Chapter 3
Neurobiology of Well-Being

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ABSTRACT

This chapter is designed to review much of the research on the neurobiology of well-being. A distinction between hedonic well-being and eudaimonic well-being is made. The brain reward center was discussed in relation to well-being, which was followed by an in-depth discussion related to drugs, neurotransmitters, and well-being. Neurochemicals related to hedonia and eudaimonia were then discussed, followed by another discussion on gene expression. Finally, brain structures involved in well-being were the discussed followed by concluding thoughts.

INTRODUCTION

Well-Being: Hedonic and Eudaimonic

There is a plethora of concepts directly related to the psychology of well-being, including but not limited to life satisfaction, domain satisfaction, positive and negative affect, emotional well-being, hedonic well-being, perceived quality of life (QOL), happiness, psychological well-being, eudaimonia, authentic happiness, flourishing, positive mental health, psychological happiness, prudential happiness, perfectionist happiness, the good life, etc. Philosophers and psychologists of well-being have much to say about these concepts and their meaning (Sirgy, 2012).

In a review of the literature on subjective well-being, Diener, Suh, Lucas, and Smith (1999) defined subjective well-being as a broad category of phenomena that includes people's emotional responses, domain satisfaction (satisfaction in important life domains such as satisfaction with family life, health life, work life, leisure life, social life, etc.), and global judgments of life satisfaction. Diener and his col-

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leagues added that each of these concepts should be studied separately, although the constructs often correlate substantially with each other.

Sirgy and Wu (2009) assert that true happiness occurs when an individual experiences satisfaction in terms of their basic needs (based on Maslow's hierarchy of needs), but also in terms of their growth needs (i.e., social, esteem, self-actualization, knowledge, and aesthetic needs). This type of satisfaction is referred to as eudaimonic or psychological well-being. Ryff refers to eudaimonic well-being as human flourishing. Ryff's construct involves six dimensions: self-acceptance, positive relations with others, personal growth, purpose in life, environmental mastery, and autonomy (e.g., Ryff, 1989, 2017; Ryff & Singer, 2008; Ryff et al., 2016). Whereas the hedonic approach to well-being focuses on pleasure attainment and pain avoidance (Kahneman, 1999), the eudaimonic approach focuses on meaning, self-realization, and purposefulness. Throughout this chapter hedonic well-being and eudaimonic well-being will be referred to as two major components that define overall well-being.

In sum, well-being is an umbrella concept that captures hedonic well-being and eudaimonic well-being. Hedonic well-being is the affective dimension that reflects preponderance of positive affect over negative affect. Eudaimonic well-being focuses on experiences related to personal growth and character development.

The Reward Center and Well-Being

What is the mechanism of action that produces pleasant emotions that result in hedonic well-being? The mechanism involves brain centers that reflect what neuroscientists refer to as "the reward system" (Wise, 1996). The seminal study demonstrating the presence of the reward circuit involved rats that pressed a bar to administer a brief burst of electrical stimulation to specific sites in their brains (Olds & Milner, 1954). Said behavior had no value to their survival (i.e., food) or to that of the species (i.e., sex), but resulted in compulsive repetition of bar pressing. This phenomenon has been referred to as "intracranial self-stimulation" or "brain-stimulation reward" (Wise, 1996).

Research investigating intracranial self-stimulation has identified several brain sites that are involved in the reward system. Some regions stand out more than others (e.g., the ventral tegmental area (VTA) and the medial forebrain bundle). Stimulation of these regions activates fibers that form the ascending pathways from dopamine-producing cells of the VTA that project to the nucleus accumbens (NAc), the amygdala, the hippocampus, and the prefrontal cortex (Advokat, Comaty, & Julien, 2014; Kolb & Whishaw, 2014; Rickard & Vella-Brodick, 2014). This system, referred to as the mesolimbic dopamine pathway, plays a crucial role in reward. Drugs of abuse activate this reward system either directly (e.g., cocaine) or indirectly (e.g., opium). Much evidence shows that increases in dopamine (a neurotransmitter) in this pathway are directly involved with positive affect (i.e., feelings of pleasure and even euphoria).

The mesolimbic system shows a marked increase of dopamine when animals are engaged in intracranial self-stimulation (Olds & Milner, 1954). The same system shows a marked increase of dopamine when animals engage in rewarding behaviors (e.g., feeding and copulation). The reward system also shows a marked increase in dopamine with all drugs taken for pleasure, such as amphetamines, opiates, barbiturates, alcohol, THC, PCP, MDMA, nicotine, and even caffeine (Kolb & Wishaw, 2014, p. 438). Other addictions, such as compulsive gambling, pathological overeating, and sexual addiction, have also been strongly correlated with changes in the VTA-NAc dopamine system (Nestler, 2005). Chronic dopamine activation diminishes endogenous dopamine release and causes down-regulation of dopamine receptors which is a major aspect of drug tolerance (Volkow et al., 2005). Fewer dopamine receptors creates a