Dark Humor: The Brain's Necessary Evil

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Perhaps I know best why it is man alone who laughs; he alone suffers so deeply that he had to invent laughter.
-Nietzsche, The Will to Power

Introduction

People often indulge in dark humor, a psychological state evoked by jokes with immoral or repulsive content (Bloom, 2010). Why do people enjoy making light of grotesque topics such as death or sex? In this paper, I argue that while dark humor violates moral principles, the dark humorous state is a necessary source of chemical pleasure.

Background

1.1. Humor

One usually enters a humorous state through incongruency detection and resolution. In other words, individuals recognize an event's inconsistency with their expectations, thus evoking surprise and a piecing-together process, all to find a joke funny (Suls, 1972). For example, why can't a bicycle stay standing? It feels "tired." To break down this joke, "tired" is a play on two definitions: a bicycle's tires and the human feeling of being tired. The "aha!" moment is the resolution that one arrives at after reconstructing this joke in their head.

Be that as it may, individuals more frequently indulge in atypical humor, which is evoked by ideas that cannot be pieced together (Ruch, 1992). For instance, people may find it hilarious to witness a dog using curse words towards its owner. Realistically, dogs cannot speak like humans do, let alone use vulgar language. This incongruency can only be resolved by recognizing absurdity of the situation, rather than reconstructing the joke through logical means.

Dark humor mixes immorality into the typical and atypical. Sexual jokes commonly evoke the typical dark, humorous state since the mention of sex outside of intimate settings is incongruent with morals (Russell, 1999). To demonstrate, what is the first thing a man puts in a woman when they get married? The wedding ring! The incongruency of this joke lies between the question's suggestive nature and the actual answer. The question's phrasing intends to motivate an answer related to sexual intercourse, but the answer defies that expectation by providing a literal rather than suggestive answer, the wedding ring. On the dark side of atypical humor, people joke about ideas that evoke repulsive feelings in most people, such as having sexual motivations toward their dog. This example, like many other dark jokes, transcends the absurdity of the normal atypical humorous state by violating moral principles.

It is quite natural to question why people indulge in these psychological states. However, one must comprehend the neurobiological grounds for humor and its behavioral expression before understanding the benefits of jesting at such moral defiance.

1.2. Chemical Motivation

Humor and its ensuing laughter induce the release of a brain chemical called dopamine, which exerts pleasurable sensations. More specifically, humorous laughter activates the mesolimbic pathway, a dopamine-abundant brain circuit that essentially motivates behaviors for obtaining sources of pleasure (Ikemoto, 2010). Azim and colleagues conducted fMRI studies on a sample of 10 men and 10 women. During the scans, each participant was presented with a cartoon, and they pressed a button if they found it funny. Subsequently, the subjects ranked each cartoon's hilarity on a 1-10 scale. The researchers compared fMRI results with participants' comedic ratings to determine whether blood flow changes in specific brain structures corresponded with funniness. Consequently, participants exhibited higher blood flow in the nucleus accumbens, a key component of the mesolimbic pathway, the funnier they perceived the cartoon (Azim et al., 2005). Although blood flow is an indirect measure of brain activity, the results suggest that dopaminergic activation in a brain structure within the mesolimbic pathway contributes to humor induction.

Another study further substantiates dopamine's involvement in the humorous state. Researchers applied deep brain stimulation (DBS) to treat a patient's involuntary tremors. As the participant experienced a higher amount of stimulation, the patient's display of positive emotion increased as a smile grew into laughter. MRI and CT scans showed activation patterns in a set of connections called the medial forebrain bundle (MFB), which regulates behaviors that approach sources of pleasure (Coenen et al., 2022). One of the MFB's offshoots, the superolateral branch, converges with key structures of the mesolimbic pathway (Coenen et al., 2009). These results show that laughter coincides with the activation of the MFB, which includes connections with the dopaminergic pleasure pathway. Together with the findings of the previous study, dopaminergic release within the mesolimbic pathway likely rewards humor evocation and induces the humorous execution of laughter.

1.3. Chemical Delight and Relaxation

Serotonin

Moreover, humorous laughter elevates levels of serotonin, the brain molecule implicated in mood regulation (Mohammad-Zadeh et al., 2008).

The effects of humor on serotonergic release are best perceptible through changes in depressive symptom severity. 17 elderly participants with impaired motor or cognitive function engaged in laughter therapy. They watched four weekly 30-minute performances by a Japanese stand-up comedian. Researchers gathered the participants' blood samples one day before the first show and the day after the last show to measure serotonin concentration, blood pressure, and heart rate. The participants additionally filled out the Geriatric Depression Scale 15 (GDS-15), a 15-question survey that gathers subjective feelings about daily life and measures depressive symptoms. Higher scores translate to higher depressive severity (Kuru & Kublay, 2017). Results showed that the blood samples collected after laughter therapy exhibited higher serotonin levels than the ones extracted one day before the procedure. Correspondingly, participants scored lower on the GDS-15 after all four comedic performances (Yoshikawa et al., 2018). As demonstrated by the patient's blood samples and depressive scores after laughter therapy, laughter arising from a humorous state increases serotonergic levels to improve mood.

Similarly, a 2005 Japanese study applied laughter therapy to 64 middle-aged women diagnosed with depression. They completed a three-stage program that included education about laughter and activities that provoke laughter, such as dances, smiling exercises, applause, and positive affirmations. This intervention occurred five times a week over a 2-week period. The researchers collected the women's blood samples before the first session and after the last session. Consequently, the women showed higher blood serotonin levels and fewer depressive symptoms after the last intervention. Post-procedural analyses confirmed that serotonergic variation mediated the effects of laughter therapy on depressive symptoms (Cha & Hong, 2015). Correspondent with the work by Yoshikawa and colleagues, these results show that humor evocation, as well as laughter production, heightens mood through the increased release of serotonin.

Beta-Endorphin

In addition to serotonin, humorous laughter increases the release of beta-endorphin, a protein that helps increase pain tolerance (Sprouse-Blum et al., 2010). To elaborate, beta-endorphin binds to a type of receptor called a micro-opioid receptor (MOR) to create an excess of do-

pamine that combats pain with pleasure (Miller et al., 2014). Research supports the notion that the effects of beta-endorphin result from humor induction. 68 patients receiving hemodialysis, a procedure that filters the blood to compensate for kidney failure (Elliott, 2000), participated in sixteen 30-minute biweekly laughter yoga sessions. During this exercise, participants were instructed to tell jokes to each other while forcing their laughter so they could eventually produce natural laughter. The researchers collected blood samples to measure beta-endorphin levels before the first session and after the last session. As a result, patients had lower blood endorphin levels after all 16 sessions (Özer & Ateş, 2021). Based on these findings, humorous laughter, even when forced, increases the release of beta-endorphin. This increase in concentration causes heightened dopaminergic levels that evoke a pleasant counter to pain signals.

Cortisol

Additionally, humor-induced laughter reduces levels of cortisol, a hormone that circulates throughout the body to modulate chronic stress in various contexts, including endurance activities, shift work, major life events, and emotional hardship (Staufenbiel et al., 2013). One study examined the relationship between cortisol and humorous laughter. 120 healthy university students participated in one of three activities: laughter yoga, comedy movie, and reading. Researchers collected salivary samples immediately before, immediately after, and 30 minutes after participants performed their assigned activity. In effect, the students who engaged in laughter yoga and the comedy movie consisted of lower salivary cortisol levels than those who read a book (Fujisawa et al., 2018). As implied by the results, laughter alleviates stress through the reduction of cortisol levels**.**

1.4. Chemical Sociality

Another brain molecule, oxytocin, motivates group laughter. The brain circuit associated with social behavior consists of numerous nodes that are abundant in neuropeptides (proteins associated with brain function) (Albers, 2015). One of these proteins, called oxytocin (OT), influences prosocial behaviors (behavior that benefits others), including interpersonal attachment (Jurek & Neumann, 2018). Recent studies demonstrate that the induction of humor and laughter are oxytocin-mediated and, therefore, prosocial behaviors. Participants viewed a brief clip of a comedy television show with a close friend after receiving intranasal OT or a placebo (a substance that has no effect). Consequently, the group that received OT during the show laughed more than those who consumed the placebo. This evidence substantiates that laughter is a prosocial behavior and that oxytocin promotes social laughter. Unlike other brain chemicals involved in humor, oxytocin concentrations did not change in response to laughter; rather, they induced the humorous state to eventually produce laughter. Therefore, oxytocin likely contributes to the initiation rather than the reinforcement of group laughter.

Considering dopamine's involvement in pleasure motivation through the mesolimbic pathway (Ikemoto, 2010), oxytocin likely interacts with dopamine-abundant brain regions to prompt social laughter. Hung and colleagues performed multiple experiments on rat models to test this notion. In one of the procedures, the control group remained untouched while the other received an injection to inhibit neurons within an oxytocin-abundant structure called the paraventricular nucleus (PVN). These neurons communicate with the ventral tegmental area (VTA), a key structure of the mesolimbic pathway. 2 weeks after inhibition; the researchers performed a socially conditioned place preference (CPP) test to determine whether the rats prefer to stay in an environment associated with social interaction. As a result, rats that received inhibitory injections to the PVN spent significantly less time in the social context than the control group. These experimental findings suggest that oxytocinergic connections must interact with pleasure motivation circuitry to elicit social behavior. Since the former study conveys humorous laughter as a social behavior, collective humorous expression likely follows this same neurobiological mechanism.

Furthermore, endorphinergic release reinforces oxytocin-dopamine-mediated laughter within a social setting. One 2017 study confirms this notion. Twelve healthy male participants engaged in a social laughter manipulation experiment. Each subject spent 30 minutes in a room without any social contact. Then, they provided baseline brain activity via PET scans. Subsequently, participants spent another 30 minutes watching a pre-arranged series of comedic YouTube clips with two close friends. A video camera recorded every session while a microphone tracked the number of laughter outbursts. The researchers conducted another set of PET scans immediately after social laughter, and they quantified the number of micro-opioid receptors (MORs) (including endorphinergic receptors) in various brain regions. Relative to baseline, PET images after viewing the clips with close friends showed a higher release of endorphins and an increased presence of MORs in structures that comprise the dopaminergic pleasure pathway. As supported by the results, laughter increases the availability of MORs to allow more endorphins to bind and induce dopaminergic release. This gives rise to pleasurable sensations that counteract pain and reinforce laughter during social interaction.

In the rest of this paper, I utilize the evidence of laughter's chemical pleasures, as revealed by neuroscience, to explain why dark humor is a necessary source of reward. I initially argue that dark humor is a gratifying experience, and then I assert that this psychological state combats distressing feelings such as pain or stress. Subsequently, I refute possible counterarguments to further support my assertion. Finally, I provide caveats and concluding remarks.

Dark Humor is the Brain's Necessary Evil

2.1. Moral defiance is a pleasant experience.

Despite its morally defiant nature, dark humor allows the brain to release chemicals that create pleasurable sensations. One study provides evidence for this notion. Thirty male volunteers viewed 32 single-frame sexual humor cartoons while under an fMRI. The procedure consisted of two phases: anticipation and outcome. During the anticipatory phase, the cartoon appeared for 1000 ms and ensued with a 2500 ms anticipatory delay period. Subsequently, the outcome phase required participants to determine whether a target number was smaller or larger than 5. They witnessed the correctness of their answer and then received either an erotic, monetary, or non-reward outcome. Finally, participants gave a rating pertaining to their enjoyment of each sexual humor cartoon on a scale of 1-4, with 4 indicating the greatest liking. To supplement fMRI findings, the researchers utilized dynamic causal modeling (DCM) to establish the directionality of brain activity. Consequently, scans showed that volunteers' appreciation for the sexual cartoon corresponded with brain cell projections from the ventromedial prefrontal cortex and the amygdala, both of which are structures within the mesolimbic pathway (Chan & Chou, 2022). As implied by the results, individuals recognize that sexual jokes are incongruent with conventional ideas since they are taking the concept of sex outside of intimate contexts. Therefore, their appreciation for the joke triggers a dopaminergic release that creates pleasant experiences.

2.2. Moral incongruency provides relief.

Moreover, dark humor helps alleviate stress and pain, despite its grotesque range of topics. One study shows that the evocation of dark humor functions as emotional support throughout the progression of fatal medical conditions. Twenty-one people each related to a patient diagnosed with brain cancer participated in 40 to 60-minute interviews. Each session was recorded and transcribed with the participants' consent. Interviewers began by asking for a description of the participants' experience as someone related to a person diagnosed with brain cancer. Interviewers referred to humor as a response to or reflection on a participant's experience but did not explicitly ask about humor. After analyzing the recordings, the researchers deduced that participants commonly evoked humor to manage emotions toward their loved one's loss of independent function as well as their health trajectory (Heinsch et al., 2022). This analysis shows that people do not indulge in evoking a humorous state towards their loved one's fatal trajectory; rather, they need humorous laughter to stabilize their mood through serotonergic release and alleviate their stress by reducing cortisol levels. Equally important, laughing at the situation increases endorphin levels to ultimately combat their anguish with dopamine-induced pleasure.

of humorous laughter through interactions between a male student and their therapist. With the client's consent, the researchers recorded 330 sessions that each averaged a 53-minute duration. However, they only picked seven sessions to indicate the early, middle, and late phases of therapy. The investigators repeatedly watched the seven sessions to gather the number of humorous laughter episodes. Then, they analyzed each occurrence as well as its context. Consequently, the researchers found that the client produced humorous laughter for self-regulation. To elaborate, the client turned his gaze away from the therapist, an action that allotted time for the regulation of their negative emotions while discussing difficult topics (e.g. career path or depressive symptoms) (Bänninger-Huber & Salvenauer, 2022). These observations convey that people use dark humor to control their mood and stress levels while engaging with emotionally charged topics such as their depression. Recognizing the incongruency of ridiculing depression induces a serotonergic release and decline in cortisol levels that improve the ability to discuss personal hardships.

2.3. Dark humorous states create a shared affinity.

Although dark humor violates moral principles, the collective evocation of dark humorous states makes people feel connected with each other.

In her personal account, Rachel Sobel jested with her medical team about the funniest cases that they called in for overnight, such as a patient catching fire (Sobel, 2006). This banter demonstrates moral incongruency since it is considered wrong to talk about patient cases outside of the healthcare setting, especially in a comedic manner. Drawing upon the neurobiology of laughter, recognizing this moral inconsistency likely induced an interaction between the dopaminergic pleasure and oxytocinergic social circuits, initiating humorous laughter. This collective expression of the dark humorous state triggered a release of endorphins that increase dopamine levels to create a pleasurable sensation that combats the stress of intense experiences. The team's dark humor essentially strengthens emotional connections among each other through shared pleasure.

Another study further supports the idea that collective dark humor builds interpersonal relationships. Dangermond and colleagues conducted a study on humor in Dutch fire service culture. Researchers made 20 observations within six teams of firefighters during their 24-hour shifts and evening drills. After the observation period, they filled their reports with special moments, group dynamics, and other characteristics. Then, the researchers conducted 1.5-hour interviews with another 72 firefighters to gain a deeper knowledge of the culture. They recorded each session on tape and transcribed the interaction with the participant's consent. After analyzing the interviews, the investigators deduced that the firefighters' indulgence in dark humor helps them cope with critical incidents. They provided an example in which the firefighters failed to resuscitate a man who ordered the all-you-can-eat option at a sushi restaurant. One of the service fighters made light of the man's death, stating that the sushi was all the man could eat (Dangermond et al., 2022). The researchers' conclusion, as well as the example provided, exemplifies the dark humorous state strengthening emotional bonds. The firefighters' banter is incongruent with morality because they are mocking a person's death. However, their dopaminergic and oxytocinergic systems interacted with each other to produce humorous laughter within the group. This social behavior increased endorphin release, which caused dopamine-induced pleasure to combat the despair of the man's death. Together with the previous study, people laugh at moral incongruency together to establish kinship through shared pleasure.

Dark Humor is an Unnecessary Evil (Counterarguments)

3.1. Immoral Defiance Promotes Feelings of Superiority

Despite neuroscience revealing the brain's pleasures of humorous laughter, people oppose dark humor because it conveys feelings of superiority (Lintott, 2016).

Researchers required groups of 2-4 friends to participate in five activities to evoke humorous laughter: reading tongue twisters, watching joyful video clips (e.g., babies laughing), singing karaoke in an animal and filled out a questionnaire to provide the emotion they perceived in each recording. The researchers then compared the answers with those from the groups that produced laughter in each clip. The results reveal that the people who listened to the recordings accurately distinguished the emotions of joy, tickle, and schadenfreude in those that produced humorous laughter. These findings, especially the discernment of schadenfreude humorous laughter, validate the superiority theory of humorous laughter. This proposition implies that the jest of others' mishaps conveys a condescending attitude since the chemical-induced pleasure evoked by laughter contrasts with the observed misfortune.

Additionally, investigations of homophobic humor show dark humor being utilized to convey superlative feelings. McCann and colleagues conducted interviews with 63 men about the accepted norms of Australian masculinity. The researchers deduced that Australian schoolboys would ridicule each other if any of their physicality was deemed uncharacteristic of masculinity. One of the interviewees described that their peers labeled them a "poofter" (the Australian equivalent of "faggot") since he lacked body hair on his legs (McCann et al., 2014). This finding demonstrates how the humorous defiance of morals makes one feel superior. The schoolboys evoked a humorous state by recognizing that non-hairy body parts are inconsistent with the norms of Australian masculinity. Therefore, throwing the homophobic insult triggered a neurochemical release that manifested as feeling more masculine than the other person.

Although the evidence shows that dark, humorous states perpetuate condescension, they can make an individual feel superior to their past self (Morreall, 2012). This demonstrates a positive attitude towards self-improvement. Two different investigations support this notion. The first study showed that humorous states reveal negative attitudes about the past. One hundred fourteen students completed a survey that determined their time perspective, which entails whether they deemed most of their past experiences pleasant or unpleasant. They then completed a self-report questionnaire that discerned each participant's humor style. The results showed that participants whose scores identified with self-defeating humor tended to have troublesome perceptions of the past (Hampes, 2013). The second study provides the possibility that negative feelings about the past, like in Hampes's work, stems from the desire to feel better than their former selves. During one of the studies, researchers required 51 adults to remember specific past events in two 30-minute periods. During the first interval, they recollected when they lied to someone and then recalled when they received a lie during the second interval. After the recollection period, participants answered questions pertaining to the adequacy of their memory and the extent to which they believe they are the same person now as they were during that event. The results showed that people tended to deem their actions more immoral when they affirm that they are drastically different from the former self that engaged in lying behavior (Stanley et al., 2017). As implied by the superiority theory and the two aforementioned studies, people likely indulge in humorous states to feel superior to their former selves. They evoke humor by perceiving the incongruency between their present and past state; Therefore, the banter of past immoral actions chemically induces the pleasure of overcoming the former self.

3.2. Humorous Immorality Conveys Insensitivity

Although dark humor induces the brain's provision of chemical rewards, the evocation of such a pleasurable state can be perceived as insensitive. In a 1995 study that explored the ethics of evoking humorous states, Moira Smith states that the range of topics for evoking humor is governed by culturally specific principles that determine whether a concept is appropriate for creating a joke and distinguish the contexts for which such jokes can be used. She provides an example in which a phony sexual harassment consent form was posted in the University of Arizona physics department. The college administration deemed this act an insensitive attempt at evoking humor, and they consequently recommended that all science faculty attend sexual harassment awareness workshops (Smith, 1995). In this case, the incongruency was the open banter of an objectionable topic within a collegiate science department, which is expected to refrain from any humorous mention of immoral topics. Because this incongruency was deemed inappropriate by the board, measures were taken to discourage any similar behavior in the future. Of course, this is a relatively

not indulge in dark humor because it can reduce perceived sensibility.

Be that as it may, there is individual variation in the receptivity to dark jokes. Chapman and colleagues confirm such individual differences in the humorous state. They presented 15 postcards to a 30-person sample (15 men and 15 women). Themes included a mixture of sexual and non-sexual topics: rape, male impotence, DUI, ventriloquism, males and females as sex toys, religion, ongoing intercourse, etc. The participants then rated each postcard's comicality, individual fondness of each cartoon, personal attraction to the opposite sex, frequency of joke-telling, and perceived sense of humor relative to others. The researchers additionally presented questionnaires about perceptions of female liberation ideology and sex-role attitudes. Then, all participants completed the Wilson-Patterson Conservatism Scale (WPCS), which measured conservative affiliation. The results showed numerous differences in people's humorous states. For instance, those who scored higher on the conservatism scale expressed distaste for the ongoing sexual intercourse cartoon. Furthermore, older men deemed the jokes about castration and female masturbation less funny, and older women conveyed less appreciation for the breasts cartoon (Chapman & Gadfield, 1976). Clearly, the dark humorous state varies across individuals, as the receptivity to immoral jokes depends on a multitude of variables. Regardless, engagement in dark humor should not be discouraged solely for its differences in receptivity.

Discussion

I present two caveats for my argument.

First, I do not assert that engagement in the dark humorous state is more or less effective than normal humor at evoking pleasurable sensations. I believe that dark humor is a necessary method of coping with the hardships of daily life. However, its efficacy cannot be compared with normal humor, as there are individual variations in humor receptivity. What works for some people may not work for others.

Second, my claims about dark humor are merely based on neuroscientific explanations of humorous laughter and not on research that directly explores the neurobiology of dark humor. Therefore, the following arguments should be perceived as steps for future research on the neurobiological mechanisms underlying the dark humorous state rather than concrete evidence.

Conclusion

Ultimately, the neuroscience of humorous laughter supports the notion that dark humor is necessary for influencing the brain's provision of pleasure. The evocation of the dark, humorous state helps cope with distressing situations by chemically inducing stress reduction and pain relief. Equally as important, immoral jest strengthens interpersonal bonds through shared pleasure that helps in stressful situations.

Dark humor is a prominent psychological state in modern society, as jokes that defy immoral principles are shared in numerous social interactions. Therefore, more research needs to be conducted to reveal the neurobiological and psychological processes that explain the reasons for its popularity and indulgence. The current literature hopes to contribute to the neuroscience of dark humor, a highly relevant yet under-investigated topic.

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