

Dopaminergic Imaging in Parkinson's Disease Depression: A Systematic Review

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Background

Parkinson's disease (PD) depression is a common neuropsychiatric complication of PD and is associated with reduced quality of life and increased disability.¹ There is a high prevalence of depression in people with PD, and many develop prodromal depression prior to motor symptoms.¹ Growing evidence suggests that the pathophysiology of PD depression is the result of biological factors.² However, it is controversial as to whether the underlying dopamine dysfunction of PD is associated with the subsequent development of depression.^{3,4}

Objective

To systematically review the existing literature on the imaging of cerebral dopamine activity in PD depression.

Methods

MEDLINE, EMBASE and PsycINFO were searched for keywords from inception through to January 2021. Authors independently screened all titles and abstracts according to the eligibility criteria and independently reviewed the full text articles of included studies.

Data extracted included year of study, study size, participant demographics (age, sex, duration of PD), methodologies (depression assessment instrument, neuroimaging modality) and key findings.

Inclusion Criteria:

- Studies published in a peer-reviewed journal and written in English;
- At least one group of participants in the study had a diagnosis of Parkinson's disease and did not have a concurrent neurocognitive disorder;
- The study assessed participants for depression symptoms with a validated psychometric tool;
- The study utilized a neuroimaging modality which could measure cerebral dopaminergic activity (i.e., via radioligand binding or uptake).

Results

A total of 20 studies comprising of 2048 PD participants were included (Figure 1). Studies ranged in size from 20 to 480 participants with an average age of 63.3 years and PD duration of 4 years.

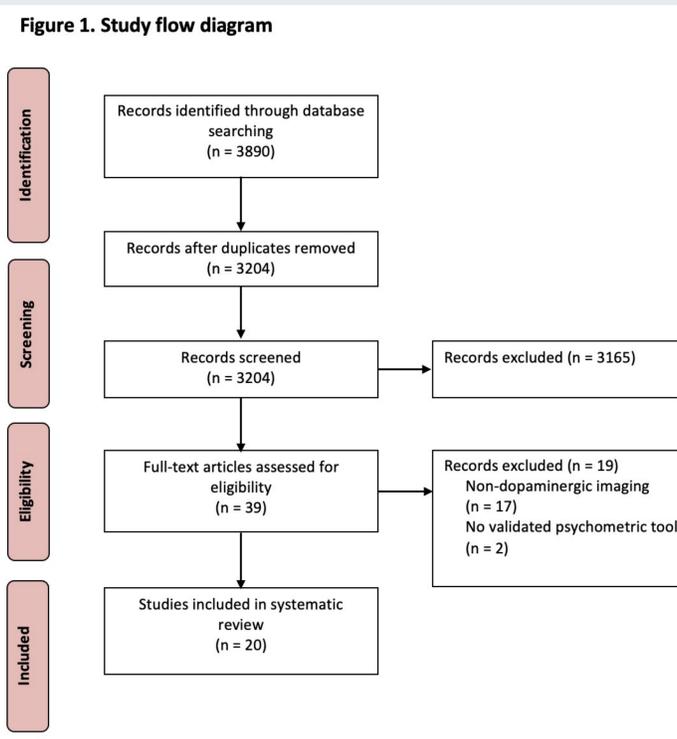
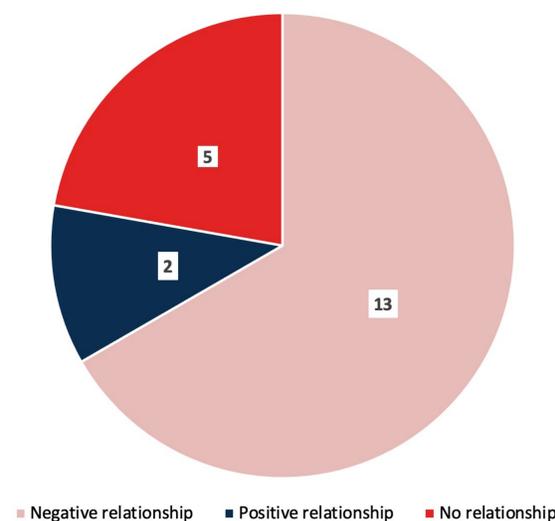
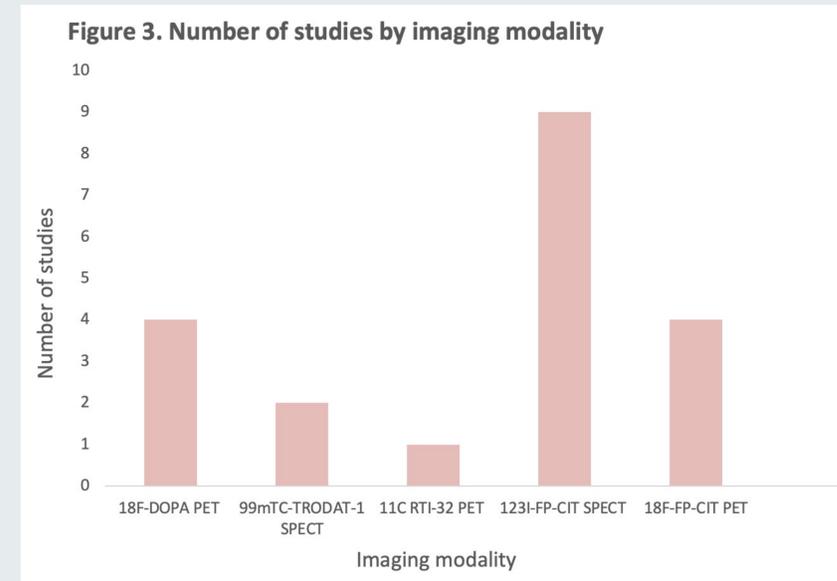


Figure 2. Number of studies demonstrating a relationship between dopaminergic activity and depressive symptoms



The relationship between dopaminergic activity and depressive symptoms was reported in all 20 studies with 13 studies (65%) demonstrating lower dopamine activity in those with greater depressive symptoms (Figure 2). All studies employed PET (n=9) or SPECT (n=11) imaging and utilized a range of radioligands (Figure 3).



Multiple methodological issues were identified in the individual studies. Small sample sizes (<50 PD participants) (n=10) and concurrent use of antiparkinsonian medications and/or antidepressants (which can interfere greatly with radioligand binding⁵) (n=10) were identified.

Conclusion:

To date, most studies suggest that there is a negative relationship between dopaminergic activity and depressive symptoms in PD. However, the results should be interpreted with caution as many studies had methodological issues which may have biased or confounded results.

More research is required, and future studies should aim to minimize all potential sources of bias and confounders.

References:

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