Inside Out: A Brain's Tale of Introverts and Extraverts

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Introduction

What makes us who we are? According to the American Psychological Association, personality is the 'the enduring configuration of characteristics and behavior that comprises an individual's unique adjustment to life, including major traits, interests, drives, values, self-concept, abilities, and emotional patterns.' (Detloff, 1972) Two primary types of human personality are introversion and extraversion.

Psychologist Carl Gustav Jung differentiated introversion and extraversion based on the "direction of flow of psychic energy". An extravert places importance on an external object (another person, place, or thing) based on his qualities (Detloff, 1972). On the other hand, introverts are loyal to an inner point of reference that takes precedence over the external object (Detloff, 1972). The object becomes important if it aligns with the inner self. Therefore, the differential feature between introverts and extraverts is how the person arrives at this perspective rather than the actual relationship between the object and subject (Detloff, 1972).

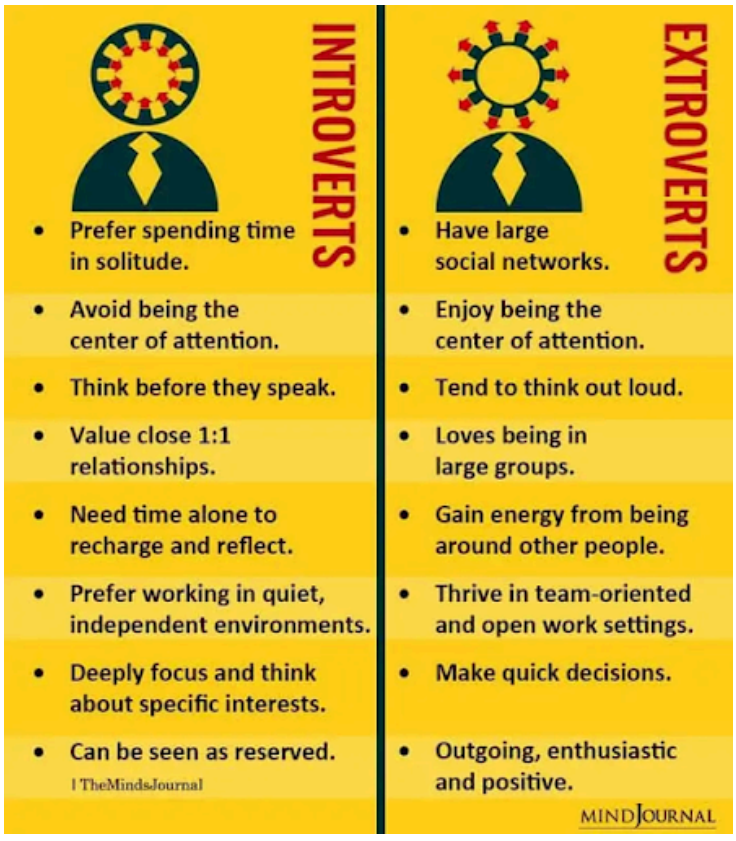

Figure 1. Personality differences between introverts and extraverts (The Minds Journal, 2022)

Physical Structure

Psychologist Hans Eysenck suggests that the behavioral differences in extraverts are due to an inherent drive to compensate for underactive reticulo-thalamo-cortical pathways. As a result, extraverts have lower activity in their behavioral inhibition system, a functional loop including the ascending reticular activating system, the frontal lobes, septal regions, and hippocampus. A positive correlation has also been found between extraversion and gray matter concentration in the left amygdala (Omura et al., 2005). The thinner cortical gray matter ribbon in the dorsolateral prefrontal cortex (DLPFC) emphasizes its importance in extraversion (Wright et al., 2006). The DLPFC strategically controls an individual's thoughts and actions based on goal-oriented behavior and positive affective states (Macdonald et al., 2000). Its dysfunction has been associated with depression and anxiety, which may also explain why low levels of extraversion lead to increased vulnerability (Grimm et al., 2011).

Neurotransmitters

In some people's brains, enhanced release of neurotransmitter dopamine, part of the brain's reward system, leads to greater excitement and engagement with the world (Watson, 2021). This release is linked to the sympathetic nervous system, responsible for the 'fight, flight, or freeze' response, which makes the brain alert and hyper-focused on its environment (Granneman, 2016). A study by researchers at Cornell University observed that rewards like food, sex, and money trigger dopamine release, producing positive emotions and increased drive for these goals (Depue & Fu, 2013). In the study, it was noted that extraverts have a more robust dopamine response system, making them experience strong positive emotions more frequently. Moreover, with time, extraverts develop a more extensive network of reward-context memories to activate the brain's reward system, further increasing the feeling of positivity and excitement. On the other hand, it was noted that acetylcholine, which is linked to introspection, was more prevalent in introverts. This neurotransmitter is integral in the ability to think deeply and to concentrate. This idea is reinforced by the fact that Acetylcholine is associated with the parasympathetic nervous system, responsible for the 'rest and digest' response, due to its features of energy conservation, muscle relaxation, and decreased blood pressure–necessary for periods of intense study (Granneman, 2016).

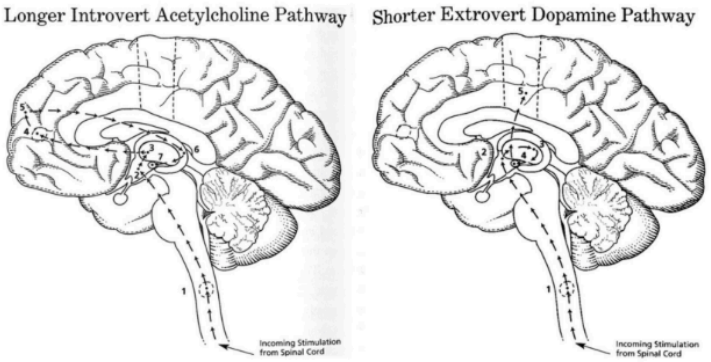

Figure 2. Neurotransmitter pathways between introverts and extraverts (Medium, 2016)

Environmental Influences

Introversion and extraversion hold a genetic component, but environmental factors also play a role. Results from identical twin studies suggest that one's surroundings greatly influence personality, with a 40% genetic and 60% environmental variance (Loehlin & Nichols, 2012). In another study, Professor Brian Little developed the free trait theory, which states, "...introverts may temporarily act as extraverts in order to advance projects requiring expressions of enthusiastic assertiveness." (Little, 2008). In conclusion, introversion and extraversion are flexible, complex blends of genetic components and environmental factors. These personality types of extraversion and intraversion arise from neurological and biochemical processes, influencing our behavioral and emotional responses. Understanding this dynamic can provide valuable insights into human behavior.

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