

### Jump Scare: The Science Behind Horror and its Effects on Health

When I was six years old, my father showed my brother and I the movie *Pet Sematary*. We were ecstatic. My father had been telling us about it for weeks, really emphasizing how scary it was going to be. We were excited because he was excited. He was our hero after all, a feeling common to boys of that age. He took us out to get snacks and drinks and popcorn, and we rented the movie from Blockbuster. It was going to be a real theater experience, at least as far as you could replicate in an apartment in 2001. Popcorn popped and VHS rewound, we sat down in a dark room and proceeded to watch the most terrifying thing my brother and I had ever seen in our short lives. My father skipped through what he considered inappropriate, which left much of the hour-and-forty-three-minute film intact. Shockingly, my mother was less than pleased. This was the first time he showed us something wildly inappropriate for our age, but it certainly would not be the last. Paradoxically, this was the first step towards my lifelong love of horror films.

Horror films have been growing in popularity since well before my experience with *Pet Sematary* in 2001. According to Dr. Margee Kerr, sociologist at the University of Pittsburgh in Pennsylvania, “horror films commanded about 10% of the market share, up from almost 2% in 1996” (*Understanding and Overcoming* 6:32). Horror, particularly the film genre, isn’t going anywhere any time soon. Even so, there are those whose sensibilities are offended by the genre. It comes as no surprise that a genre that is designed to induce fear is divisive. However, horror still attracts many that enjoy the feeling that the genre induces. In fact, Kerr states that, “68% of Americans plan on celebrating Halloween in a normal year” (*Understanding and Overcoming* 6:32). While it does have its detractors, fans of horror can continue chasing scares as research

suggests that engaging in the genre can strengthen emotional bonds with friends and colleagues, improve cognitive functioning, and even provide health benefits.

Those that experience an exciting event with a group form stronger emotional bonds with each other, as evidenced in a 2006 study. In her paper, Shelley E. Taylor of UCLA discusses the effect oxytocin—a hormone often called the “love drug” (*Oxytocin: What it is*)—plays in the response to stress and its contribution to a curious phenomenon she calls “tending and befriending.” In her paper, Shelley states, “tending to offspring and affiliating with others (‘befriending’) are at least as common responses to stress in humans as fight-or-flight” (273). Shelley asserts that when we experience something stressful or exciting, oxytocin is released into the bloodstream, making us more likely to seek out fulfilling social contact. This concept is further expanded upon by Dr. Margee Kerr in a TEDx talk given in 2018. She explains that when we experience, “fun-scary things, we’re usually with... the people that we care about and... [it’s] creating these intense emotional experiences that are going to be encoded into rich complex memories... we remember... being with someone that we love” (*Why do we like to be scared?* 7:00). This comes as no surprise considering humanity’s long history of tribalism. We seek out a sense of belonging under normal circumstances so it stands to reason that these instincts would be stronger under stress. When this response is mimicked with “fun-scary” events we tighten our sense of community in a fun and memorable way without a sense of true danger.

In addition to emotional wellbeing, the fight-or-flight response to acute stress—short-lived bursts of stress—has been shown to improve cognitive functioning. In 2013, researchers at UC Berkley conducted a study to examine the effects of acute stress on the hippocampus, a region of the brain that plays a major role in the consolidation of memory. In the study, researchers subjected rats to conditions that would induce the fight-or-flight response, such as

restricting their movement in cages for three-hour periods and shocking their feet at random intervals for thirty minutes. They found that there was a marked improvement in cognitive abilities in the dorsal hippocampus, the half that deals with memory consolidation, after two weeks. According to their findings, inducing the fight-or-flight response had a direct impact on the genesis of neural stem cells into full hippocampus nerve cells (Kirby et al. 3). Furthermore, the rats experienced fear extinction, a marked decrease in conditioned fear responses when the responses are not reinforced. To sum up the research, this fear response directly led to neurogenesis in the part of the brain that consolidates memories and after two weeks the rats showed an increase in cognitive capabilities with no negative psychological effects from the experiment. Furthermore, a study published *Neuroimage* in 2020, revealed that the acute stress response we feel during a horror film activates the same sections of the brain as those that are activated during a dangerous event (Hudson, et al. 8).

One of the key hormones released in fight-or-flight is norepinephrine. In 2002, Dr. Christa McIntyre, associate professor at UT Dallas, and colleagues studied the effects of norepinephrine on consolidation of memory. In their study, they demonstrate the effect norepinephrine in the amygdala has on memory consolidation during stressful events, with higher volumes of the hormone correlating with increased retention (McIntyre et al. 1223). An intriguing connection can be drawn from this study and a prominent, non-stimulant ADHD medication, atomoxetine. The medication is a selective-norepinephrine reuptake inhibitor (Callahan et al. 65), effectively blocking the body's ability to reabsorb the hormone, leaving more of it in the body's system for use. Dr. Patrick Callahan, assistant professor at the University of Pittsburgh Medical Center, was able to show an increase in cognition related to memory recall as well as other common ADHD side effects such as impulsivity and sustained focus after

administration of atomoxetine (Callahan et al. 65). Having taken atomoxetine to treat ADHD myself, the parallels between these two studies are especially fascinating and when applied to horror may explain my own enthusiasm for the genre.

In addition to positively effecting cognitive functioning, a recent study has linked acute stress with immune health. In a scientific article published by Stanford Medicine News Center, science writer Bruce Goldman analyzes the results of a study conducted for the school by Dr. Firdaus Dhabar. An associate professor of psychology and behavioral science, Dhabar along with several colleagues was able to show that stress hormones released during the fight-or-flight response releases immune cells into the bloodstream. For the study, Dhabar and colleagues subjected rats to a similar type of stress as the UC Berkely study, containing them in clear plexiglass containers for a period of time and drawing blood throughout the process to measure the hormonal and immune response. Goldman states:

The general pattern, Dhabar said, was that norepinephrine is released early and is primarily involved in mobilizing all major immune-cell types — monocytes, neutrophils and lymphocytes — into the blood. Epinephrine, also released early, mobilized monocytes and neutrophils into the blood, while nudging lymphocytes out into “battlefield” destinations such as skin. And corticosterone, released somewhat later, caused virtually all immune cell types to head out of circulation to the “battlefields.”

When our bodies enter fight-or-flight, it tends to be in response to imminent physical danger (Goldman). Our bodies release these cells to preemptively fight infection of those expected wounds. The rats in the study were never in any legitimate danger, despite the flood of fight-or-flight hormones. Similarly, while experiencing horror either from films or attractions,

our brains work to assess the threat level of the experience, deciding within a fraction of a second that we are in no real danger (Kerr *The Atlantic*). In an era that is increasingly aware of public health and the spreading of disease, this information can go a long way in easing the minds of those with concerns about public gatherings, especially those experienced in a theater or haunted house.

The effects of chronic stress are well studied, ranging from insomnia and headaches to high blood pressure, heart disease, and chronic pain (*Stress Effects on the Body*). According to staff writers for the Mayo Clinic, “long-term activation of the stress response system and the overexposure to ... stress hormones... can disrupt almost all your body's processes. This puts you at increased risk of many health problems” (*Chronic Stress puts*). This is primarily due to how certain stress hormones, specifically adrenaline, norepinephrine, and cortisol, affect your body during a stress response. The American Psychological Association asserts that adrenaline and norepinephrine regulate heart rate, strength of contractions of the heart, and blood pressure during fight-or-flight, elevating all to quickly pump blood to the parts of the body that need it most (*Stress Effects on the Body*). Cortisol, on the other hand, “suppresses the digestive system, the reproductive system and growth processes” (Mayo Clinic), during this response and plays a key role in the immune system response, elevating levels of immune cells in the bloodstream (Goldman). Long term exposure to cortisol can damage the connections between the regulatory system in the brain and the immune system, resulting in many health conditions such as diabetes and immune disorders (*Stress Effects on the Body*). However, these same hormones can have positive effects in small amounts, such as during the acute stress response experienced during a horror movie or haunted attraction. Whether or not it is entertaining is subjective, and care should be taken by sensitive parties that may find the material disturbing.

There is no doubt that these kinds of stressful experiences have a damaging effect on young children's psyche. The hormones that are released during these responses work to solidify memories and if a child is too young to know the difference between what is real and what is not, it can create "flashbulb" memories that stay with the child long into adulthood (Kerr *The Atlantic*). While my brother and I knew what we were seeing was just a movie, the memory of that night is still particularly vivid for both of us. We were not the target audience for that film and furthermore we were not psychologically prepared for it. The response to horror films is a visceral experience and research suggests that the physiological response activates the same neuropathways as real danger (Hudson, et al. 8). The claims and supporting evidence found in this paper are by no means meant to endorse horror for all parties but rather to provide a case for the positive effects the horror genre can instill in those that choose to engage with it for entertainment.

When I was six years old my father showed me *Pet Sematary* along with my brother—who was five and is perhaps a greater lapse in judgment on my father's part—and it was without doubt the most horrific experience either of us had had. Terrifying as this experience was, it is something my brother and I remember and talk about to this day. The days surrounding that experience, and indeed even the hours, are hazy at best but that night remains memorable. Though my mother was upset, she showed us *Terminator* and *The Matrix* as payback in a double feature of a night, effectively undermining her outrage. While I can't speak to the health and cognitive effects, these kinds of shared experiences have fostered a closeness between my brother and I that has lasted well into adulthood and a mutual love of horror that has only strengthened since that first ill-advised trip into the macabre.

#### Works Cited

Callahan, Patrick M., et al. "Atomoxetine Improves Memory and Other Components of Executive Function in Young-Adult Rats and Aged Rhesus Monkeys."

- Neuropharmacology*, vol. 155, 1 Sept. 2019, pp. 65–75.,  
doi:10.1016/j.neuropharm.2019.05.016.
- Goldman, Bruce. “Study Explains How Stress Can Boost Immune System.” *News Center*,  
Standord Medicine, 21 June 2012, med.stanford.edu/news/all-news/2012/06/study-  
explains-how-stress-can-boost-immune-system.html.
- Hudson, Matthew, et al. “Dissociable Neural Systems for Unconditioned Acute and Sustained  
Fear.” *NeuroImage*, vol. 216, 1 Aug. 2020, doi:10.1016/j.neuroimage.2020.116522.
- Kerr, Margee. *Understanding and Overcoming Fear: Why Do People Want to Be Scared?*  
*Wondrium*, 8 June 2022, www.wondrium.com/understanding-and-overcoming-fear.
- Kerr, Margee. *Why Do We like to Be Scared? Tedx Talks*, 22 May 2018,  
www.ted.com/talks/dr\_margee\_kerr\_why\_do\_we\_like\_to\_be\_scared.
- Kirby, Elizabeth D, et al. “Acute Stress Enhances Adult Rat Hippocampal Neurogenesis and  
Activation of Newborn Neurons via Secreted Astrocytic FGF2.” *ELife*, vol. 2, 16 Apr.  
2013, doi:10.7554/elif.00362.
- Mayo Clinic Staff. “Chronic Stress Puts Your Health at Risk.” *Mayo Clinic*, Mayo Foundation  
for Medical Education and Research, 8 July 2021, www.mayoclinic.org/healthy-  
lifestyle/stress-management/in-depth/stress/art-20046037.
- McIntyre, Christa K., et al. “Amygdala Norepinephrine Levels after Training Predict Inhibitory  
Avoidance Retention Performance in Rats.” *European Journal of Neuroscience*, vol. 16,  
no. 7, 16 Oct. 2002, pp. 1223–1226., doi:10.1046/j.1460-9568.2002.02188.x.
- “Oxytocin: What It Is, Function & Effects.” *Cleveland Clinic*,  
my.clevelandclinic.org/health/articles/22618-oxytocin.



Ringo, Allegra, and Margee Kerr. "Why Do Some Brains Enjoy Fear?" *The Atlantic*, 31 Oct. 2013, [www.theatlantic.com/health/archive/2013/10/why-do-some-brains-enjoy-fear/280938/](http://www.theatlantic.com/health/archive/2013/10/why-do-some-brains-enjoy-fear/280938/). Accessed 1 Dec. 2022.

"Stress Effects on the Body." *American Psychological Association*, American Psychological Association, 1 Nov. 2018, [www.apa.org/topics/stress/body](http://www.apa.org/topics/stress/body).

Taylor, Shelley E. "Tend and Befriend." *Current Directions in Psychological Science*, vol. 15, no. 6, Dec. 2006, pp. 273–277., doi:10.1111/j.1467-8721.2006.00451.x.