Objective: Apathy is a primary lack of motivation that is frequently reported in Parkinson's disease (PD) and often misdiagnosed as depression. In PD, apathy worsens over time with motor symptom progression. Evidence over the past 15 years has documented that use of selective serotonin reuptake inhibitors (SSRIs) is associated with increased apathy in patients with depression, including individuals with PD. In PD, this appears to be related to downregulation of dopaminergic systems by serotonin. Despite increasing evidence, SSRIs continue to be heavily prescribed in individuals with PD—potentially worsening apathy and decreasing quality of life for these individuals. This study is an update, re-examining the relationship between apathy and the use of SSRIs and other antidepressants in a large cohort of individuals with PD.
Participants and Methods: Participants included a convenience sample of 387 nondemented individuals with idiopathic PD who were in their mid-60's (mean age=64.9+8.72 years), well-educated (mean=14.95+2.78 years), predominantly male (72.4%), non-Hispanic white (94.5%), and in mid-stage of disease severity (on medication Unified Parkinson Disease Rating Scale motor score=25.3+10.1). All scored above clinical cutoff for dementia on a cognitive screener (Dementia Rating Scale-2 (DRS) > 125). Medications, cognitive, mood, and clinical data were extracted from chart review. Depression and apathy were measured using the Beck Depression Inventory-II (BDI-II) and the Apathy Scale (AS). Antidepressant medications were grouped into SSRIs, serotonin and norepinephrine reuptake inhibitors (SNRIs) and other. Analyses included bootstrapped Pearson's correlations, Pearson's chi-square, and linear regressions
Results: Among 387 individuals with PD, 41.3% (N=160) were taking antidepressant medications. Of these 160, 61.3% were on SSRIs, 24.4% on SNRIs, and the remainder on other antidepressants. Approximately 36.9% of the 387 PD patients exceeded recommended clinical cutoffs for apathy (AS >14) and 23.5% for depression (BDI-II >14) (Starkstein et al., 1992; Beck et al., 1996). Individuals taking SSRIs (N=98, χ^2=5.14, p=0.023) or SNRIs (N=39; χ^2=5.43, p=0.020) were more likely to be clinically apathetic than those taking other depression medications (N=23; χ^2=1.28, p=0.26). Results of a multiple regression with age, education, disease duration, motor severity, DRS-2, BDI-II, and all psychotropic medications (anti-depressants, anti-anxiety, anti-psychotics) as independent variables explained 42.8% of the variance in total apathy scores (F[17,285]=12.550, p<0.001). SSRIs were the only medication to significantly predict greater AS scores (β=0.110, p=0.020) in this model. Less education (β=-0.119, p=0.017) worse cognition (β=-0.128, p=0.009), and greater depressive symptoms (β=0.561, p<0.001) were also significant predictors of apathy.
Conclusions: These findings suggest that use of SSRIs, but not other antidepressants, is associated with greater apathy in PD. Given the interactive relationship between serotonin and dopamine, the current findings highlight the importance of considering apathy as a potential adverse effect when determining which anti-depressants to prescribe to individuals with PD. Similarly, switching a SSRI for an alternative anti-depressant in individuals with PD who are apathetic may be a potential treatment for apathy that needs further study. Longitudinal studies are also needed to elucidate the relationship of apathy and anti-depressant use over time, specifically to determine potential causality of this observed association.
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Keyword 1: Parkinson's disease
Keyword 2: apathy
Keyword 3: psychopharmacology
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5 Anticholinergic Medications, Cognition, and Parkinson's Disease. Do Medications matter?

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Objective: While Parkinson's disease (PD) is traditionally known as a movement disorder, cognitive decline is one of the most debilitating and common non-motor symptoms. Cognitive profiles of individuals with PD are notably heterogeneous (Goldman et al., 2018). While this variability may arise from the disease itself,

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other factors might play a role. Greater anticholinergic medication use has been linked to worse cognition in those with PD (Fox et al., 2011, Shah et al., 2013). However, past studies on this topic had small sample sizes, limited ranges of disease duration, and only used cognitive screeners. Thus, this study aimed to examine this question within a large, clinical sample, using a more comprehensive neuropsychological battery. We hypothesized that higher anticholinergic medication usage would relate to worse cognitive performance, particularly memory.
Participants and Methods: Participants included 491 nondemented individuals with PD (m=64.7, SD=9.04 years old; education m=15.01, SD=2.79; 71.9% male; 94.3% non-Hispanics white) who underwent a comprehensive neuropsychological assessment at the UF Fixel Institute's movement disorders program. Medications at the time of the neuropsychological evaluation were identified from chart review and scored based on anticholinergic properties using the Magellan Anticholinergic Risk Scale (Rudolph J.L., et al, 2008); each medication was scored from 0 (no load) to 3 (high load). The neuropsychological battery included measures across 5 cognitive domains: (1) executive function (Trails B, Stroop Interference, Letter Fluency), (2) verbal delayed memory (WMS-III Logical Memory and Hopkin's Verbal Learning Test-Revised delayed recalls), (3) language (Boston Naming Test-II, Animal Fluency), (4) visuospatial skills (Judgment of Line Orientation, Face Recognition Test), and (5) attention/working memory (WAIS-III Digit Span Forward and Backward). The published normative scores for each task were converted into z-scores and averaged into a domain composite. Due to non-normality of Magellan scores, Spearman correlations examined the relationship between each cognitive domain composite score and Magellan scores.
Results: As predicted, higher Magellan scores were significantly associated with worse memory (r=-0.11, p=0.016), with a small effect size. There were no significant relationships between Magellan scores and the remaining cognitive domains (EF, language, visuospatial, attention).
Conclusions: We found that greater anticholinergic burden was associated with worse performance on memory, but not other neuropsychological domains, in a large cohort of nondemented individuals with PD who underwent comprehensive assessment. This finding corresponds to previous literature in smaller PD cohorts. Though the effect size was low, this finding highlights the importance of monitoring anticholinergic burden in PD patients in order to minimize detrimental effects of medications on memory function. Future work should examine whether greater anticholinergic burden predicts future progression of memory decline.
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6 Improved verbal fluency following unilateral right hemisphere subthalamic nucleus deep brain stimulation for Parkinson's disease: Is implant hemisphere a modifiable risk factor for cognitive decline?

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Objective: Non-motor symptoms, such as mild cognitive impairment and dementia, are an overwhelming cause of disability in Parkinson's disease (PD). While subthalamic nucleus deep brain stimulation (STN DBS) is safe and effective for motor symptoms, declines in verbal fluency after bilateral DBS surgery have been widely replicated. However, little is known about cognitive outcomes following unilateral surgeries.
Participants and Methods: We enrolled 31 PD patients who underwent unilateral STN-DBS in a randomized, cross-over, double-blind study (SUNDIAL Trial). Targets were chosen based on treatment of the most symptomatic side (n = 17 left hemisphere and 14 right hemisphere). All

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