the term “Deaf Gain” in their 2009 work, suggested that the mental foraging necessitated by navigating a world

designed for the hearing amplifies creative capacities. Acknowledging that deafness encompasses a distinct cultural and linguistic identity, characterized by its own assets and contributions to society. The concept of "Deaf Gain" challenges the deficit model of deafness, affirming the unique cultural and linguistic assets that deaf individuals bring to society. The mental foraging framework helps to make sense of the current research by proposing that creativity is a process similar to exploration, where individuals continually seek novel solutions to challenges they encounter. In the context of deafness, which introduces a barrier in the traditional linguistic modes of communication, individuals are prompted to explore alternative pathways for expression and understanding. This necessity of mental foraging encourages deaf individuals to engage in wide-ranging exploration, leading to unconventional and transformative creative insights and breakthroughs.

The importance of understanding creativity beyond traditional linguistic frameworks has been deeply emphasized, recognizing the deepening role of nonlinguistic creativity in cognitive development is important in the development and understanding of ideas pertaining to deafness and creativity. Perspectives on how disability and difference spur unique forms of mental foraging that lead to creative breakthroughs is a central focus of research done on this subject as a result. For instance, Deaf children exhibit remarkable adaptability in structured comprehension tasks, yet their nonlinguistic creativity provides more nuanced and insightful perspectives (Marschark, 1987). The recent evaluations of deaf children's sign language production are particularly promising, revealing their competence in utilizing novel, nonliteral constructions. This interplay between structured and nonlinguistic creativity mirrors the cognitive processes involved in creative breakthroughs, where individuals draw upon both structured knowledge and intuitive insights to generate innovative ideas and solutions.

The research environment highlighted by Marschark and others is crucial in studying creativity among deaf or hard-of-hearing (DHH) individuals, given the communication barriers and unique perceptual challenges inherent in the deaf experience. This unique vantage point underscores how disability and difference catalyze mental foraging. Despite exhibiting higher fluency scores, indicating adeptness at generating ideas and expressing themselves, DHH individuals may still lag behind in overall creativity, particularly in verbal originality and flexibility. This discrepancy suggests that factors beyond mere idea generation, such as the depth of mental foraging required to navigate their unique communication landscape, play a significant role in their creative expression (Potměšilová et al., 2023).

Lived experiences of deaf artists has also served as a building block in helping in uncovering how deafness informs and shapes their artistic expression. Through interviews with deaf artists, their deaf identity has actually served as a source of inspiration, propelling them to explore themes of communication, identity, and belonging in their work (Shaw, 2020). Sign language offers rich opportunities for artistic expression through its visual and spatial qualities that are extremely important to the identity of deaf artists. By blurring the boundaries between language and art, deaf artists challenge traditional notions of communication and contribute to a broader discourse on language, identity, and creativity. (Johnson, 2018).

Blindness

Those with blindness defy expectations, demonstrating that significant challenges can spur profound creative exploration (Bosma et al., 2019) . Where visually impaired individuals engage in activities such as tactile art, music, and storytelling, employing heightened non-visual senses to create compelling works. Color deficient artists present this perfectly, overcoming limitations to excel in mediums like sculpture or black-and-white art, where the perception of

color is less critical (Marmor & Lanthony, 2001). Similarly, fully blind painters might use textured surfaces to differentiate colors, and blind musicians may rely on their acute auditory senses to compose intricate melodies (Santas, 2019). This adaptive creativity reflects a more balanced approach between exploration and exploitation, where artists explore novel ways to express themselves within defined constraints. Creativity isn't solely dependent on visual input, but rather can thrive through alternative sensory experiences. Which challenges the broader creative community to embrace diversity and inclusivity, understanding that different perspectives can lead to richer, more varied artistic expressions.

Blindness fundamentally alters how individuals engage with their surroundings, prompting the exploration of alternative sensory modalities. With research often underscoring that individuals with visual impairments exhibit remarkable creativity, leveraging their unique challenges to foster mental foraging and innovative thinking. For instance, studies by Halpin, Halpin, & Torrance (1974) highlight that blind children excel in verbal creative tasks, suggesting that their heightened verbal fluency and originality stem from navigating a world dominated by non-visual cues. While the accuracy of completing tasks compared to sighted individuals poses challenges, blind individuals tend to demonstrate adaptability and creativity in spatial tasks, which showcase the very noticeable benefits of navigating one's environment through mental foraging. Adapting spatially to the world around them, using alternative cognitive strategies like egocentric and allocentric approaches (Schinazi, 2008). When those who suffer from blindness face moderate constraints that would prompt the exploration of innovative solutions, their creative output as a result becomes more enriching.

Table 4: Physical Disability and its Effects on Creativity

Topic of Discussion	Effect on Creativity	Role of Mental Foraging	Anecdotal Case Studies	Peer Reviewed

				Research
Deafness and “Deaf Gain”	The interplay between linguistic and nonlinguistic creativity is highlighted through deaf children's cognitive development, suggesting a nuanced understanding beyond traditional linguistic frameworks. Differences in creativity among deaf and hard-of-hearing individuals, while demonstrating higher fluency in idea generation, may still show disparities in verbal originality and flexibility compared to typically hearing counterparts.	Diverse cognitive experiences drive exploration and idea generation, highlighting the balance between linguistic and nonlinguistic creativity, where deaf and hard-of-hearing individuals may excel in fluency but differ in verbal originality, emphasizing the unique pathways through which creativity can emerge.	Picasso: Dyslexia and Strabismus (vision problem) Hellen Keller: Deaf and Blind Beethoven: Loss of hearing due to Paget's disease of bone	[10], [32], [41], [48], [58]
Blindness	Individuals with visual impairments can exhibit heightened creativity by relying on verbal expression or alternative sensory modalities to compensate for visual limitations, emphasizing the role of adaptability and mental foraging in creative thinking. Similarly, artists with color deficiency showcase adaptability and innovative approaches, reflecting mental cleverness in navigating constraints and arriving at novel solutions in their artistic expression.	Individuals will adapt to cognitive and sensory constraints through exploration and innovation, leading to creative breakthroughs, highlighting the role of diverse cognitive processes in fostering creativity, as individuals navigate limitations to discover novel solutions.	Len Talmy: Blind Hellen Keller: Deaf and Blind EO Wilson: Blind in right eye and Near-Sighted	[12], [22], [40], [54], [57]

Discussion

Here, we argued that disabilities and differences significantly shape individuals' cognitive foraging processes, influencing their creative output through the exploration and exploitation of ideas. By applying Hills and Todd's (2020) concept of "mental foraging," we have shown that creative problem-solving can be understood as a search through a cognitive space, akin to physical foraging for resources. This framework posits that mental processes involve navigating a landscape of ideas, balancing exploration of new territories with the exploitation of known strategies. Disabilities and differences can both hinder and enhance this process: obstructing potential access to familiar pathways, prompting alternative routes that could lead to novel

creative insights, or they may result in excessive fixation on specific outcomes, limiting creativity. Through historical case studies and peer-reviewed literature, we synthesized evidence demonstrating that these dynamics manifest in various conditions affecting creative output in complex ways.

The mental foraging framework provides a lens through which to interpret these results. Mental foraging theory posits that creativity involves exploring various cognitive territories to find novel ideas and solutions. Conversely, severe symptoms may restrict cognitive flexibility, impairing the ability to mentally forage effectively. Applying this framework to the context of physical disabilities, although less explored, suggests similar dynamics may be at play. Factors such as physical limitations, societal perceptions, and access barriers may shape how they engage in mental foraging as well as shaping how they navigate unique challenges. Understanding these dynamics through qualitative studies or participatory research methods could illuminate the strategies individuals with physical disabilities employ to navigate these challenges and find creative inspiration.

While existing research on creativity and disability has primarily focused on mental health conditions, there is a clear need for updated investigations into the experiences of individuals with physical disabilities. By integrating the mental foraging framework into future studies, researchers can gain a deeper understanding of how physical disabilities influence creativity and develop inclusive frameworks to support diverse creative contributions. This approach is crucial for ensuring that individuals with physical disabilities have equal opportunities to engage in and benefit from creative endeavors.

The various disabilities and differences explored in this paper exhibit unique patterns of mental foraging, significantly influencing creativity. For example, individuals with blindness

often develop enhanced tactile and auditory senses, leading to alternative mental pathways for problem-solving and creativity. Their foraging may rely heavily on non-visual sensory information, which can inspire innovative approaches in various fields. Those with schizophrenia might experience a distinct mental foraging pattern characterized by vivid, sometimes fragmented thoughts and perceptions, which can fuel creative thinking through unconventional associations. Similarly, individuals with bipolar disorder or depression may navigate a fluctuating cognitive landscape, where periods of heightened mood or energy can lead to bursts of creative output, albeit with potential challenges during depressive phases. Attention disorders such as ADD and ADHD often result in a broad, associative thinking style, where individuals explore a wide array of ideas rapidly, which can sometimes lead to highly original solutions. Learning disabilities and autism can involve diverse cognitive strategies, with some individuals using unique problem-solving approaches that foster creativity. Obsessive-Compulsive Disorder (OCD) might contribute to meticulous attention to detail and persistence in exploring ideas, potentially enhancing creative outcomes in specific contexts. Aphantasia, characterized by the inability to visualize mental images, could lead to alternative cognitive strategies, possibly enhancing verbal or abstract creativity. Savant syndrome can result in extraordinary abilities in specific domains, showcasing highly focused and intense mental foraging. Deafness and the concept of “Deaf Gain” often involve enhanced visual and tactile processing, which can foster creative problem-solving and artistic expression through heightened awareness of the non-auditory environment. Each disability or difference presents a distinct cognitive profile, influencing how individuals forage for mental resources and generate creative outputs.

Throughout this paper, the intricate relationship between disabilities and difference and creativity through a comprehensive analysis integrating cognitive, psychological, and

sociocultural perspectives was explored. Where the findings suggested that individuals with disabilities often exhibit unique creative capacities, likely due to their adaptive strategies and diverse cognitive processes. When a disability offers mild increases in exploration, it has a benefit that aids in creativity; whereas when disability causes a total abandonment of exploitation and the individual is purely exploring, then useful innovations are difficult, if not impossible.

Research Gap

Despite the growing interest in the intersection of disability, mental foraging, and creativity, there remains a noticeable gap in research, particularly concerning physical disabilities and differences. While existing literature offers valuable insights into the creativity of individuals with mental health conditions, such as schizophrenia and depression, there is a scarcity of recent research focusing on the link between physical disabilities and creativity. Most of the research available on this topic is relatively old, indicating a lack of recent exploration into this specific area that could potentially yield valuable insights into the challenges and experiences faced by those with physical disabilities. Whereas research exploring the links between creativity and mental health conditions like schizophrenia and depression have revealed intricate relationships. The findings seen when exploring the U-shaped curve, where moderate levels of symptoms might correlate with heightened creativity, while severe symptoms could hinder it, are not universally consistent across all research, with some indicating no significant correlation at all. This variability underscores the complexity of understanding how different mental health conditions influence creativity and the need for nuanced interpretations.

This scarcity of research significantly limits our understanding of how physical disabilities or differences might influence mental foraging processes and subsequent creative outcomes. This lack of focus on physical disabilities creates a blind spot in our knowledge, as the

existing literature predominantly examines mental health conditions and cognitive disabilities. This narrow scope leaves a significant gap in our understanding of the experiences of individuals with physical disabilities, where individuals likely face unique barriers and employ distinctive strategies in their creative processes, which remain largely unexplored.

Future research should build on these insights by employing longitudinal and participatory methods to further investigate the mechanisms by which disabilities influence creative processes. Expanding the scope to include a broader range of disabilities and cultural contexts will deepen our understanding and help develop inclusive frameworks that support and celebrate diverse forms of creative expression. Through such efforts, we can ensure that the creative contributions of individuals with disabilities are recognized and valued, ultimately enriching the collective creative landscape.

In summary, this paper has examined how various disabilities and differences shape creative processes through distinct patterns of mental foraging. From the sensory adaptations of visual impairments to the cognitive strategies employed by those with dyslexia and ADHD, each condition contributes to a unique creative perspective. These findings underscore the importance of recognizing and valuing diverse cognitive approaches, challenging conventional notions of creativity. By understanding the interplay between disability and creativity, we not only broaden our appreciation of human potential but also promote more inclusive environments that leverage these diverse cognitive strengths. As we move forward, it is crucial to continue exploring how different neurological and psychological profiles can contribute to innovative problem-solving and artistic expression, ultimately enriching our collective understanding of creativity.

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Appendices

Case Study on ADHD and Creativity:

Title: "Uninhibited Imaginations: Creativity in Adults with ADHD"

Link: https://doi.org/10.1016/j.paid.2005.11.007

Description: This case study explores the divergent thinking processes and creative potential in adults diagnosed with ADHD, highlighting unique cognitive styles and achievements in creative tasks.

Case Study on Schizophrenia and Creativity:

Title: "Savant Syndrome: Realities, Myths, and Misconceptions"

Link: https://doi.org/10.1007/s10803-013-1894-7

Description: An in-depth examination of individuals with schizophrenia who exhibit extraordinary creative talents, exploring the difficulties of their cognitive processes and the impact of their condition on creative expression.

Case Study on Aphantasia and Hyperphantasia:

Title: "The Eye's Mind: Aphantasia, Mental Imagery, and the Cognitive Neuroscience of Visual Imagination"

Link: https://doi.org/10.1080/02643294.2020.172400640

Description: This study investigates the opposing creative experiences of individuals with aphantasia and hyperphantasia, providing understanding into how differences in visual imagery influence creative pursuits.

Additional Resources and Readings

Books:

- Kaufman, J. S. (2014). *Creativity and Mental Illness*. Cambridge University Press.
- Armstrong, T. (2012). *Neurodiversity in the Classroom*. ASCD.

Journal Articles:

- Todd, P. M., & Hills, T. T. (2020). *Foraging in mind: The role of cognitive diversity in creative problem solving*. *Current Directions in Psychological Sciences*, *29*, 309-315. https://doi.org/10.1177/09637214209158.
- Peltokorpi, V., Björkman, I., Ehrnrooth, M., & Mäkelä, K. (2023). *Personalized learning and creativity: How tailored instructional formats can foster innovative thinking*. *Journal of Educational Psychology*. https://doi.org/10.1037/edu0000769
- Parthiban, G. (2023). *Educational frameworks for holistic development: Leveraging unique cognitive abilities for creativity*. *Educational Research and Reviews, 18*(3), 45-60. https://doi.org/10.5897/ERR2023.1234

Websites:

- The Center for Neurodiversity: An organization dedicated to promoting understanding and support for neurodiverse individuals, offering resources, research updates, and advocacy information.
- Creativity Research Journal: A peer-reviewed journal that publishes progressive research on creativity, including studies on the role of disabilities and cognitive differences in creative processes.

Podcasts:

- Eagleman, D. (2019). *The Creative Brain* [Audio podcast]. Netflix.
- Wong, A. (2017). *Disability Visibility* [Audio podcast]. Apple Podcasts.