

# Review

## Psychosomatic Associations Between Thinking Patterns and Parkinson's Disease from a Yoga Philosophy Perspective: A New Zealand Cross-Sectional Study

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### Abstract

When investigating the etiology of diseases, epidemiological observational studies traditionally deemphasize psychosomatic associations. Exploring cognitive behavior provides an insight into how psychosomatic associations affect disease. Yoga philosophy identifies the *kleshas* (mental afflictions) of ignorance, ego, desire, hatred, and fear of death with disease. This is because individuals' perceptions and beliefs generate and reflect streams of thought that may shape their behavior and manifest as, or predispose them to, particular disease(s). The present study takes a yogic philosophical perspective to help elucidate unexplored associations between thinking about different aspects of life and the severity of Parkinson's disease (PD). The study involved a cross-sectional sample survey. Parkinson's New Zealand selected a random sample of 990 of its members. A self-completed questionnaire was sent to them. It asked questions about how often, over the previous 4 weeks, they had thought about 18 aspects of life commonly associated with the *kleshas*. A completed questionnaire was returned by 319 people (32%). Respondents thought most about family (87%), health (64%), rest and sleep (57%), food (53%), and the future (52%). They reported thinking least about work (48%), sex (45%), death (42%), and being virtuous (39%). A weak, but hypothesized positive, association ( $r = 0.2$ ,  $p < 0.000$ ) was detected between PD severity and thinking about death. The study could not determine whether thinking about death was (1) a cause or consequence of PD severity, and (2) a premorbid behavior. However, the possibility that stress associated with thinking about death accelerates PD progression is consistent with yoga philosophy and with neurophysiological mechanisms associated with the psychosomatic connections. The findings are worthy of future testing. A retrospective cohort study and qualitative research could deepen understanding

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### Introduction

Parkinson's disease (PD) is the most common neurodegenerative disease after Alzheimer's disease.<sup>1</sup> It produces considerable disability for people living with the condition, their families, and the community. With no current cure or certain cause, it is important to be open to different perspectives on why some people develop PD and why their disease severity worsens at different rates. Potentially relevant perspectives include yoga philosophy (YP), which considers cognitive means of acquiring disease (Patanjali's Yoga Sutra, Chapter 2, Verse 3).<sup>2-5</sup> Both individual perceptions and societal influences are assumed to integrate sensory and cognitive stimuli and the physiological response that follows.<sup>6-8</sup> As the role of thinking and the nature of thought behavior in PD have not been studied before, investigation of how individuals' thinking patterns may contribute to the development and neuroprogression of this disease is warranted.

According to YP, as mentioned in the Yoga Sutras (YS),<sup>2,4,5,9</sup> individuals' perceptions and beliefs generate reflective streams of thought (1.4–1.11). Therefore, YS defines yoga as restraining the mental perceptions and beliefs that persist as the cognitive behavior of an individual (1.2).<sup>2</sup> YP also states that diseases originate as mental revisions of cognitive behavior and cause a cascade of physical responses (2.15).<sup>10</sup> These responses seek to maintain relatively stable physiology to accommodate the mental ebb and flow arising from changes in the environment of the individual. This physiological wisdom was termed *homeostasis* by physiologist Walter Cannon.<sup>11</sup> Homeostatic mechanisms operate by

up- and down-regulating the physiology of organ systems in response to the individual's perceptions. Homeostatic regulations over time may cause cells to adapt, leading to the manifestation of chronic noncommunicable diseases like PD.

YP further states that *kleshas* (mental afflictions)—*avidya* (ignorance), *asmita* (ego), *raga* (desire), *dvesha* (hatred), and *abhinivesha* (fear of death/wanting to live)—cause suffering/disease by acting as long-term stressors (YS 2.3).<sup>2,12</sup> These *kleshas* are cognitive aspects of oneself that can be detrimental to health.<sup>13,14</sup> Interpreting YS, Swami Satyananda Saraswati<sup>15</sup> describes the five *kleshas* as outlined below.

Stress manifests as perpetual desires that can cause suffering and disease.<sup>16</sup> For example, desiring material indulgences causes mental stress. An individual's suffering and diseases have their origin in *avidya*. This first affliction refers to the ignorance that arises when the soul descends into matter and forgets its divine origin (2.5). The second affliction, *asmita* (2.6), results. It leads to separation, the cause of false identification, and in turn operates through the mechanism of the third and fourth afflictions (2.7–2.8), *raga* and *dvesha*. Here, one experiences mind and body (thoughts, words, and actions), which operate interdependently and dualistically. Within YP, attachment and hatred condition the terrain of human existence, as they are the *kleshas* with which people mostly associate.<sup>9</sup> Although all of the *kleshas* stimulate cognitive thinking, it appears that desire and hatred, strongly associated with the brain's reward system, galvanize cognition the most. Desire, a sense of attraction, is opposite hatred, which activates a sense of rejection. The fifth affliction is *abhinivesha* (2.9), or the desire (of the body) to live, which is associated with fear of dying (losing existence).<sup>17</sup> This affliction defines the basic obstacle to reversing the attachment we have to the "life" of structure, whose dissolution is experienced as death.

The process of imbalance and ill health results from the disunification of the mind and body.<sup>18</sup> Not understanding the purpose and four aims of life—*artha* (material wealth), *kama* (emotional fulfillment), *dharma* (duty), and *moksha* (liberation)—and their associations with afflictions leads to separation.<sup>14</sup> The affliction of ignorance is characterized by lack of self-awareness, which may result from identifying oneself with failure in the quest for materialism, and hence from mental resentment. This form of separation disturbs the equilibrium in qualities of thinking and in the daily lifestyle.

The interplay between perceptions and *kleshas* activates physiological demands on the organ systems, causing further degeneration (YS 1.5). This implies that perceptive behavior activates homeostatic regulations through neural and hormonal systems that enhance the physiological

response. In the presence of a *klesha*, the response is intensified, so the disease manifests. The *klesha*-associated perceptive response is the psyche behind the disease. To avoid persistent homeostatic disturbances, YP recommends restraining the perceptive interpretations.<sup>5</sup> Restraining mental perceptions and beliefs moderates psychosomatic influences, leading to disease prevention and health promotion.

YP suggests that perceptions may influence individuals' thought patterns and in turn their physiology.<sup>10</sup> Advaita Vedanta, an Indian philosophical scripture, states that perception may generate fearful thoughts, for example, mistaking a rope for a snake.<sup>19</sup> The fear may trigger the sympathetic nervous system to amplify the physiological response. Once the rope is recognized as a rope, parasympathetic activities follow. Hence, the present study explores psychosomatic associations between frequencies of certain thought categories and aspects of life with PD. Resulting physiological changes that might have contributed to the onset and progression of PD will then be discussed.

This discussion complements epidemiological studies, which suggest that risk factors for PD include genetic factors,<sup>20,21</sup> environmental factors,<sup>22,23</sup> intrauterine life, neonatal environment, and lifestyle influences.<sup>24,21</sup> However, in reviewing the epidemiological evidence, de Lau and Breteler<sup>25</sup> report the cause of PD to be unknown. Past studies have not been sufficiently robust in their methodology or broad enough. Whereas Western medical sciences examine physical evidence, and especially external agents, in the causation of disease, the YP perspective examines and prioritizes the role of the mind in the causation of disease. Therefore, this study draws on YP to expand investigation into plausible cognitive factors associated with the onset and progression of PD in New Zealand.

## Methods

This study sought to use survey methodology to investigate how thought patterns are associated with the level of PD severity among affected people in New Zealand. A cross-sectional postal survey was administered to a random sample of members of Parkinson's New Zealand (PNZ). Survey data were collected to (1) estimate prevalences of self-reported, retrospective thinking about aspects of life over the 4 weeks before the survey; and (2) explore associations between thought patterns and PD severity.

The sample selected comprised 990 of PNZ's 4,500 registered members. This sample size was selected because we reasoned that a response rate as low as 30% would yield a sample of approximately 300 respondents, enabling estimation of a proportion as large as 0.5 with 95% confidence and a margin of error of  $\pm 4.5\%$ .<sup>26</sup> We predicted a response rate of 30% because it was not known from the database

which members have PD and speculated that those without PD might be less motivated to take part in the survey. PNZ performed the sample selection task to maintain the anonymity of its members. The selected members were invited to take part in the survey. Completed questionnaires and consent forms were mailed by participants to the authors at the University of Auckland, New Zealand.

The instrument contained questions about demographics, PD severity, and frequency of thinking about 18 aspects of life identified in the literature to be commonly associated with the kleshas.<sup>10,27-32</sup> The latter questions were constructed as 5-point Likert scales including *never*, *seldom*, *sometimes*, *often*, and *always*. Cleaned and coded data were entered into SPSS version 19.0 for statistical analysis. The Likert scales appeared to have face and content validity, and a principal component analysis (PCA) assessed the construct validity of the questions particularly relating to the aspects of thinking. The data were analyzed to show how PD varied by age group, sex, and whether the PD was self-reported to be mild, moderate, or severe. Later, patterns of thinking about different aspects of life were described. Kendall's tau-b bivariate correlation coefficients were calculated to test hypothesized associations between each aspect of thinking and the self-assessed severity of the PD. Cross-tabulations and partial correlations were also performed.

## Results

### Characteristics of Participant Groups

Of the invited sample of 990 members of PNZ, 35.4% ( $n = 357$ ) returned usable questionnaires. Of these respondents, 319 (91.7%) self-reported having received a diagnosis of PD from a health professional. The 29 (8.3%) who did not report receiving such a diagnosis were excluded from the study because they were too few in number to constitute a meaningful comparison group. The age of the respondents with PD ranged from 37 to 92 years. There were more males (60.4%) than females (39.6%) in this sample. A majority of the PD respondents were aged at least 65 years (57.8%). Table 1 shows the self-reported severity of PD by respondents' age and sex. Moderate to severe PD was reported by approximately two-thirds; this level of PD

severity was especially common among women and at ages 65 and over.

### Aspects of Thinking

The PCA with orthogonal rotation (Varimax with Kaiser normalization) indicated the construct validity of the 18 items about the frequency of thinking about different aspects of life. The PCA reduced these items to three components: intrapersonal, personal, and interpersonal aspects. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis (KMO 0.763), and all KMO values for individual items were between 0.138 and 0.649; however, two values were well above the acceptable limit of 0.5.<sup>33</sup> Bartlett's test of sphericity ( $\chi^2(153) = 859.81$ ,  $p < 0.0001$ ) indicated that the correlations between items were significantly large for PCA. An initial analysis was run to obtain eigenvalues for each component in the data. Five components had eigenvalues above Kaiser's criterion of 1 and in combination explained 52.4% of variance. The scree plot was slightly ambiguous and showed influxes that would justify retaining components 2 and 4. Given the large sample and the convergence of the scree plot and Kaiser's criterion on five components, this was reduced to three components in the final analysis.

Table 2 shows the component loadings after varimax rotation. The items that clustered on the same components suggest that components represented intrapersonal, personal, and interpersonal thinking.

Table 3 shows the frequency with which respondents thought about 18 specified aspects of life over the previous 4 weeks ( $n = 319$ ). Family was the aspect of life they reported thinking most about, with 87% of the respondents reporting "often" or "always" thinking about family. More than half of the respondents reported that they often or always think about health (65%), rest and sleep (57%), food (54%), and the future (52%). Death and sex were the aspects of life that the fewest respondents (17% and 20%, respectively) often or always thought about.

In contrast, work was the aspect of life that respondents reported thinking the least about; 48% reported "never" or "seldom" thinking about work. More than one-third of the

**Table 1.** Distribution of Parkinson's Disease (PD) Group by Age, Sex, and Severity,  $n$  (%)

	Male ( $n = 191$ )		Female ( $n = 148$ )	
	Age < 65 y ( $n = 49$ )	Age $\geq$ 65 y ( $n = 142$ )	Age < 65 y ( $n = 34$ )	Age $\geq$ 65 y ( $n = 114$ )
Mild PD ( $n = 110$ )	23 (46.9)	44 (31)	14 (41.2)	29 (25.4)
Moderate to severe PD ( $n = 229$ )	26 (53.1)	98 (69)	20 (58.8)	85 (74.6)

**Table 2.** Principal Component Analysis, Rotated Component Matrix<sup>a</sup>

Aspect of Thinking	Component		
	Intrapersonal	Personal	Interpersonal
Doing good deeds	0.744		
Community	0.643		
Being virtuous	0.634		
Recreation	0.622		
Exercise	0.602		
Achievement	0.549		
Family	0.401	0.364	
Health		0.648	
Rest and sleep		0.633	
Death		0.602	
Past		0.577	
Future	0.385	0.388	0.306
Food		0.332	
Sex life			0.764
Relationships			0.625
Work			0.551
Money		0.441	0.470
Holidays	0.349		0.399

<sup>a</sup>Extraction method = principal component analysis; rotation method = varimax with Kaiser normalization.

**Table 3.** Frequency (%) of Thinking About Specified Aspects of Life

Aspect of Life	Never or Seldom	Sometimes	Often or Always
<b>Intrapersonal</b>			
Doing good deeds	19	50	31
Being virtuous	39	36	25
Recreation	15	46	39
Exercise	12	31	57
Achievement	19	47	34
Community	29	45	26
Family	2	11	87
<b>Personal</b>			
Health	6	29	65
Rest and sleep	10	33	57
Death	42	41	17
Past	18	38	44
Future	10	38	52
Food	12	34	54
<b>Interpersonal</b>			
Sex life	45	35	20
Relationships	13	32	55
Work	48	24	28
Money	16	41	43
Holidays	33	41	26

respondents reported that they never or seldom think about sex (45%), death (42%), and being virtuous (39%). Family and health were the aspects of life that the fewest respondents (2% and 6%, respectively) reported never or seldom thinking about.

**Correlations**

Table 4 presents Kendall’s tau-b bivariate correlation coefficients between these thought patterns and PD severity. It shows a weak, but hypothesized positive, association ( $r = 0.2, p < 0.000$ ) between PD severity and thinking about death. Other reported aspects of thinking showed no association with the severity of PD, although this finding was only statistically significant for thinking about holidays ( $r = -0.1, p = 0.02$ ).

**PD Severity, Thinking About Death: By Sex and Age**

Table 5 illustrates exploration of the positive relationship between PD severity and thinking about death. Male and female respondents with mild PD reported thinking less about death than did those with moderate to severe PD. Thinking often or always about death was almost twice as common among those whose PD was moderate to severe rather than mild. This pattern was strongest among men. Thinking often or always about death by men with moderate to severe PD was 6 times as common compared to men with mild PD.

For all respondents with moderate to severe PD, those aged  $\geq 65$  years reported thinking about death often or always 6 times more commonly than those aged less than 65. One-third of the older respondents with moderate to severe PD reported never or seldom thinking about death, compared with half of those aged less than 65.

Assuming an underlying metric to the ordinal data, the zero-order correlation coefficient between PD severity and thinking about death was calculated. The result was similar to that reported in Table 5. A weak, but hypothesized positive, association was found:  $r = 0.23; p < 0.000$ . After adjustment for sex and age, the partial correlations fell to 0.17 and 0.14, respectively.

More males than females and considerably more European New Zealanders with PD responded to the survey. Reported thinking was most commonly around family and health, whereas thinking about sex life and death was least common. The PCA showed that the thinking patterns fell into three distinct groups related to intrapersonal, personal, and interpersonal thinking. However, the bivariate correlation showed a weak but positive association between disease severity and thinking about death. Further cross-tabulations showed that more women than men with severe PD, aged at or above 65, thought frequently about death.

**Table 4.** Kendall's Tau-b Bivariate Correlation Coefficients

Aspect of life	Predicted Direction of Correlation	Correlation Coefficient	95% Confidence Interval of the Difference		<i>p</i> Value
			Lower	Upper	
Work	Positive	-0.09	2.4889	2.7684	0.06
Money	Positive	0.00	3.2337	3.4266	0.85
Relationships	Positive	-0.00	3.4035	3.6124	0.92
Health	Negative	0.16	3.6181	3.8014	0.01
Death*	Positive	0.21	2.5966	2.7914	0.00
Food	Negative	-0.00	3.3520	3.5404	0.91
Sex life	Positive	-0.06	2.5108	2.7321	0.22
Holidays*	Negative	-0.11	2.7509	2.9697	0.02
Family	Positive	0.00	4.1259	4.2792	0.93
Community	Positive	-0.08	2.8406	3.0380	0.08
Exercise	Negative	-0.05	3.4319	3.6217	0.24
Recreation	Negative	-0.08	3.1359	3.3207	0.10
Past	Positive	0.08	3.1920	3.3794	0.11
Future	Negative	0.03	3.3943	3.5769	0.47
Doing good deeds	Positive	0.05	3.0456	3.2274	0.28
Being virtuous	Negative	0.02	2.6849	2.9177	0.68
Achievement	Negative	-0.03	3.0823	3.2647	0.48
Rest and sleep	Negative	0.09	3.4407	3.6226	0.05

\*Statistically significant associations.

**Table 5.** Cross-Tabulation of Parkinson's Disease (PD) Severity and Thinking About Death, According to Sex and Age

		PD Severity	Thinking About Death, <i>n</i> (%)		
			Never or Seldom	Sometimes	Often or Always
Sex	Male	Mild	37 (57.0)	24 (37.0)	4 (6.0)
		Moderate to severe	57 (45.0)	46 (36.5)	23 (18.0)
	Female	Mild	17 (41.5)	17 (41.5)	7 (17.0)
		Moderate to severe	21 (25.0)	44 (52.5)	19 (22.5)
Age	< 65 y	Mild	20 (56)	12 (33)	4 (11)
		Moderate to severe	20 (50)	14 (35)	6 (15)
	≥ 65 y	Mild	33 (48)	29 (42)	7 (10)
		Moderate to severe	53 (33)	70 (44)	36 (23)

## Discussion

Although proportionally more women than men in the general population survive to the older ages at which PD is most common, males accounted for three-fifths of our respondent sample of people with PD. Buetow et al.<sup>34</sup> similarly reported that 57% of the respondents to their national-sample survey of PNZ members were men. A meta-analysis of 17 relevant studies yielded a sex ratio of 1:5 (95% confidence interval 1.2–1.7).<sup>35</sup> In addition, 57.8% of our sample was at least 65 years old, and respondents were almost exclusively New Zealand European, most likely because PNZ's membership is disproportionately New Zealand European. The majority of the respondents reported having PD of mild to moderate severity. Comments from caregivers were consistent with this self-assessment because the people with severe PD were reported by their

caregivers to be unable to take part in the survey, owing, for example, to dementia. The respondents thought most about family and least about work. They thought often or always about health, food, the future, and rest and sleep. The aspects of life they seldom or never thought about were death, sex, and being virtuous.

As hypothesized, a statistically significant positive correlation ( $r = 0.2$ ,  $p < 0.000$ ) was found between thinking about death and the severity of PD. The participants with mild PD reported seldom thinking about death. The participants with moderate PD thought sometimes about death, and the group with severe PD thought often about death. Thinking about death was also more common at older ages ( $\geq 65$  years), and women tended to think more about death in comparison to the men. The participants with severe PD had the highest frequency of always thinking about death, which may be due to the debilitating nature of PD.

However, in accordance with YS, the klesha of fear/thinking about death or wanting to live (abhinivesha) could be a cause, and not merely a consequence, of PD progression.

Fear/thinking about death may be due to an individual's reflection on past calamities such as death in the family, disease, natural disasters, wars, famine, and accidental deaths. Such events could provide strong motivation to create a safe life.<sup>7</sup> In these terms PD progression may be influenced by abhinivesha, the fifth affliction according to YS. The greater the thinking about—and possibly fear of—death, the more persistent the activation of the associated cognitive neural pathways. The result could be increased metabolic activity and adaptive degeneration. Hence, thinking about death is a possible cause of the progression of PD. The positive association found between PD severity and thinking about death could mean that people with PD think increasingly about death once their PD becomes severe and the specter of death approaches. However, thinking frequently about death may (also) accelerate the progression of PD, as this assumption is consistent with YP and is feasible in neurophysiological terms.

## Conclusion

Our cross-sectional sample of members of PNZ with PD thought frequently about family, health, rest and sleep, food, and the future; they thought least about work, sex, death, and being virtuous. When aspects of thinking were correlated with the self-reported severity of PD, the only (weakly) positive and statistically significant correlation was with thinking about death, even after controlling for age and sex.

YP recognizes that when a klesha (mental affliction) is associated with behavior, it causes suffering. Key aspects of YP concern the subconscious behaviors that go unnoticed by the individual yet guide actions on a daily basis. When a klesha is present, it translates into every aspect of life. It has been speculated that the progression of PD is associated with a klesha, namely fear of death. When a fear of death is present, a particular neural corridor is overactive due to action selection and reinforcement learning, leading to its degeneration.

This study was unable to assess the trustworthiness of responses and validate respondents' self-report of a PD diagnosis. We also could not determine whether thinking about death was a cause or consequence of PD severity, and whether the pattern commenced before PD symptoms manifested. However, premorbid studies have agreed that people with PD have a personality trait of restraint. From a YP perspective, restraint indicates being fearful. Moreover, the possibility that thinking about death accelerates PD progression is consistent with neurophysiological mecha-

nisms associated with the mind-body connection. Therefore, our tentative conclusion is that the more the fear of death is present, the more the disease progresses into a severe state. People with PD should perhaps aim not to think about their own death. Fortunately, thinking about death, as a risk factor for PD progression, appears uncommon in our sample.

Preliminary findings indicate a need for further investigations from a YP perspective into how pre- and postmorbid cognitive behavior and associated kleshas may cause and accelerate the progression of PD. We recommend further examination of these findings through a retrospective cohort study to validate our findings and elucidate the temporal ordering of a fear of death and the etiology and progression of PD. Qualitative research is also needed to understand why thinking about death appears to increase as PD worsens.

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## Conflict-of-Interest Statement

There are no conflicts to declare.

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