Therapeutic Benefits of Deep Brain Stimulation in Neurodegenerative Diseases Based on the Top 100 Cited Literature

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Introduction

Neurodegenerative disorders such as Alzheimer's and Parkinson's Disease entail the appearance and progression of various symptoms not limited to motor function, ultimately impacting quality of life. Characteristic symptoms include dysphagia (impaired swallowing) and freezing of gait (FOG)[47]. Potential treatment plans range from simpler, prescribed medication to more complex, surgical procedures[4]. Of the surgical procedures, data has shown the prevalence of utilizing deep brain stimulation (DBS) due to its efficacy and safety[14]. Through the surgical process of DBS, neurologists can target the relaying systems of the subthalamic nucleus (STN), assisting in the treatment of Parkinson's disease symptoms while also treating symptoms of Alzheimer's through increased glucose metabolization of the brain.

Objectives

•To establish an assessment of novel contributions and track trends on the longitudinal integration of Deep Brain Stimulation (DBS) through cross-national examination

•To determine socioeconomic implications of developed countries in implementing cutting-edge technology in universal healthcare systems

Methodology

Utilizing bibliometric techniques to refine our research, 398 preliminary studies were obtained through the searching of key terms in the expansive "Web of Science" database. "Neurology" was set in all fields to provide medically relevant articles that were then narrowed towards "Deep Brain Stimulation Benefits." The most relevant and highly cited journal articles, reviews, and other sources were gathered through a filtration process that yielded the top 100 published, highest-cited material in the respective field. Through an analysis using R and Bibliometrix, statistical modeling of various geographic, temporal, and relevance factors.

Mapping Analysis

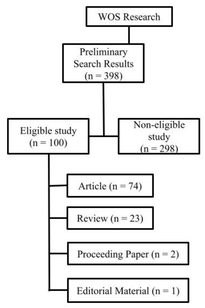


Figure 1

Results

(**Figure 2.1**: Country Collaboration Map, **Figure 2.2**: Most Cited Countries, **Figure 3**: Word Clusters and Relevance, **Figure 4:** Country Production over Time):

Of the 398 results on "DBS therapeutic benefits for patients with neurodegenerative diseases such as Alzheimer's and Parkinson's", we analyzed the top 100 most-cited sources. The 74 articles, 23 reviews, 2 proceeding papers, and 1 editorial material were all in English, which could be problematic for geographic regions with limited English-speaking experts. As indicated by scientific production within each country, the United States of America leads with 207 papers published, making it the country with the highest number of published papers among the top 10 most-cited countries. The United Kingdom followed in second with just 70 published papers. Further supported by a country's production over time, it demonstrates the consistency of the United States of America being the country with the most articles produced from 2000 to 2021, with a slight exception during the period of late 2006 to early 2010 where France surpassed the United States of America by a few articles.

Figure 2.1

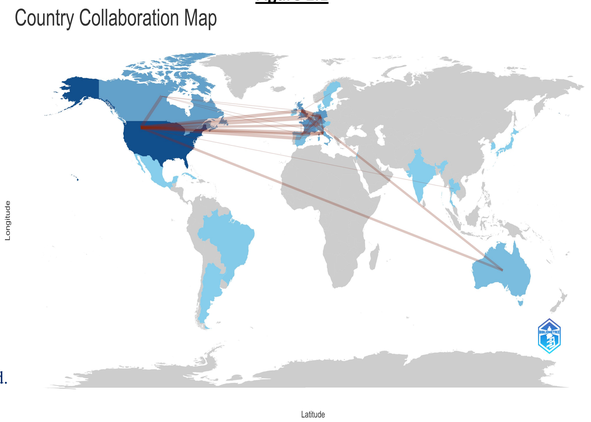


Figure 2.2

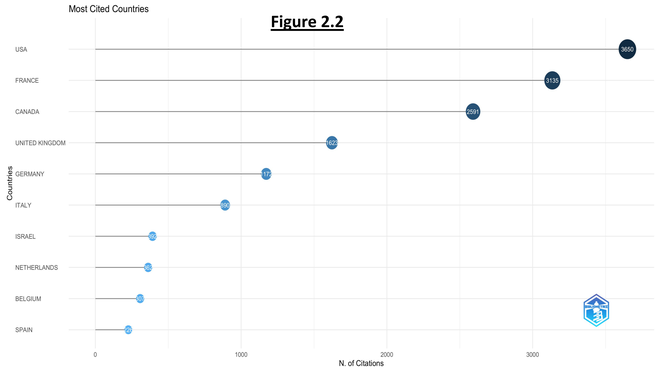


Figure 3

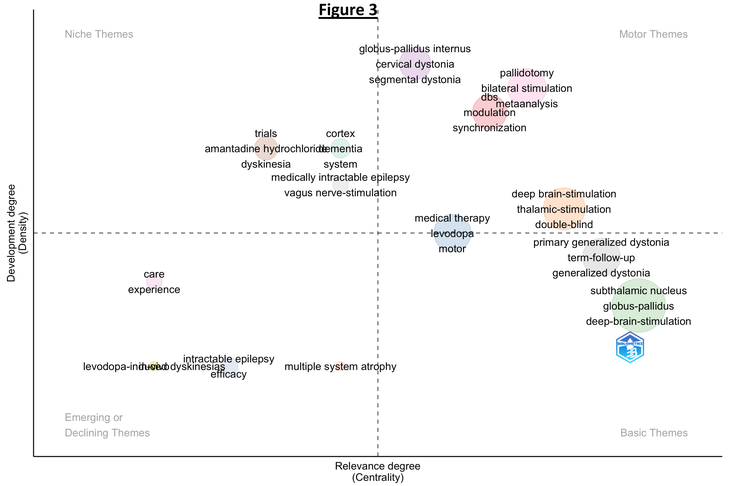
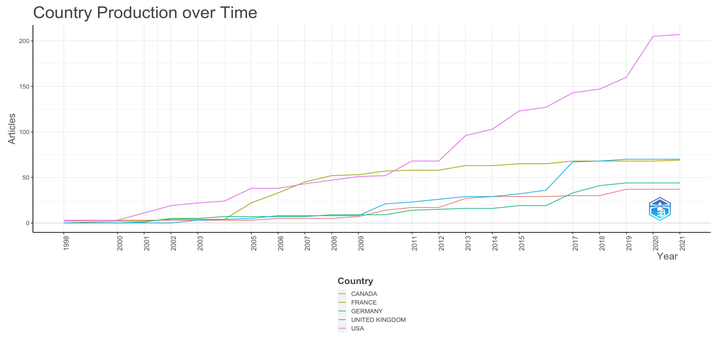


Figure 4



Discussion

Of all the analyzed literature through Bibliometrix, one author was noted to have significant contributions to the field of Neuroscience. Andres M. Lozano[4], the most cited Neurosurgeon in the world (Thomson Reuters 2002-2012), has without a doubt been the most influential contributor to our sources and research as a physician-scientist. However, it must be noted that potential expertise bias can present a concern where the majority of influence comes from one individual. Even though Lozano is an expert in the field and the technology, nevertheless, he has still contributed highly important findings and insights into this specific field of neuroscience research with DBS to treat a wide range of conditions.

As a Canadian researcher, Lozano also highlights the need to include a more diverse bloc of nations that may not be first-world countries. While the increase in the terminology of "term follow up" and "randomized control trial" could indicate a higher willingness to use resources to conduct effective longitudinal studies to expand the understanding of this field, the scientific community should still strive to encourage more nations to counter the stagnation of research. In doing so, potential developments of cheaper alternatives or approaches to DBS could pave the way for more accessible therapeutic interventions in neurodegenerative diseases.

Conclusions

From our extracted data, we found that highly-developed Western countries have produced and collaborated the most on deep brain stimulation (DBS) research, suggesting that less-developed countries have minimal ability in engaging with DBS as a healthcare option. The strong links between words such as "medical therapy" and "term-follow-up" within the analyzed papers suggest that DBS is therapeutically beneficial as a longer-term treatment, working to reduce but not resolve symptoms.

In light of the dominance of more developed Western countries regarding DBS integration, it's imperative to foster a global collaboration framework. This approach not only democratizes the research but also enriches it by incorporating diverse perspectives. Such collaboration could lead to innovative solutions tailored to different populations, considering cultural and genetic differences in treatment responses. This global exchange of knowledge and techniques will be instrumental in developing more universally accessible and effective treatments for Alzheimer's and Parkinson's Disease.

Lastly, further research may want to examine why DBS research has stagnated in production as of recent years as well as looking into possible alternative medical interventions or therapies that can be implemented in underdeveloped nations.

References

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