



AN EXPLORATION OF “TEENAGE LIMBO” IN CHEMICAL HEARTS IN CONNOTATION TO PSYCHOSIS, NEUROTRANSMITTERS AND NEUROCHEMICALS

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Abstract

“Chemical Hearts,” released in 2020, is a romantic drama film helmed by director Richard Tanne. The film adaptation draws inspiration from the novel “Our Chemical Hearts,” penned by Krystal Sutherland. This analysis explores the depiction of psychosis in the story and its effects on the main characters’ lives by analyzing the narrative and character development. It investigates the intricate psychological aspects, difficulties, and outcomes related to psychosis, providing insights into the accuracy of its portrayal and the potential implications for fostering understanding and empathy. Psychosis is a psychological disorder marked by a detachment from reality, often accompanied by hallucinations, delusions, and impaired cognitive functioning. The study examines how psychosis affects the protagonist's perception of the world, emotional state, and decision-making abilities. The captivating effects of Dopamine and Serotonin add credibility to enhance the understanding of teens’ psyche. The ultimate goal is to comprehend various conditioning and traumatic infliction in young minds.

Keywords: Psychosis, Hallucination, Delusion, Dopamine and Serotonin.

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1. Introduction

Teenagers and love have always been closely intertwined, as adolescence is a period marked by significant emotional and social development. Love during the teenage years is a unique and transformative experience that shapes individuals and their understanding of relationships. It is a time when teenagers begin to explore and navigate the complexities of romantic feelings, attraction, and the pursuit of intimate connections. Adolescents frequently encounter their initial romantic relationships during this stage of their lives. These relationships encompass a spectrum of experiences, spanning from innocent infatuations and crushes to more profound and committed unions. They offer teenagers a chance to gain self-awareness, discern their personal preferences, and explore their desires in a romantic partner. Teenage love facilitates the development of crucial abilities such as effective communication, empathy, and compromise, all of which play a fundamental role in fostering healthy relationships in the future. Throughout adolescence, teenagers engage in a process of self-exploration, contributing to a period of personal discovery. Love and relationships exert a notable influence on the formation of their self-perception and overall development. Teenagers, through love, acquire a more profound comprehension of their emotions, longings, and limitations. They acquire knowledge about intimacy, trust, and the significance of emotional sustenance. Teenage romantic relationships often entail difficulties and uncertainties. Adolescents may struggle with various obstacles such as peer pressure, societal expectations, and parental influence, all of which can impact their relationships. Balancing academic obligations, extracurricular activities, and maintaining healthy relationships can pose challenges for teenagers. Additionally, their lack of experience and maturity can

contribute to misunderstandings, conflicts, and emotional distress.

"Chemical Hearts" Neurotransmitters and Neurochemical

Hormones play a crucial role in the lives of adolescents, impacting diverse facets of their physical, emotional, and behavioral maturation. The period of adolescence is characterized by a substantial surge in hormonal activity, primarily governed by the hypothalamus, pituitary gland, and sex hormones. Gonadotropin-releasing hormone (GnRH) is a pivotal hormone in this mechanism, as it triggers the secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) from the pituitary gland. These hormones are accountable for the emergence of secondary sexual characteristics, encompassing breast growth in females and the deepening of the voice and the growth of facial hair in males. Estrogen and progesterone serve as the predominant sex hormones in females, whereas testosterone fulfills this role in males. These hormones assume a critical function in the progression and maturation of sexual attributes. They contribute to the growth and development of reproductive organs, the regulation of the menstrual cycle in females, and the establishment of secondary sexual characteristics in both genders. In addition to their physiological impacts, hormones also exert influence over the emotional and behavioral aspects of teenagers. "Psychosis is the diagnostic category most likely to have experienced severe childhood trauma." (Gold 19) Variations in hormone levels can contribute to mood swings, heightened emotional states, and heightened sensitivity. These hormonal fluctuations occasionally give rise to mood disorders, including depression or anxiety, which are more prevalent during adolescence. Hormones also exert an influence on the emergence of romantic and sexual attractions. The surge of sex hormones can trigger heightened sexual desire and the

development of romantic interests. These hormones contribute to the shaping of the adolescent brain and its response to social and emotional stimuli, including the formation of attachments and the experience of romantic love. However, it is crucial to acknowledge that while hormones have a significant impact on teenagers' lives, they are not the sole determinants of their behavior or emotions. Other factors such as the social environment, personal experiences, and individual differences also contribute to their overall development and well-being. Understanding the role of hormones in the lives of teenagers can offer insights into the challenges and transformations experienced during adolescence. This understanding underscores the importance of providing teenagers with appropriate education, support, and guidance to navigate this transformative phase of their lives. "Chemical Hearts," a compelling romantic drama directed by Richard Tanne and released in 2022, delves into the intricate and frequently misconstrued realm of psychosis. Through its powerful and sensitive portrayal, the film sheds light on the challenges encountered by two teenagers as they navigate the complexities of love, loss, and the profound impact of mental health issues on their lives. By exploring a subject that is often stigmatized and disregarded, "Chemical Hearts" brings attention to the underappreciated aspect of mental health. "...psychotic when their mental functioning is sufficiently impaired to interfere grossly with their capacity to meet the ordinary demands of life." (Waters 22) Psychosis refers to a mental health disorder marked by a detachment from reality. People with psychosis may display symptoms like hallucinations, delusions, disorganized thinking, and limited awareness of their condition. "We feel the term 'psychosis' is helpful in outlining a set of particular experiences (e.g. hearing voices, paranoia), but would agree that it has its limitations." (Gianfrancesco 11) The

causes of psychosis can vary and include conditions such as schizophrenia, bipolar disorder, and severe depression. The purpose of this investigation is to understand the psychological and behavioral reactions among the protagonists in relation to neurotransmitter systems. The neurotransmitter system investigates the roles and functions of specific neurotransmitters in various psychological processes, such as reward and motivation, learning and memory, stress and anxiety, and mood regulation. It also focuses on the neurochemical imbalances. The neurochemical imbalances examine how alterations in neurochemical levels or dysregulation of specific neurochemical systems may contribute to the development and maintenance of mental disorders, such as depression, anxiety disorders, schizophrenia, and substance use disorders. "You are never more alive than when you're a teenager. Your brain is flush with chemicals that can turn your life into a story of epic proportions." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) The complex interplay of various hormones, neurotransmitters, and social factors. One hormone that plays a significant role in this context is testosterone in males and estrogen in females. Males generally exhibit higher concentrations of testosterone, whereas females typically have higher levels of estrogen. These hormones have a significant impact on diverse facets of human behavior, encompassing the inclination to participate in social interactions, including conversing with individuals of the opposite sex. When Grace Town expresses "I don't want to be an editor." Henry Page utters "It's just a good opportunity for a writer, I guess." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Testosterone exerts influences on behavior by facilitating assertiveness, confidence, and a propensity for risk-

taking, thereby potentially enhancing the inclination to engage in conversations and interactions with individuals of the opposite sex. "I love you as certain dark things are to be loved, in secret, between the shadow and the soul." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Testosterone can impact sexual attraction and drive, thereby serving as a motivating factor for individuals to actively pursue communication and connection. Estrogen in females has the potential to shape social behaviors and emotional expression. It possesses the capacity to augment empathy and foster a yearning to establish connections with others, including individuals of the opposite sex. Furthermore, estrogen can impact communication skills, encompassing verbal fluency and nonverbal cues, which are instrumental in both initiating and sustaining conversations. It is crucial to acknowledge the intricate nature of the impact of hormones on behavior, as it is subject to the influence of diverse factors, including individual variances, cultural norms, and personal experiences. Social factors, upbringing, and personal motivations equally contribute significantly to the inclination to engage in communication with individuals of the opposite sex. The signaling molecules are responsible for transmitting information between nerve cells. The brain had an extraordinary sensitivity to these neurotransmitters, allowing for exceptional control over their release and effects. The teenage years brought forth a surge of emotions and experiences, which intensified the potency of their abilities. Each neurotransmitter held distinct magical properties. The power to harness and manipulate them. "Dopamine is one of the instigators of love, the source of the spark that sets off all that follows. But for love to continue beyond that stage, the nature of the love relationship has to change because the chemical symphony behind it changes." (Lieberman 9) when dopamine surged

through the brain, their magical abilities became heightened, allowing them to enhance physical strength, agility, and perception. This gave them an advantage in combat or athletic endeavors, making them formidable in battles or competitions. "Dopamine isn't the pleasure molecule, after all. It's the anticipation molecule." (Lieberman 9) When dopamine levels increased within the individual's brain, their magical capabilities were augmented, resulting in enhancements in physical strength, agility, and perception. This provided the individual with a distinct advantage in combat or athletic pursuits, rendering them formidable in competitive scenarios. An abundance of serotonin in the individual's system redirected their magical abilities towards empathy and the manipulation of emotions. "...antagonists have a significant therapeutic value in treating psychiatric conditions such as schizophrenia, which result due to overexcited dopamine organization." (Sarat Chandra Yeniseti. Dopamine : Health and Disease. Intechopen 12) This enabled them to establish deeper connections with others and gain a profound understanding of their emotional states, potentially exerting influence over their feelings and moods. The release of norepinephrine, a neurotransmitter associated with the fight-or-flight response, triggered heightened reflexes and bestowed temporary bursts of speed and heightened senses to the individual. This effect empowered them with exceptional scouting and tracking abilities, particularly when navigating hazardous environments. As the individual delved deeper into their magical abilities rooted in neurotransmitters, they unveiled a concealed realm that served as the origin of these powers. Within this realm, they encountered formidable beings or deities who personified the forces associated with neurotransmitters. These entities bestowed upon the individual wisdom, guidance, or challenges to facilitate their personal growth and advancement. "Information

concerning emotional or external stressors appears to be conveyed to the rostro-lateral periL.C via limbic projections, while inputs transmitting events related to autonomic and nociceptive processes seem to impinge upon the ventromedial aspect of the periL.C." (Ordway 34) Through their numerous adventures, the individual not only honed their magical talents but also developed a comprehensive understanding of the delicate equilibrium of neurotransmitters within themselves and others. "Neruda's love for her doesn't come from, like, uh... sunshine and roses and cliché stuff. You know, it comes from, um, her... flaws and her imperfections, like, darker places." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) This transformative period of adolescence encompassed profound self-discovery, personal maturation, and the realization that their magical abilities were intricately entwined with their emotional well-being and the complex mechanisms of the human brain. Henry Page being a hopeless romantic, who expresses his feelings through his writing, finally expresses his feelings on Grace Town through poetic words "Where do you go to? Why do you go? What are your colors? What are your moods? To see you, I turn. To know you, I burn." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) the journey of the individual, driven by their connection to neurotransmitters, evolved into a captivating narrative of self-exploration, companionship, and the profound influence of emotions on their magical prowess, within a world where the boundaries between science and magic converged. ...the teenage brain goes through an upgrade before it matures to an adult brain _ the upgrade is like an explosion of connections and synapses as we figure out what's right. Or wrong. What we like, what we don't like. You know, who we want to be. Each page of the issue is the brain refining itself, figuring itself out, until eventually it's out of limbo. (Chemical

Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Traumatic events, like car crashes, can have a profound effect on an individual's psychological state. Although trauma can potentially play a role in the emergence of different psychological disorders, including psychosis, it should be emphasized that not all trauma survivors will develop psychosis. Psychosis is a multifaceted condition influenced by various factors, and trauma is merely one among numerous potential triggers. According to research, there is evidence of a link between trauma and an elevated likelihood of developing psychosis, especially among individuals who already have a predisposition to such conditions. "I did some of my physical therapy in a pool. Nine months ago, the car swerved coming around a bend and hit the rock barrier and the car flipped." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Trauma can function as a stressor, which can activate or intensify pre-existing vulnerabilities in susceptible individuals.

The precise mechanisms by which trauma impacts the development of psychosis are not yet fully comprehended, but certain theories propose that it disrupts the brain's stress-response system, modifies the functioning of neurotransmitters, or influences an individual's perception of reality. "...it reminds me that people are just the ashes of dead stars. We're just a collection of atoms that come together for a brief period of time, and then we fall apart. When all of this is over and we're dispersed back into nothingness..." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Grace had pre-existing vulnerabilities and a genetic predisposition to psychosis, the trauma resulting from the car crash could potentially play a role in its development. However, it is crucial to acknowledge that psychosis is a multifaceted condition influenced by a combination of genetic, environmental, and

biological factors. Experiencing a car crash has the potential to induce symptoms of post-traumatic stress disorder (PTSD) or similar conditions in certain individuals. One prevalent symptom associated with PTSD is the occurrence of intrusive memories or flashbacks, wherein individuals repeatedly re-experience the traumatic incident. This phenomenon may create the perception that these individuals are emotionally and cognitively stuck in the past, unable to fully engage with their present circumstances. Individuals who are living in the past as a result of trauma encounter challenges in progressing beyond the traumatic event and encounter difficulties in wholeheartedly embracing their current environment and experiences. They may incessantly ruminate on the traumatic incident, encountering intense recollections, distressing dreams, or intrusive thoughts that continually draw them back to the event. This persistent fixation on the past can significantly impede their daily functioning and overall quality of life. A car crash can result in both physical and emotional trauma, leading to a range of effects on the body, including alterations in neurotransmitter and hormone levels. The specific neurotransmitters and hormones impacted may differ from person to person. Traumatic incidents can induce the secretion of stress hormones, such as cortisol and adrenaline, which mobilize the body for the fight-or-flight response when a threat is perceived. "Did you know that, uh, heartbreak triggers the same areas of the brain as physical pain? When I think about him leaving me, my brain sends a distress signal to my nervous system. And it elevates my blood pressure and my heart rate, giving me chest pains." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Following a car crash, the continued release of stress hormones can contribute to intensified feelings of anxiety, heightened vigilance, and increased emotional arousal. These responses may present challenges for Grace

in terms of overcoming the traumatic experience and moving forward. Noradrenaline, or norepinephrine, is a neurotransmitter involved in the physiological stress response of the body. Heightened levels of noradrenaline can be linked to increased arousal, the consolidation of memory, and the encoding of emotional memories. In the context of a car crash, elevated noradrenaline levels may enhance the intensity and durability of traumatic memories, thereby posing difficulties for Grace in maintaining present-focused attention. Serotonin, a neurotransmitter responsible for modulating mood, emotions, and sleep, can be affected by trauma, leading to disturbances in serotonin functioning. Such disruptions may contribute to the emergence of symptoms like depression, anxiety, and intrusive thoughts. Changes in serotonin levels can hinder an individual's capacity to process and recover from traumatic experiences. Similarly, dopamine, a neurotransmitter associated with motivation, reward, and pleasure, can be influenced by trauma, potentially causing modifications in the brain's reward system. This leads to challenges in experiencing pleasure, reduced motivation, and a sense of detachment from present circumstances.

2. Conclusion

"The teenage years are...limbo. You're somewhere between being a kid and an adult, and the world, uh, tells you to be mature and express yourself, but the minute that you do, it tells you to shut up. The thing is, adults are just scarred kids who were lucky enough to make it out of limbo alive." (Chemical Hearts. Directed by Richard Tanne, Amazon Studios, 2020.) Chemical Hearts is a romantic drama film centered around the maturation process of its characters, based on Krystal Sutherland's novel *Our Chemical Hearts*. The narrative revolves around two final-year high school

students who, despite their personal struggles, are inexplicably drawn to one another. The film primarily follows Henry Page, an ambitious and contemplative student who has never experienced love before. As the editor of the school newspaper, Henry aspires to gain admission into a prestigious college. However, his world undergoes a transformative change when Grace Town, a transfer student with a noticeable limp and an air of mystery, arrives at their school. Captivated by Grace's enigmatic demeanor, Henry becomes resolute in his quest to uncover her secrets and comprehend her past. Over time spent together, Henry finds himself falling in love with Grace. Nevertheless, he soon realizes that Grace is grappling with emotional wounds and trauma from a previous relationship. Henry finds himself torn between his longing to assist Grace in her healing process and his own desire for a reciprocal romantic connection. This internal conflict prompts him to grapple with the complexities of love, loss, and the significance of acceptance. As their bond deepens, Grace eventually confides in Henry about her tragic history, leading both of them on a journey of self-discovery and emotional healing. *Chemical Hearts* explores several themes throughout the film, including first love, heartbreak, grief, and the profound impact that relationships can have on individuals. The movie delves into the intricate nature of young love and the emotional hurdles one faces while navigating the path to healing and self-acceptance. Ultimately, the story serves as a poignant reminder that love can simultaneously be beautiful and heart-wrenching, and it is through these experiences that individuals learn and grow. The movie highlights the recurring theme of youth and suicide in various literary works. Characters like Romeo and Juliet, Werther, Holden, and Conrad are depicted grappling with thoughts of self-harm. The dialogue then delves into the challenges faced by teenagers, including parental and

peer pressure, as well as negative body image influenced by social media. It emphasizes that even well-adjusted individuals from supportive backgrounds can find adolescence difficult. Furthermore, it explores the emotional turmoil experienced when separated from or losing a loved one, drawing parallels to the literary examples. The dialogue suggests that authors, spanning from Shakespeare to Salinger, are compelled to address the painful reality of being young, which can lead to overwhelming feelings of despair. The speaker reflects on their own contemplation of suicide and the detrimental effects of keeping such thoughts hidden. They advocate for open discussion about these issues, emphasizing the importance of addressing all personal struggles. Teenage limbo is an intermediate stage marked by ambiguity and transition that is commonly encountered by adolescents during their teenage years. This particular period is characterized by a distinct sensation of being situated between childhood and adulthood, wherein individuals have outgrown childhood yet have not fully matured into adults. During this liminal phase, teenagers often experience uncertainty regarding their life path, encounter difficulties in shaping their identities, and perceive themselves as being trapped or in a state of flux. They grapple with various challenges including navigating interpersonal relationships, assuming new responsibilities, conforming to societal expectations, and undergoing personal growth. The phase of teenage limbo encompasses a period of exploration, self-discovery, and substantial emotional and psychological changes as individuals endeavor to ascertain their position and purpose within the wider world.

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