Euphoria
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Euphoria[^1] (pronunciation: /juːˈfɔːriə/) is an affective state and a form of pleasure in which a person experiences intense feelings of well-being, happiness, and excitement.[3][4][5] Certain drugs, many of which are addictive, can cause euphoria, which at least partially motivates their recreational use.[6] Similarly, certain natural rewards and social activities, such as aerobic exercise, laughter, listening to emotionally arousing music, music-making, and dancing, can induce a state of euphoria.[5][7] Euphoria is also a symptom of certain neurological or neuropsychiatric disorders, such as mania.[8] Romantic love and components of the human sexual response cycle are also associated with the induction of euphoria.[9][10][11]

Intense euphoria is believed to occur via the simultaneous activation of every hedonic hotspot within the brain's reward system.[12]

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[^1]: Pronounced /juːˈfɔːriə/
Types

Many different types of stimuli can induce euphoria, including psychoactive drugs, natural rewards, and social activities.[3][4][7][8] Affective disorders such as unipolar mania or bipolar disorder can involve euphoria as a symptom.[8]

Exercise-induced

Continuous physical exercise, particularly aerobic exercise, can induce a state of euphoria; for example, distance running is often associated with a "runner's high", which is a pronounced state of exercise-induced euphoria.[13] Exercise is known to affect dopamine signaling in the nucleus accumbens, producing euphoria as a result, through increased biosynthesis of three particular neurochemicals: anandamide (an endocannabinoid),[14] β-endorphin (an endogenous opioid),[15] and phenethylamine (a trace amine and amphetamine analog).[13][16][17]

Music euphoria

Euphoria can occur as a result of dancing to music, music-making, and listening to emotionally arousing music.[7][18][19] Neuroimaging studies have demonstrated that the reward system plays a central role in mediating music-induced pleasure.[19][20] Pleasurable emotionally arousing music strongly increases dopamine neurotransmission in the dopaminergic pathways that project to the striatum (i.e., the mesolimbic pathway and nigrostriatal pathway).[18][19][20] Approximately 5% of the population experiences a phenomenon termed "musical anhedonia", in which individuals do not experience pleasure from listening to emotionally arousing music despite having the ability to perceive the intended emotion that is conveyed in passages of music.[20]

Drug-induced

A euphoriant is a type of psychoactive drug which tends to induce euphoria.[22][23] Most euphoriants are addictive drugs due to their reinforcing properties and ability to activate the brain's reward system.[8]

Stimulants

Dopaminergic stimulants like amphetamine, methamphetamine, cocaine, MDMA, and methylphenidate are euphoriants.[3][8] Nicotine is a parasympathetic stimulant that acts as a mild euphoriant in some people.[8]
Depressants

Certain depressants can produce euphoria; some of the euphoriant drugs in this class include drinking alcohol (i.e., ethanol) in moderate doses,[24][25] γ-hydroxybutyric acid,[3] and ketamine.[3] Euphoria has also been noted to occur in a very small percentage of individuals who used pregabalin in controlled trials as a treatment for neuropathic pain associated with diabetic peripheral neuropathy.[26]

Some barbiturates and benzodiazepines may cause euphoria. Euphoriant effects are determined by the drug's speed of onset,[27] increasing dose,[28] and with intravenous administration.[29] Barbiturates more likely to cause euphoria include amobarbital, secobarbital and pentobarbital.[30][31] Benzodiazepines more likely to cause euphoria are flunitrazepam, alprazolam and clonazepam.[27][32][33] Benzodiazepines also tend to enhance opioid-induced euphoria.[34]

Opioids

µ-Opioid receptor agonists are a set of euphoriants[8] that include drugs such as heroin, morphine, codeine, oxycodone, and methadone. By contrast, κ-opioid receptor agonists, like the endogenous neuropeptide dynorphin, are known to cause dysphoria,[8] a mood state opposite to euphoria that involves feelings of profound discontent.

Cannabinoids

Cannabinoid receptor 1 agonists are a group of euphoriants that includes certain plant-based cannabinoids (e.g., THC from the cannabis plant), endogenous cannabinoids (e.g., anandamide), and synthetic cannabinoids.[8]

Inhalants

Certain gases, like nitrous oxide (N₂O, aka "laughing gas"), can induce euphoria when inhaled.[8]

Glucocorticoids

Acute exogenous glucocorticoid administration is known to produce euphoria, but this effect is not observed with long-term exposure.[8]
Asphyxia-induced

Asphyxiation initially produces an extreme feeling of euphoria[35] leading some people to intentionally induce temporary asphyxiation. Erotic asphyxiation typically employs strangulation to produce euphoria which enhances masturbation and orgasm. The choking game, prevalent in adolescents, uses brief hypoxia in the brain to achieve euphoria.[37][38] Strangulation, or hyperventilation followed by breath holding are commonly used to achieve the effects. Accidental deaths occur from both practices but are often mislabeled as suicide.[39][40][41]

Neuropsychiatric

Mania

Euphoria is also strongly associated with both hypomania and mania, mental states characterized by a pathological heightening of mood, which may be either euphoric or irritable, in addition to other symptoms, such as pressured speech, flight of ideas, and grandiosity.[42][43]

Although hypomania and mania are syndromes with multiple etiologies (that is, ones that may arise from any number of conditions), they are most commonly seen in bipolar disorder, a psychiatric illness characterized by alternating periods of mania and depression.[42][43]

Epilepsy

Brief euphoria may occur immediately before or during epileptic seizures originating in the temporal lobes or insulae. This euphoria is symptomatic of a rare syndrome called ecstatic seizures, itself closely associated with religious and mystical experiences which are often euphoric. Euphoria (or more commonly dysphoria) may also occur in periods between such seizures. This condition, *interictal dysphoric disorder*, is considered an atypical affective disorder.[46]

Multiple sclerosis

Euphoria sometimes occurs in persons with multiple sclerosis as the illness progresses. This euphoria is part of a syndrome originally called *euphoria sclerotica*, which typically includes disinhibition and other symptoms of cognitive and behavioral dysfunction.[47][48][49]

See also

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Notes

1. Derived from Ancient Greek εὐφορία: εὖ eu meaning "well" and φέρω pherō meaning "to bear".[1][2] The word is semantically opposite of dysphoria.

References

3. Bearn J, O'Brien M (2015). ""Addicted to Euphoria": The History, Clinical Presentation, and Management of Party Drug Misuse". Int. Rev. Neurobiol. 120: 205–33. doi:10.1016/bs.irn.2015.02.005. PMID 26070759. "Eating, drinking, sexual activity, and parenting invoke pleasure, an emotion that promotes repetition of these behaviors, are essential for survival. Euphoria, a feeling or state of intense excitement and happiness, is an amplification of pleasure, aspired to one's essential biological needs that are satisfied. People use party drugs as a shortcut to euphoria. Ecstasy (3,4-methylenedioxymethamphetamine), γ-hydroxybutyric acid, and ketamine fall under the umbrella of the term "party drugs," each with differing neuropharmacological and physiological actions."
4. Schultz W (2015). "Neuronal reward and decision signals: from theories to data" (PDF). Physiological Reviews. 95 (3): 853–951. doi:10.1152/physrev.00023.2014. Archived from the original (PDF) on 6 September 2015. Retrieved 24 September 2015. "The feeling of high that is experienced by sports people during running or swimming, the lust evoked by encountering a ready mating partner, a sexual orgasm, the euphoria reported by drug users, and the parental affection to babies constitute different forms (qualities) rather than degrees of pleasure (quantities)."
6. Johnson, Bankole A. (2010). Addiction Medicine: Science and Practice. Springer Science & Business Media. p. 133. ISBN 9781441903389. "It has been observed that drugs of abuse as diverse as alcohol, barbiturates, opiates, and psychomotor stimulants all share a profile of psychoactive effects characterized as euphoria. It is generally accepted that euphoria is at least a partial explanation why these drugs are abused."
7. Cohen EE, Ejsmond-Frey R, Knight N, Dunbar RI (2010). "Rowers' high: behavioural synchrony is correlated with elevated pain thresholds". Biol. Lett. 6 (1): 106–8. doi:10.1098/rsbl.2009.0670. PMC 2817271 PMID 19755532. "This heightened effect from synchronized activity may explain the sense of euphoria experienced during other social activities (such as laughter, music-making and dancing) that are involved in social bonding in humans and possibly other vertebrates."
8. Malenka RC, Nestler EJ, Hyman SE (2009). Sydor A, Brown RY, eds. Molecular Neuropharmacology: A Foundation for Clinical Neuroscience (2nd ed.). New York: McGraw-Hill Medical. pp. 191, 350–351, 367–368, 371–375. ISBN 9780071481274. "Changes in appetite and energy may reflect abnormalities in various hypothalamic nuclei. Depressed mood and anhedonia (lack of interest in pleasurable activities) in depressed individuals, and euphoria and increased involvement in goal-directed activities in patients, who experience mania, may reflect opposing abnormalities in the nucleus accumbens, medial prefrontal cortex, amygdala, or other structures. ... Although short-term administration of glucocorticoids often produces euphoria and increased energy, the impact of long-lasting increases in endogenous glucocorticoids produced during depression can involve complex adaptations such as those that occur in Cushing syndrome (Chapter 10). ... Exposure to addictive chemicals not only produces extreme euphoric states that may initially motivate drug use, but also causes equally extreme adaptations in reinforcement mechanisms and motivated behavior that eventually lead to compulsive use. Accordingly, the evolutionary design of human and animal brains that has helped to promote our survival also has made us vulnerable to addiction."
9. Georgiadis JR, Kringelbach ML (July 2012). "The human sexual response cycle: brain imaging evidence linking sex to other pleasures" (PDF). Prog. Neurobiol. 98 (1): 49–81. doi:10.1016/j.pneurobio.2012.05.004. PMID 22609047. "Strong feelings of pleasure and euphoria, as well as marked alterations in cognitive processing, self-referential thought, and physiological arousal are defining features of sexual consummation, especially during orgasm (Mah and Binik, 2001). These processes promote inter-individual intimacy and approach, and degrade the interference of external distractors (Koukounas and McCabe, 2001), both of which are necessary requirements to engage in sexual activity ...

Many individuals experience a particularly euphoric response to music, sometimes described as “shivers-down-the-spine” or “chills”, which perhaps is not unrelated to the orgasm phase of the sexual pleasure cycle ... Perhaps even more interesting is the finding that activity in VS/NAcc, medial and mid-anterior OFC strongly correlated with the intensity of chills related to musical pleasure (Blood and Zatorre, 2001). Further studies showed that VS/NAcc dopamine release were specifically linked to the peak of perceived chills and not to their anticipation (Salimpoor et al., 2011), and there was an absence of activity in VS/NAcc and OFC when exposed to a novel, but liked, pop song (Berns et al., 2010). The peaks in the medial and mid-anterior OFC are very similar to those found during orgasms or during hedonic processing of foods ...

Drugs of abuse that enhance sympathetic arousal also typically induce euphoria, which is described as intensely pleasurable, especially in drug naïve participants (Vollm et al., 2004). In one fMRI study, participants rated feelings of high, low, rush, and craving after cocaine infusion (Breiter et al., 1997). Rush and high both peaked within 3 min after the volunteers received cocaine, after which these feelings dissipated (though rush more quickly than high). ... Thus, areas correlating with rush are not only likely to reflect general arousal effects (e.g. elevated heart rate, sweating), but also the euphoria associated with high. The overlap between areas related to cocaine rush/high and sexual arousal (genital stimulation) is striking, and includes aMCC, anterior and posterior insula, ventral pallidum/basal forebrain, and frontal operculum/vPMC. In addition, the amygdala showed prolonged decreased activity after cocaine infusion, similar to decreased activity during sexual genital stimulation (Georgidis et al., 2009, 2010a)."

10. Blum K, Werner T, Carnes S, Carnes P, Bowirrat A, Giordano J, Oscar-Berman M, Gold M (March 2012). "Sex, drugs, and rock 'n' roll: hypothesizing common mesolimbic activation as a function of reward gene polymorphisms". J. Psychoactive Drugs. 44 (1): 38–55. doi:10.1080/02791072.2012.662112. PMC 4040958 PMID 22641964. "Early-stage romantic love can induce euphoria, is a cross-cultural phenomenon, and is possibly a developed form of a mammalian drive to pursue preferred mates. ... Under normal conditions, it is not surprising that sexual activity is physiologically regulated by the reward circuitry of the brain, specifically by dopaminergic pathways (see Figure 1). Moreover, the early stages of a new, romantic relationship can be a powerful and absorbing experience. Individuals in new romantic relationships report feeling euphoric and energetic. They also become emotionally dependent on, desire closeness with, and have highly focused attention on their partner (Reynaud et al. 2010; Young 2009). Human neuroimaging studies have shown that feelings experienced during the early stages of a romantic relationship are associated with neural activations in several reward-system and affect-processing regions of the brain (Young 2009; Aron et al. 2005; Bartels & Zeki 2000; Mashek, Aron & Fisher 2000)."

11. Jankowiak, William; Paladino, Thomas (2013). "Chapter 1. Desiring Sex, Longing for Love: A Tripartite Conundrum". In Jankowiak, William R. Intimacies: Love and Sex Across Cultures. Columbia University Press. p. 13. ISBN 9780231508766. "These emotional states may also be manifested behaviorally as "labile psychophysical responses to the loved person, including exhilaration, euphoria, buoyancy, spiritual feelings, increased energy, sleeplessness, loss of appetite, shyness, awkwardness ... in the presence of the loved person" (Fisher 1998:32). The presence of similar neurological mechanisms and brain patterns may account for the ability to readily identify when someone is romantically involved or erotically excited (Fisher 1998:32; Fisher 1995)."
12. Kringelbach ML, Berridge KC (2013). "The Joyful Mind". From Abuse to Recovery: Understanding Addiction. Macmillan. pp. 199–207. ISBN 9781466842557. Retrieved 8 April 2016. "So it makes sense that the real pleasure centers in the brain—those directly responsible for generating pleasurable sensations—turn out to lie within some of the structures previously identified as part of the reward circuit. One of these so-called hedonic hotspots lies in a subregion of the nucleus accumbens called the medial shell. A second is found within the ventral pallidum, a deep-seated structure near the base of the forebrain that receives most of its signals from the nucleus accumbens. ... On the other hand, intense euphoria is harder to come by than everyday pleasures. The reason may be that strong enhancement of pleasure—like the chemically induced pleasure bump we produced in lab animals—seems to require activation of the entire network at once. Defection of any single component dampens the high."

13. Szabo A, Billett E, Turner J (2001). "Phenylethylamine, a possible link to the antidepressant effects of exercise?". Br J Sports Med. 35 (5): 342–343. doi:10.1136/bjsm.35.5.342. PMC 1724404. PMID 11579070. "The 24 hour mean urinary concentration of phenylacetic acid was increased by 77% after exercise. ... These results show substantial increases in urinary phenylacetic acid levels 24 hours after moderate to high intensity aerobic exercise. As phenylacetic acid reflects phenylethylamine levels, and the latter has antidepressant effects, the antidepressant effects of exercise appear to be linked to increased phenylethylamine concentrations. Furthermore, considering the structural and pharmacological analogy between amphetamines and phenylethylamine, it is conceivable that phenylethylamine plays a role in the commonly reported "runners high" thought to be linked to cerebral β-endorphin activity. The substantial increase in phenylacetic acid excretion in this study implies that phenylethylamine levels are affected by exercise. ... A 30 minute bout of moderate to high intensity aerobic exercise increases phenylacetic acid levels in healthy regularly exercising men. The findings may be linked to the antidepressant effects of exercise."

14. Fantimomonaco M, Ceci R, Sabatini S, Catani MV, Rossi A, Gasperi V, Maccarrone M (2014). "Physical activity and the endocannabinoid system: an overview". Cell. Mol. Life Sci. 71 (14): 2681–2698. doi:10.1007/s00018-014-1575-6. PMID 24526057. "The traditional view that PA engages the monoaminergic and endorphinergic systems has been challenged by the discovery of the endocannabinoid system (ECS), composed of endogenous lipids, their target receptors, and metabolic enzymes. Indeed, direct and indirect evidence suggests that the ECS might mediate some of the PA-triggered effects throughout the body. ... the evidence that PA induces some of the psychotropic effects elicited by the Cannabis sativa active ingredient Δ9-tetrahydrocannabinol (Δ9-THC, Fig. 1), like bliss, euphoria, and peacefulness, strengthened the hypothesis that endocannabinoids (eCBs) might mediate, at least in part, the central and peripheral effects of exercise [14]. ... To our knowledge, the first experimental study aimed at investigating the influence of PA on ECS in humans was carried out in 2003 by Sparling and coworkers [63], who showed increased plasma AEA content after 45 min of moderate intensity exercise on a treadmill or cycle ergometer. Since then, other human studies have shown increased blood concentrations of AEA ... A dependence of the increase of AEA concentration on exercise intensity has also been documented. Plasma levels of AEA significantly increased upon 30 min of moderate exercise (heart rate of 72 and 83 %), but not at lower and significantly higher exercise intensities, where the age-adjusted maximal heart rate was 44 and 92 %, respectively ... Several experimental data support the hypothesis that ECS might, at least in part, explain PA effects on brain functions, because: (1) CB1 is the most abundant GPCR in the brain participating in neuronal plasticity [18]; (2) eCBs are involved in several brain responses that greatly overlap with the positive effects of exercise; (3) eCBs are able to cross the blood–brain barrier [95]; and (4) exercise increases eCB plasma levels [64–67]."

β-Endorphin, an endogenous μ-opioid receptor selective ligand, has received much attention in the literature linking endorphins and depression or mood states. ... exercise of sufficient intensity and duration can increase circulating β-endorphin levels. ... Moreover, a recent study demonstrated that exercise and physical activity increased β-endorphin levels in plasma with positive effects on mood. Interestingly, the researchers reported that, independently of sex and age, dynamic anaerobic exercises increased β-endorphin, while resistance and aerobic exercises seem to only have small effects on β-endorphins. ... The results showed that mood tends to be higher in a day an individual exercises as well as that daily exercise and exercise overall are strongly linked with mood states. In line with these findings, a recent study showed that exercise significantly improved mood states in non-exercisers, recreational exercisers, as well as marathon runners. More importantly, the effects of exercise on mood were twofold in recreational exercisers and marathon runners."

16. Lindemann L, Hoener MC (2005). "A renaissance in trace amines inspired by a novel GPCR family". *Trends Pharmacol. Sci*. **26**(5): 274–281. doi:10.1016/j.tips.2005.03.007. PMID 15860375. "The pharmacology of TAs might also contribute to a molecular understanding of the well-recognized antidepressant effect of physical exercise [51]. In addition to the various beneficial effects for brain function mainly attributed to an upregulation of peptide growth factors [52,53], exercise induces a rapidly enhanced excretion of the main β-PEA metabolite β-phenylacetic acid (b-PAA) by on average 77%, compared with resting control subjects [54], which mirrors increased β-PEA synthesis in view of its limited endogenous pool half-life of ~30 s [18,55]."


18. Salimpoor VN, Benovoy M, Larcher K, Dagher A, Zatorre RJ (2011). "Anatomically distinct dopamine release during anticipation and experience of peak emotion to music". *Nat. Neurosci*. **14**(2): 257–262. doi:10.1038/nn.2726. PMID 21217764. "Music, an abstract stimulus, can arouse feelings of euphoria and craving, similar to tangible rewards that involve the striatal dopaminergic system. ... the caudate was more involved during the anticipation and the nucleus accumbens was more involved during the experience of peak emotional responses to music. ... Notably, the anticipation of an abstract reward can result in dopamine release in an anatomical pathway distinct from that associated with the peak pleasure itself."

19. Mavridis IN (March 2015). "Music and the nucleus accumbens". *Surg Radiol Anat*. **37**(2): 121–125. doi:10.1007/s00276-014-1360-0. PMID 25102783. "The functional connectivity between brain regions mediating reward, autonomic and cognitive processing provides insight into understanding why listening to music is one of the most rewarding and pleasurable human experiences. Musical stimuli can significantly increase extracellular DA levels in the NA. NA DA and serotonin were found significantly higher in animals exposed to music. Finally, passive listening to unfamiliar although liked music showed activations in the NA. ... Music can arouse feelings of euphoria and craving, similar to tangible rewards that involve the striatal DAergic system [16]. Reward value for music can be coded by activity levels in the NA, whose functional connectivity with auditory and frontal areas increases as a function of increasing musical reward [19]. ... Listening to pleasant music induces a strong response and significant activation of the VTA-mediated interaction of the NA with the hypothalamus, insula and orbitofrontal cortex [1].

**Conclusions**

Listening to music strongly modulates activity in a network of mesolimbic structures involved in reward processing including the NA. Music, acting as a positive pleasant emotion, increases NA DAergic activity. Specifically the NA is more involved during the experience of peak emotional responses to music. Reward value of music can be predicted by increased functional connectivity of auditory cortices, amygdala and ventromedial prefrontal regions with the NA. Further research is needed to improve our understanding of the NA role in the influence of music in our lives."
Zatorre RJ (March 2015). "Musical pleasure and reward: mechanisms and dysfunction". *Ann. N. Y. Acad. Sci.* **1337**: 202–211. doi:10.1111/nyas.12677. PMID 25773636. "Most people derive pleasure from music. Neuroimaging studies show that the reward system of the human brain is central to this experience. Specifically, the dorsal and ventral striatum release dopamine when listening to pleasurable music, and activity in these structures also codes the reward value of musical excerpts. Moreover, the striatum interacts with cortical mechanisms involved in perception and valuation of musical stimuli. ... Development of a questionnaire for music reward experiences has allowed the identification of separable factors associated with musical pleasure, described as music-seeking, emotion-evocation, mood regulation, sensorimotor, and social factors. Applying this questionnaire to a large sample uncovered approximately 5% of the population with low sensitivity to musical reward in the absence of generalized anhedonia or depression. Further study of this group revealed that there are individuals who respond normally both behaviorally and psychophysiological to rewards other than music (e.g., monetary value) but do not experience pleasure from music despite normal music perception ability and preserved ability to identify intended emotions in musical passages."

Methamphetamine | InfoFacts | The National Institute on Drug Abuse (NIDA) (http://drugabuse.gov/infofacts/methamphetamine.html)

Merrian-Webster definition (http://www.merriam-webster.com/dictionary/euphoriant)


45. Jones, Niya; Sather, Rita (eds.). "Online Medical Encyclopedia: Epilepsy and Seizures". *University of Rochester Medical Center*. Retrieved 23 May 2016. "The most common aura involves feelings, such as déjà vu, impending doom, fear, or euphoria."


Categories: Happiness | Euphoriants | Pleasure | Emotions

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