The Neurological Effects of Game Mechanics

In order to create a successful video game, game developers are constantly chasing after the elusive elements that will hook the player in. The primary strategy developers rely on is gathering user feedback through data analytics and playtest sessions during the later stages of production. While this information is incredibly useful, it often comes too late in the process for any meaningful change. To improve the chances of a game’s success, game developers would be well served to understand neurologically how individual game mechanics affect player behavior before they even start prototyping. This understanding starts by looking at three categories of stimuli common in games: Physical, Mental, and Emotional.

The Physical stimulus category covers all mechanics that rely on the human body’s natural motor skills and behaviors, such as reaction-based timing and spatial awareness. Hidden object games and First Person Shooters (FPS) can be described as having a core mechanic of spatial awareness; requiring players to visually track discrete elements within the game environment. This mechanic exploits the instinctive reward-driven behavior of saccadic eye movement. As the user attempts to look around the screen, the eye will involuntarily bounce around along the movement trajectory searching for interesting elements to target. When an element fitting the intended quarry is discovered, the brain releases small amounts of dopamine as a reward. Thus, the player is encouraged, through both gameplay and subliminal cues, to continue to engage in the activity. It is important to note that this effect last only for a brief amount of time, which means these mechanics must be used frequently in order to achieve user satisfaction.
Mental stimulus denotes the mechanics that utilize the cognitive functions of the brain, such as logic puzzles and pattern recognition. The primary mechanic in both time management and Real-time Strategy (RTS) games is micromanagement, the ability to quickly make decisions while under pressure. Here the mechanic exploits the brain's reward system through intrinsic reinforcement. Each time the user is exposed to a problem, they are required to analyze the immediate situation, compare it against previous experiences, and then choose an appropriate response. If the feedback the user receives indicates that the response is correct, dopamine is released and the brain is encouraged to repeat this pattern. Each time the pattern is repeated the neural circuit is strengthened and becomes easier to access, but the amount of dopamine is reduced. In order to satisfy the user with these mechanics it requires a steady escalation in the difficulty of the problem.

Emotional stimulus describes the mechanics that activate the limbic system, the area of the brain responsible for emotions, motivation and long-term memory, such as character customization, dialogue trees and construction. Role-playing games (RPG) and life simulations both have a core mechanic of customization, or the ability to personalize the characters and/or environment of the game. This mechanic exploits the mere-exposure effect, where people develop a preference for the familiar. When a player is given a choice to alter an in-game asset, they are required to make an emotional judgment based on their personal preferences and level of attachment. The closer they are able to relate a scenario or state to their ideal, the higher likelihood that the body will release oxytocin into the brain. Oxytocin is a hormone that increases feelings of connection and empathy, which aids in increasing the user’s attachment to the game.

Each one of these stimulus categories affects different areas of the brain, and promotes various player behaviors. Physical stimulus is responsible for immersing the player in the game world on a moment-by-moment basis. Mental stimulus drives the player to seek out the next
challenge. Emotional stimulus encourages a lingering attachment that will draw the player back to the game. Developers who have a deep understanding of cognitive science as a framework for building their game mechanics may feel better armed to predict player behavior and engagement with greater accuracy, much earlier in the development cycle. Informed game design, in combination with data analytics and play testing, gives designers an advantage in creating an engaging experience.