

**Aims of the Review** The purpose of this paper was to highlight findings deriving from research in individuals with PD that might contribute to clarifying the factors related to individual differences in approach and avoidance aptitude. In particular, we here reviewed PD literature to clarify whether neurobiological and neuropsychological modifications due to PD are associated to changes in approach–avoidance related personality features. We focused on this issue for three main reasons: First, PD clinical manifestations are primarily a consequence of dopamine dysfunction in neural networks whose activity is considered important for sustaining the activity of behavioral motivation systems (Young, 2002; Calabresi et al., 2006; Laricchiuta et al., 2014). Second, some data suggest that PD patients develop personality characteristics and psychopathological disorders associated with avoidance behavior (Meyer et al., 1999; Muris et al., 2001). Third, PD patients frequently present neuropsychological disorders involving cognitive functions that are critical for sustaining goal-directed behavior (Halliday et al., 2014). These three points will be discussed by focusing mainly on the results of studies that suggested a potential relationship between the modifications occurring during the course of PD and the expression of various aspects of approach and avoidance behavior.

**Methods** The studies were searched using electronic database Medline and PsychInfo in a period including the first months of 2014. In both databases the same following keywords were used: Approach–avoidance; Dopamine systems; Parkinson’s disease; Personality; Motivation Disorders; Cognitive functioning; Executive abilities. The studies included in the review should investigate, in PD patients, personality traits that could be related to approach–avoidance aptitude and their relationship with neurobiological and neuropsychological variables. A list of the studies that were considered with a description of main characteristics and results is reported in Table 1.

**Neurobiological Mechanisms of Approach–Avoidance Behavior and PD: Evidence of an Overlap** Neurobiologic Correlates of Approach–Avoidance Behavior: Evidence from Non–PD Studies Enter et al. (2012) found that dopamine transporter (DAT1) polymorphisms were related to different approach–avoidance behaviors when healthy adults were assessed using a task that had stimuli with emotional social valence (i.e., human faces). In particular, these authors demonstrated that, compared with DAT1 10-repeat homozygote carriers DAT1 9-repeat carriers showed an increased effect of the presented stimuli (happy and angry faces) in approach–avoidance responses. This finding suggests that the motivational behavioral systems of these subjects are more sensitive. The DAT is involved in dopamine reuptake in the striatum and the DAT1 9-repeat carriers have been reported to have lower levels of DAT than individuals with 10-repeat alleles, which indicates that these subjects have higher dopamine concentrations in the striatum (Heinz et al., 2000). Furthermore, in a recent functional magnetic resonance imaging (fMRI) study in healthy young subjects, Simon et al. (2010) documented greater ventral striatal and mesial orbito-frontal cortex activation when individuals who showed a high expression of reward-seeking behavior actually received rewards. By contrast, they found less ventral striatal activation when subjects who were more prone to inhibit appetitive behavior received a reward (Simon et al., 2010). These findings provide evidence in line with previous data from animals models that dopamine neurotransmission in neural networks (including the striatal structures) is critically involved in the modulation of motivation behavior (For a review on animal models see, Hoebel et al., 2007).