

The Relationship between Sleep and Emotional Well-being in Individuals with Parkinson's disease with and without Deep Brain Stimulation

INTRODUCTION

Sleep disturbance, including insomnia, sleep apnea, restless leg syndrome, and REM sleep disorder, as well as depression and anxiety are quite prevalent in Parkinson's disease (PD).^{1,2,3,4,5,6} In fact, sleep disturbances have a direct, yet complex relationship with anxiety and depression.^{7,8,9} Depression is one of the two most common causes of insomnia,^{7,10} and sleep disturbance is one of the most common presenting symptoms of depression and anxiety.⁸ Some research has found that PD patients with more severe sleep dysfunction had greater depression and anxiety.¹¹ The relationship between these variables warrants further investigation.

OBJECTIVE

The goal of this project was to learn more about the relationship between sleep and emotional well-being in individuals with PD and to learn more about the differences in this relationship in persons who have and have not undergone **Deep Brain Stimulation of the Subthalamic Nucleus (DBS-STN)**.

METHODS

The participants were recruited from a variety of sources. Some had participated in previous surveys conducted by The Parkinson Alliance; others responded to study announcements in medical clinics around the country, and still others found out about the study through their participation in local PD support groups, The Parkinson Alliance website (www.parkinsonalliance.org), or our affiliate website devoted to DBS (www.dbs-stn.org). Participants came from around the United States as well as Canada and the UK. The participants in this report included 87 individuals with PD who underwent DBS and 76 individuals with PD without DBS.

RESULTS

The summary of the demographic information for this study can be found in Table 1. The average age of PD onset was 46 years for the **DBS group** and 58 years for the **Non-DBS group**. Male and female participants were equally represented for each group and most of the patients were married. The **DBS group** was younger and had an earlier age of onset of PD than the **Non-DBS group**.

Table 1. Demographics and clinical features of the sample.

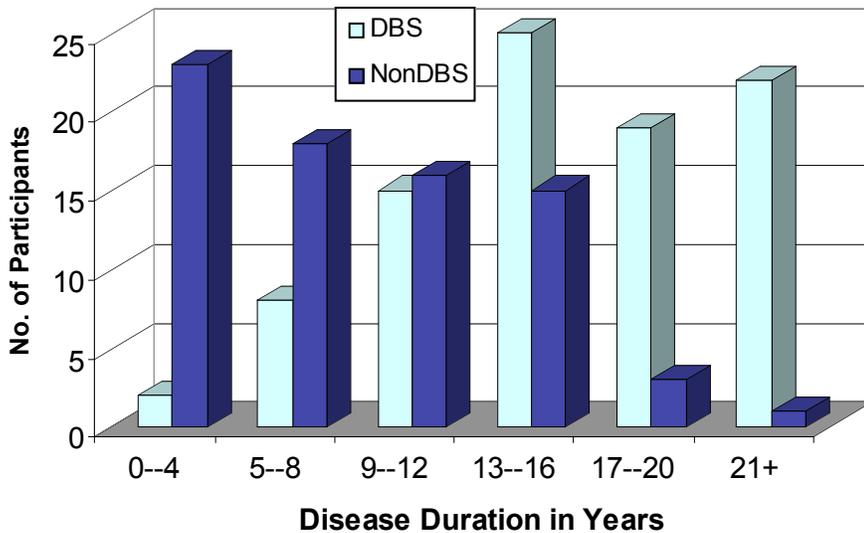
Variable	DBS (n=87)	Non-DBS (n=76)
Mean Age in years *	62	66
Duration of PD in years *	15.9	8.3
Percent Male	52%	53%
Percent Female	48%	47%
Percent Married	73%	71%
Mean Age of PD onset (in years)*	46	58
Average Time since DBS-STN (in years)	3.8	n/a

- denotes significant differences between the groups

Duration of PD within the two groups:

There was a significant difference in duration of PD between the two groups (**DBS>Non-DBS**; see Figure 1). For research purposes it is important to take duration into consideration, which was done for all of the results reported below.

Figure 1. Disease Duration Categories (in Years) for DBS and Non-DBS groups



The relationship between Sleep disturbance and Depression and Anxiety:

As was discussed in our previous reports, emotional difficulties and disrupted sleep were quite prevalent in the **DBS** and **Non-DBS groups** (please refer to Report 1 and Report 2 for the results of the reported experience of anxiety and depression and sleep disturbances).

In this particular study, as expected, we found that there was a very strong relationship between depression and anxiety and sleep disruptions. It should be mentioned, however, that in the majority of the analyses we conducted, we cannot say which difficulty causes the other (e.g. whether one has increased levels of anxiety and/or depression as a result of the sleep disturbance or whether the sleep disturbance results in increased levels of anxiety and/or depression). What can be determined, though, is that the greater the anxiety or depression the greater the sleep disturbance, and conversely, the greater the sleep disturbance, the greater the report of depression and anxiety.

The DBS Group:

In the **DBS group**, anxiety and depression were related to the overall quality of one's sleep - the greater one's symptoms of anxiety and/or depression the worse one's sleep; or, the worse one's sleep the greater one's symptoms of anxiety and/or depression. Additionally, anxiety and depression were related to the following Parkinson's Disease Sleep Scale (PDSS) items: one's difficulty staying asleep; the experience of restlessness of legs or arms at night causing a disruption of sleep; fidgeting in bed; suffering from distressing dreams at night; having incontinence of urine because one was unable to move due to "off" symptoms; having painful muscle cramps in arms or legs while sleeping at night; and, feeling tired and sleepy after waking in the morning (See Table 2, which is located at the end of this report).

In the **DBS group**, anxiety was also significantly related to suffering from distressing hallucinations at night and waking up early with painful posturing of arms or legs. Depression, however, was significantly related to getting up to go to the bathroom at night, experiencing numbness or tingling of arms or legs which wakes a person from sleep at night, and unexpectedly falling asleep during the day (See Table 2, which is located at the end of this report).

In addition to looking at whether or not anxiety and depression were simply related to specific aspects of sleep disruptions for the **DBS group**, we also looked at whether or not specific symptoms of anxiety and depression could predict whether or not one would encounter poorer overall quality of sleep. In regard to the specifics of how anxiety affects sleep, our data suggested that feeling tension and nervousness were two variables in particular that tended to predict one's overall quality of sleep for the DBS group; in other words, the more a person reported experiencing feelings of tension and nervousness, the more one would expect the person to have poorer quality of sleep. We did not find specific information related to symptoms of depression that predicted if the PD patient would have poor overall quality of sleep.

The Non-DBS group:

In the **Non-DBS group** anxiety and depression were related to the following PDSS items: one's ability to fall asleep at night; one's difficulty staying asleep; suffering from distressing hallucinations at night; having incontinence of urine because one was unable to move due to "off" symptoms; experiencing numbness or tingling of one's arms or legs which wake him or her from sleep at night; having painful muscle cramps in arms or legs while sleeping at night; and, feeling tired and sleepy after waking in the morning (See Table 3, which is located at the end of this report).

In the **Non-DBS group**, anxiety was also significantly related to the overall quality of one's night sleep, fidgeting in bed, waking up early with painful posturing of arms or legs, and experiencing tremor upon waking up. Depression, on the other hand was related to unexpectedly falling asleep during the day (See Table 3, which is located at the end of this report).

In addition to looking at whether or not anxiety and depression was simply related to specific aspects of sleep disruptions for the **Non-DBS group**, we also looked at whether or not specific symptoms of anxiety and depression could predict whether or not one would encounter poorer overall quality of sleep. In regard to the specifics of how anxiety affects sleep, our data suggested that feeling nervousness was one variable in particular that tended to predict one's overall quality of sleep for the **Non-DBS group**. In other words, the more a person reported experiencing feelings of nervousness, the more one would expect the person to have poorer quality of sleep. Similar to the **DBS group** though, we did not find specific information related to symptoms of depression that predicted if the PD patient would have poor overall quality of sleep for those in the **Non-DBS group**.

DISCUSSION

- As discussed in the prior reports, the findings of our research and general estimates of others suggest that approximately 20-47% of PWP will have sleep disturbances including insomnia, restless legs, vivid nightmares, and acting out dreams,¹ and a significant portion of individuals with PD (**with and without DBS**) experience anxiety and depression.
- This study was consistent with other research findings, pointing out that sleep problems have a strong relationship with anxiety and depression. Typically, depression and anxiety impact one's ability to fall asleep and stay asleep, and individuals who are depressed and/or anxious may also suffer from early morning waking. In this study, we found that depression and anxiety are related to many aspects of sleeping difficulties as it specifically relates to sleep problems commonly experienced within the PD population. As expected, when looking at the differences between the groups, for both the **DBS group** and the **Non-DBS group**, sleep problems were related to anxiety and depression.
- The findings of this study support the claim that special attention should be paid to depression and anxiety as well as sleep, as all three frequently accompany PD and interfere with one's quality of life with or without DBS.

ACKNOWLEDGEMENTS

As we complete our fourth DBS-STN patient survey, which was be divided into three reports (anxiety and depression; sleep disturbance; and the relationship between sleep and emotional disturbance in PD patients), I am fortunate to be working with three People with Parkinson's (PWPs), Richard Kramer, who also had DBS, and John Wherry and Ram Ramchandran. Their input and data analysis is very important to our work. We also have two Neuropsychologists who analyze the data and add their professional skills to our work, including Dr. Jeffrey C. Wertheimer, staff Neuropsychologist for Brooks Rehabilitation Hospital, and Dr. Julie Smith, staff Neuropsychologist for Henry Ford Hospital. Additionally, I want to thank Valentina Trepatschko, a staff member of The Parkinson Alliance, for all of her diligence and assistance in data collection and organization, and I want to acknowledge the ongoing dedication and tenacity of Carol Walton,

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Margaret Tuchman,
President,
The Parkinson Alliance

Table 2: The Relationship between the Parkinson’s Disease Sleep Scale (PDSS) and Depression and Anxiety in the DBS Group

**= Significantly related
 NS= Not significantly related

PDSS Items	Anxiety	Depression
The Overall Quality of your nights Sleep	**	**
Difficulty falling asleep at night	NS	NS
Difficulty staying asleep	**	**
Having restlessness of legs or arms at night or in the evening causing disruption of sleep	**	**
Fidgeting in bed	**	**
Suffering from distressing dreams at night	**	**
Suffering from distressing hallucinations at night (seeing or hearing things that you are told do not exist)	**	NS
Getting up at night to go to the bathroom	NS	**
Having incontinence of urine because you are unable to move due to “off” symptoms	**	**
Experiencing numbness or tingling of your arms or legs which wake you from sleep at night	NS	**
Having painful muscle cramps in your arms or legs whilst sleeping at night	**	**
Waking early in the morning with painful posturing of arms or legs	**	NS
Experiencing tremor upon waking	NS	NS
Feeling tired and sleepy after waking in the morning	**	**
Unexpectedly falling asleep during the day	NS	**

Table 3: The Relationship between the Parkinson’s Disease Sleep Scale (PDSS) and Depression and Anxiety in the Non-DBS Group

**=Significantly related

NS= Not significantly related

PDSS Items	Anxiety	Depression
The Overall Quality of your nights Sleep	**	NS
Difficulty falling asleep at night	**	**
Difficulty staying asleep	**	**
Having restlessness of legs or arms at night or in the evening causing disruption of sleep	NS	NS
Fidgeting in bed	**	NS
Suffering from distressing dreams at night	NS	NS
Suffering from distressing hallucinations at night (seeing or hearing things that you are told do not exist)	**	**
Getting up at night to go to the bathroom	NS	NS
Having incontinence of urine because you are unable to move due to “off” symptoms	**	**
Experiencing numbness or tingling of your arms or legs which wake you from sleep at night	**	**
Having painful muscle cramps in your arms or legs whilst sleeping at night	**	**
Waking early in the morning with painful posturing of arms or legs	**	NS
Experiencing tremor upon waking	**	NS
Feeling tired and sleepy after waking in the morning	**	**
Unexpectedly falling asleep during the day	NS	**

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