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The Pulse of Emotion

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How is it that a familiar face, soft eyes and a tight, pitiful smile can alter my very physiology? The machinery of my body, jolted by the shadow of someone I used to know. How is it that forming my own smile — one that can't quite reach the corners of my eyes, a polite, rehearsed mask — can make me acutely aware of the rhythmic beat in my chest? Can transform a heart that had been content with its steady rhythm to one forcing a pulsing, insistent throb.

The emotional centre of my brain, the amygdala, recognises the whispering of old memories, dormant emotions reawakened, this interaction, as an emotional stress. Recognises the emotional significance of a lingering look. And in protest to my own desire to maintain a composed front, to deny any and all emotion, activates my fight or flight response. My sympathetic response. I am a puppet under the control of my own body's unconscious responses.

I'm in a train carriage too crowded, too narrow, with a heartbeat that feels too loud, too fast. The screech of wheels on tracks and the rumble of engines are drowned out by the thundering rhythm of my own heart. My body has begun to transform this emotion into action, in preparation for an imagined threat. With every beat it demands attention, demands action.

The unseen conductor of my autonomic nervous system has blown his whistle. Chemicals epinephrine and norepinephrine, the messengers of this system, flood into my bloodstream and race along sympathetic nerves toward my heart. They travel like a harbinger, delivering a declaration of war.

The concealed mechanics of emotion, hidden, denied, but felt in full. Norepinephrine and epinephrine find friendship in the pacemaker of the heart, the sinoatrial node, binding to the cells' receptors and unleashing a cascade of changes. There is an influx of calcium in the cells of the sinoatrial node and elsewhere in the heart, akin to waves crashing on the shore. As calcium levels rise, the firing of electrical impulses controlled by the pacemaker surges like bullets from the barrel of a gun. My heart squeezes with increasing urgency and force.

I know this is what is supposed to happen, how my body has been programmed by history. That more blood is flowing from my heart to prepare to defend. That the body does not listen to logic or reason.

And just when I feel my heart can't bear it anymore — that it might make an escape attempt — the figure leaves my sight. Relief follows slowly but emotion lingers in my sweaty palms and rabbiting heart rate. I suppose I can refute my feelings to others, but my heart knows me the best, doesn't and can't lie. Neither of us can escape each other. A creeping shame overwhelms me from my involuntary reaction, a reminder that I'm not fully in control.

But I remember emotion isn't only in extremes: the heart bends to the will of joy, excitement and anticipation just the same. Your heart experiences your emotions with you, the stress of an upcoming exam, the thrill of a rollercoaster and the surprise of a younger sister hiding around a corner hoping to scare you. It ticks peacefully in my chest when I giggle along to stories told by an old friend. And my heart has not always beat against my will, it meets my demands for energy when I race along a track. Keeps me alive, keeps me safe.

To calm my beating heart, I take slow and deep breaths. Externally, it's the only thing one might note as peculiar: girl sitting steady as deep breaths pull oxygen into her lungs, lips parted to allow the passing of a whisper of air. A deliberate pause. Then, the hiss as breath is forced from my lungs as a warm gust. Each breath is a plead for calm.

My heart listens to my steady breaths and responds in kind. The vagus nerve heeds the call, a slow tug on the reins of the autonomic nervous system. Helping to restore balance between its parasympathetic and sympathetic systems. It runs through my body, like a series of wires reaching into various organs. It sends acetylcholine to the heart as a messenger to make it harder for electrical signals to fire from pacemaker cells, slowing the beat of the heart. The storm within the body fizzles out and with it, I return to reality. The heart relents to the control of the parasympathetic system, a small battle won in an everlasting push and pull.

The symphony of sound returns, I hear a muffled announcement over speakers as my five-minute train ride comes to an end. No permanent scar is left on my consciousness or heart, though for a short time, I am still aware of my heart beating in my chest. I am struck by its resilience to this constant change, a part of me I often take for granted.

My heart beats on — a strong, steady rhythm that continues, unbroken.

Scientific Statement

The Pulse of Emotion is a creative nonfiction piece that explores the body's physiological response to emotion, delving into a moment of heightened emotion/stress. The narrative explores how these intense emotions can activate the body's autonomic nervous system (the segment of our nervous system dedicated to involuntary bodily functions). Scientists understand that the autonomic nervous system mediates the body's response to emotional stimuli (think 'fight or flight'). The amygdala, a small crucial brain structure, processes sensory input (such as smell, visual, taste, and touch), integrates this information with emotional memories, and, if the stimuli are flagged as emotionally significant, can trigger a physiological response. These responses are driven by chemical messengers referred to as adrenaline (epinephrine) and noradrenaline (norepinephrine), which act on the heart's sinoatrial (SA) node to increase heart rate and contractile force by enhancing calcium influx and firing rate of the pacemaker cells.

Additionally, *The Pulse of Emotion* discusses the opposing effects of other emotions and emotional regulation techniques on our physiology. The parasympathetic system (commonly referred to as 'rest and digest' system) counteracts the sympathetic system primarily by releasing another chemical messenger, acetylcholine, via the vagus nerve. Acetylcholine slows the heart rate by inhibiting the same pacemaker cells of the SA node.

Ultimately, this piece highlights the intricate relationships between the internal systems that govern our physiological states, and explores how emotional triggers, both voluntary and involuntary, can provoke profound changes in our physiological state, revealing the balance and detail of these systems.

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