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Review Article

Personality in Parkinson's disease: Clinical, behavioural and cognitive correlates

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ABSTRACT

Affective disorders and personality changes have long been considered pre-motor aspects of Parkinson's disease (PD). Many authors have used the term "premorbid personality" to define distinctive features of PD patients' personality characterized by reduced exploration of new environmental stimuli or potential reward sources ("novelty seeking") and avoidance behaviour ("harm avoidance") present before motor features.
The functional correlates underlying the personality changes described in PD, implicate dysfunction of meso-cortico-limbic and striatal circuits. As disease progresses, the imbalance of neurotransmitter systems secondary to degenerative processes, along with dopamine replacement therapy, can produce a reversal of behaviours and an increase in reward seeking, laying the foundations for the emergence of the impulse control disorders.
Personality disorders can be interpreted, therefore, as the result of individual susceptibility arising from intrinsic degenerative processes and individual personality features, in combination with extrinsic factors such as lifestyle, PD motor dysfunction and drug treatment.
For a better understanding of personality disorders observed in PD and their relationship with the prodromal stage of the disease, prospective clinical studies are needed that correlate different personality profiles with other disease progression markers.
Here, we review previous studies investigating the clinical, cognitive and behavioural correlates of personality traits in PD patients.

Contents

Abbreviations: NS, novelty seeking; HA, harm avoidance; RD, reward dependence; TPQ, Temperament Personality Questionnaire; TPI, Temperament Personality Inventory; NEO-PI, NEO Personality Inventory; DBS, deep brain stimulation.

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1. Introduction

1.1. Personality: definition, theoretical models and assessment tools

Personality characteristics are distinctive and recurrent patterns of thoughts, feelings and actions that occur in response to particular situational demands [1]. Until now, several models of personality and its organization in dimensions or factors have been proposed. In brief, Cattell et al., proposed a model with sixteen personality traits on which the 16 Personality Factors Test (16 PFT) was developed [2,3]. When these variables were analysed, only five factors were found to be replicable (i.e. Extraversion, Agreeableness, Conscientiousness, Emotional Stability versus Neuroticism, and Culture, which was reinterpreted as Intellect and Openness to Experience), and were then included in the first model of personality (i.e. the Big Five Model) [4], in which each factor included a cluster of specific traits and was associated with distinct neural pathways [5,6]. In agreement with the Big-Five framework, Costa and McCrae then constructed the NEO Personality Inventory [NEO-PI] [7]. Eysenck further simplified this model by including only three dimensions (i.e. extraversion, neuroticism and psychoticism), and on this basis developed the Eysenck Personality Inventory [8,9]. More recently, Cloninger proposed a three-dimensional model of personality that included: the novelty seeking construct (NS), defined as the tendency to response to novelty, danger and cue for reward; the harm avoidance (HA) trait, characterized by the tendency to avoid aversive stimuli; and the reward dependence (RD), defined as the tendency to react actively to rewards [10]. To measure these dimensions the Temperament Personality Questionnaire (TPQ) and the Temperament Personality Inventory (TPI) was then developed [11,12]. Cloninger revised the model by adding a new dimension, "Persistence" (P) described as perseverance despite frustration and fatigue [13]. All dimensions were considered to be independently heritable and correlated with activity of various monoamines: in particular, NS was associated with low basal dopaminergic activity, HA with high serotoninergic activity and RD with low basal noradrenergic activities [14] (a summary of personality models and assessment tools has been listed in Table 1).

Understanding the neurobiological basis of personality would benefit from the study of neurodegenerative diseases such as Parkinson's disease (PD), characterized by the alteration of monoaminergic neural transmission, mainly a dopaminergic depletion, determining the onset of both motor and non-motor symptoms since its early stages [15]. An association between monoaminergic activity and specific personality traits supports the idea of a premorbid personality in PD and the transition towards specific personality traits after PD onset and antiparkinsonian treatments.

Here, we review previous studies investigating the idea of a premorbid personality specific to PD as well as personality changes following PD clinical onset, and those investigating neural correlates of personality traits in PD.

Table 1
Theoretical models and assessment tools for personality traits.

Authors	Personality traits	Assessment tools
Cattell [2,3]	Warmth; Reasoning; Emotional Stability; Dominance; Liveliness; Rule-Consciousness; Social Assertiveness; Sensitivity; Vigilance; Abstractedness; Privateness; Apprehension; Openness to Change; Self-Reliance; Perfectionism; Tension.	16 Personality Factors Test (16PFT)
Big-Five framework (Costa and McCrae [7])	Extraversion; Agreeableness; Conscientiousness; Neuroticism (or Emotional stability); Culture (or reinterpreted as Intellect and Openness to Experience).	NEO Personality Inventory [NEO-PI]
Eysenck [8]	Extraversion; Neuroticism; Psychoticism.	Eysenck Personality Inventory (EPI)
Cloninger et al. [13]	*Temperament*: Novelty seeking (NS1-Exploratory excitability vs. Stoic rigidity; NS2-Impulsiveness vs. Reflection; NS3-Extravagance vs. Reserve; NS4-Disorderliness vs. Regimentation); Harm avoidance (HA1-Anticipatory worry and pessimism vs. Uninhibited optimism; HA2-Fear of uncertainty; HA3-Shyness with strangers; HA4-Fatigability and asthenia); Reward dependence (RD1-Sentimentality; RD2-Attachment; RD3-Dependence); Persistence *Character*: 1. Self-directedness refers to the self-determination of the subject (S1-Responsibility vs. Blaming; S2-Purposefulness vs. Lack of goal-direction; S3-Resourcefulness; S4-Self-acceptance vs. Self-striving; S5-Enlightened second nature); 2. Cooperativeness concerns the degree to which a person is generally agreeable in his/her relations with other people (C1-Social acceptance vs. Social intolerance; C2-Empathy vs. Social disinterest; C3-Helpfulness vs. Unhelpfulness; C4-Compassion vs. Revengefulness; C5-Pure-hearted conscience vs. Self-serving advantage); 3. Self-Transcendence refers to the experiencing of spiritual ideas (ST1-Self-forgetful vs. Self-conscious experience; ST2-Transpersonal identification vs. Self-differentiation; ST3-Spiritual acceptance vs. Rational materialism)	Tridimensional Personality Questionnaire (TPQ), Temperament and Character Inventory (TCI)

1.2. Search strategy and selection criteria

We searched PubMed for articles published up to October 9, 2016 with the terms "Personality AND Parkinson's Disease", "Trait personality AND Parkinson's Disease", "temperament AND Parkinson's Disease". Selected articles were also obtained from the reference lists of papers identified by the previous searches. Apart from a few key studies, only reports published in English were included. The final reference list was generated on the basis of relevance to the topics covered in this Review.

2. Premorbid personality traits in PD population

2.1. Studies on PD populations

Since observations in the first half of 20th century, most authors reported a premorbid personality profile as rigid, inflexible, and punctual which did not change after the onset of motor symptoms [16–18]. The majority of these reports were based on retrospective impressions of traits framed in psychoanalytic terms, suggesting that repression of emotional reactions, along with a persistent anxiety would characterize individuals with a higher risk of developing PD [17].

Other authors described PD patients as perfectionist [19,20], obsessive [19,21], dependent [19,22], affectively inconstant, passive [22], industrious, very exact and ambitious [23], morally rigid, mentally inflexible [20,21], worried sick about body image [21]. More recently, Poewe et al., reported an introverted and anancastic premorbid personality type, characterized by high level of over-control, social impotency and depression [24].

Several studies comparing pairs of monozygotic twins have partly confirmed these observations. A retrospective study by Ward et al. showed that in childhood the twins who later developed PD were less likely to be aggressive and confident, and more self-controlled and