Fall 11-29-2023

The Impact of Boxing Exercise on the Quality of Life in People Living with Parkinson's Disease

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The Impact of Boxing Exercise on the Quality of Life in People Living with Parkinson's Disease

Jen Baker
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An Integrative Review

Dr. Mary Ramos

November 15, 2023
Abstract

This integrative review aimed to explore the effects of boxing exercises on the quality of life (QOL) of people with Parkinson’s Disease (PwP). Boxing exercise programs are popular in the Parkinson’s Disease (PD) community. Decreasing motor symptoms tends to be a primary focus in exercise and PwP. However, non-motor symptoms are a side effect of PD that varies amongst individuals and can impact QOL. Understanding the effects of boxing, especially on non-motor QOL, can support practitioners when prescribing specific exercise modalities for PwP. An integrative review with the search of PUBMED, CINAHL, and MEDLINE was performed, and the methodology of Whittemore and Knafl guided the review: ten studies were included. The review found that the available literature was limited; however, there is a commonality in several articles that the patients reported an overall better quality of life, and participation in a community exercise program, specifically for PwP, was a contributing factor. More research is needed, and more extensive studies that represent a broader population of PwP would enable the findings to apply to the community.
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The Impact of Boxing Exercise on the Quality of Life in People Living with Parkinson's Disease

Statement:

People with Parkinson’s disease (PwP) face multiple challenges related to a degenerative neurological system and subsequent motor and non-motor impairments that result in activity limitations. Research has suggested that exercise is a favorable approach of adjunct therapy to medication. This serves as a potential neuroprotective mechanism, which can contribute to symptom relief, and improving quality of life (QOL) (Franzen et al., 2019). Literature recommending different forms of aerobic and anaerobic exercise is gradually making strides in documenting improvements of functional independence (Ellis & Rochester, 2018). One intervention gaining in popularity is community boxing exercises tailored for PwP. Rock Steady Boxing (RSB) is recognized globally as a non-contact boxing-style fitness leader and proposes a benefit in improving quality of life (RSB, 2023).

Purpose:

This integrative review aims to explore comparative studies defining QOL parameters of improvement in PwP that support a positive correlation in QOL or improvements in daily functioning when participating in a non-contact boxing exercise.
1. Introduction

Parkinson’s disease (PD) is classified as a multi-system, chronic, and progressive neurodegenerative disease. According to the World Health Organization (2023), the prevalence of PD has doubled in the past 25 years. PD incidence rates have been estimated to be in the 40,000 – 60,000 range per year (Wills et al., 2022). However, a new study reports that the updated rate in the U.S. is 1.5 times higher, showing approximately 90,000 new cases yearly (Willis et al., 2022). The increases of age earmarks PD incidence increasing with is a higher diagnosis rate in males (Willis et al., 2022).

Parkinson’s presents as a progressive neuromuscular disease that develops by the loss of dopaminergic neurons in the substantia pars compacta (Pingale & Gupta, 2020). Taking into consideration the primary risk factor for PD is age, and incidence increases in the 7th decade of life (Willis et al., 2022) makes diagnosing PD can be tricky because some symptoms may mimic symptoms of aging. Cardinal symptoms of PD are difficulty initiating movements (akinesia), slowness including difficulty continuing and maintaining movement (bradykinesia), tremors, and rigidity (Crizzle & Newhouse, 2006). The prominent signs and symptoms of PD develop after 70-80% loss of dopaminergic neurons (Pingale & Gupta, 2020), making therapeutic control difficult for practitioners due to the unpredictable yet definitive progression when the disease is diagnosed. The exact reasons behind the dopaminergic neuron loss are not understood, and many theories have been purported addressing the etiology of PD (Pingale & Gupta, 2020; Johnson et al., 2019; Patrick et al., 2019). These theories have suggested oxidative stress, gene
mutation, mitochondrial dysfunction, gut bacteria etc., as causative agents, but none can fully explain the vast symptomology of PD.

PD has four distinguishing features: resting tremor, rigidity, akinesia, and postural instability. A clinically probable diagnosis consists of two out of three symptoms minus postural instability and a definitive response to levodopa-carbidopa (Armstrong & Okun, 2020). Motor symptoms remain central in diagnosis; however, increasing recognition of non-motor manifestations is becoming inclusive in active and prodromal PD diagnosis criteria (Huq et al., 2021). Formal identification is made by the Movement Disorder Society clinical diagnostic criteria utilizing these four features and cardinal manifestations detailed in the Motor Examination Section (Part 3) of the Movement Disorder Society-Unified Parkinson Disease Rate Scale (MDS-UPDRS) (Pingale & Gupta, 2020; Huq et al., 2021). The movement disorder specialist (MDS) criteria for prodromal PD are based on an evidence-based framework that also uses a statistical analysis of the likelihood that the patient has PD, considering age, risk, and genetic markers (Heinzel et al., 2019). The MDS criteria are focused on streamlining diagnosis and making it reproducible for all practitioners, including two distinct categories of certainty for the clinician: clinically established or clinically probable (Huq et al., 2021). Finally, the Hoehn & Yahr scale, included in the UPDRS, is used internationally to summarize a global systematic assessment from a clinometric point of view (Martinez-Martin et al., 2018). The categories used in this assessment tool are based on motor impairments and do not consider non-motor symptoms.

This complex disorder can present with different symptoms with wide progression ranges. The phase between cell loss and clinical symptoms must be identified for an optimal
treatment plan and symptom control. Motor dysfunctions are the most common symptoms and are predominantly consequences of dopamine deficiency, while non-motor symptoms, including depression, sleep disorder, and constipation, appear in the prodromal phase several years before dopamine deficiency symptoms become apparent and are present throughout the disease course (Schapira et al., 2017). PD includes motor symptoms, which characterize the disease, and non-motor symptoms that are secondary consideration in diagnosis (Pingale & Gupta, 2020). The mobility dimension is often reported as one of the most affected motor complications (Chapuis et al., 2014).

The first line of intervention with PD usually involves a pharmacologic dopamine replacement strategy targeted for motor symptomology. This is accomplished by levodopa/carbidopa, monoamine oxidase type B inhibitors, or a dopamine agonist (Church, 2021). Therapy interventions such as diverse exercise approaches, physiotherapy, and speech therapy have been shown to improve motor symptoms. Advanced novel therapies such as deep brain stimulation (DBS) and Levodopa-Carbidopa enteral suspension (Duopa) are used for patients with medication-responsive motor symptoms but have increased off-time and apparent decreased medication effectiveness (Armstrong & Okun, 2020).

Patients with PD can present with debilitating non-motor symptoms (NMS), such as dysautonomia, sleep disorders, and depression. As many as 50 non-motor symptoms have been identified in PwP, which can notably impact the quality of life (QOL) (Kurihara et al., 2020). According to a study by Heimrich et al. (2023), the most reported non-motor symptoms are depressive. The prevalence of this symptom differs amongst studies, with a range from 20% to 50% of patients reporting depressive symptoms (Goodarzi et al., 2016). Managing the non-
motor symptoms of PD is challenging because differentiation must be made between the effects of medication, PD progression, and the patient’s emotional state (Church, 2021). Treating depression in PwP usually involves treatment with an antidepressant from the class of SSRIs or SNRIs (Church, 2021). Many drugs are approved by the Food and Drug Association (FDA) which can address the non-motor symptoms of PD, such as depression, anxiety, excessive drooling, and gastrointestinal problems.

QOL can be affected over time due to the nature of the progression of PD, symptoms, and disability. It has been hypothesized that QOL is the difference between one's hopes and experiences at a given point during their life and has materialized as a framework for clinical follow-up in new care models (Stuhrenberg et al., 2022). Not only has the perception of QOL, including health in PwP, evolved over the years, but so have the assessment tools. QOL is a multi-dimensional concept and should be viewed as individualized and evaluated by a subjective evaluation. Each area can be affected by social factors, individual factors, and the presence of social support (Stuhrenberg et al., 2022). PwP tends to have poorer QOL, and this complex disease has multiple manifestations and unpredictability that can contribute to a patient's outcomes (Berardi et al., 2020).

Various conventional QOL measurement instruments are used as existing methods for evaluation. The requirement of the instruments depends on the purpose of the research. There are specific measurement tools that are more frequently used with PwP because they are PD-specific. The Parkinson’s Disease Questionnaire (PDQ-39) and the short form (PDQ-8) are the most widely practiced but lack clarity on non-motor symptoms (Berardi et al., 2020). The PDQ-39 assesses how often PwP is experiencing difficulties across eight dimensions of daily living.
The eight dimensions are mobility, activities of daily living, emotional well-being, stigma, social support, cognitions, communications, and bodily discomfort (Berardi et al., 2020). The PDQ-39 is a four-point Likert scale rating ranging from never to always; the lower the total score, the better the QOL (Schonenberg & Prell, 2022). PDQ-8 is a self-administered shortened version of PDQ-39. The Non-Motor Symptom Scale (NMSS) is a 35-item-rater and can be used in correspondence to evaluate QOL. The Movement Disorder Society-Unified Parkinson’s Disease Rating Scale (MDS-UPDRS, 2018) is a revised comprehensive scale that evaluates several aspects of PD, including QOL (Hendricks & Khasawneh, 2021). In addition to the generalized QOL, Health-Related Quality of Life (HRQoL) is an essential quantitative tool because it looks at the disease and its effect on the perception of health in seven dimensions (Stührenberg et al., 2022). The EQ-5D is one of the most commonly used questionnaires measuring HRQoL. It contains five dimensions and can detect 3,125 unique health conditions (Zhou et al., 2021).

Exercise is defined by the CDC (2019) as a bodily movement produced by skeletal contraction with increased energy expenditure and can be utilized as a base for rehabilitation therapies. Current research has supported the idea that exercise is essential to PD treatment regimens and can potentially increase functional independence (Almikhlaifi, 2023). Exercise programs like non-contact boxing have come in and out of fashion, and a set protocol must be followed due to the nature of the disease symptoms. Interestingly, this specific regime reports focusing on boxing exercises is beneficial for targeted systems and functions in PwP. This exercise has seen international growth, and the non-profit organization Rock Steady Boxing (RSB) estimates that 43,500 participants have participated since its inception in 2005 (Larson et al., 2021). A greater understanding of the effects and benefits of boxing exercise on different
variables measuring non-motor symptoms of PD has yet to be widely analyzed. Further extensive research is needed on specific boxing interventions for PwP affecting QOL. This literature review has been initiated to explore a specific component, QOL, by asking the following questions: (i) does a non-contact boxing exercise program for PwP positively affect QOL data? Furthermore, (ii) is there a trend in data or reported outcomes in QOL domains and PwP? The findings of this review will help guide health practitioners and PwP in considering a boxing program as a supplemental exercise.

2 Methods

This research employs an integrative review approach to gain a comprehensive overview of the effects of the non-contact boxing exercise program on the QOL of individuals with PD. This approach integrates experimental and non-experimental articles, allowing for a more holistic evaluation of the impact of the intervention. The integrative review framework is strategically aligned with the methodology advocated by Whittemore & Knafl (2005), enabling the identification of both strengths and gaps within the body of scientific evidence. The review process is systematically guided by the rigor and structure provided by a data matrix tool. The headings on the columns outlined a detailed description of articles, type of analysis, population details, measurement tools, outcomes, and level of quality of evidence. These tools are instrumental in precise identification, critical appraisal, and inclusion of the most current and relevant scholarly articles. Such a methodological approach ensures that the research engages with high-quality investigations directly pertinent to the stated research questions.

Following the article selection, the analysis takes a thematic approach, which involves synthesizing and identifying recurring themes across the selected studies. This allows for a
comprehensive exploration of the various dimensions of QOL affected by the non-contact boxing exercise program. The thematic analysis will help draw connections between different QOL domains and PwP, enabling the research to address the research questions effectively and provide valuable insights into the impact of the exercise program on the QOL of PwP.

2.1 Data Sources and Searches

Integrative reviews allow for broader flexibility in review approaches, which include quantitative and qualitative findings. The mnemonic derived to form a research question: patient, intervention, comparison, outcome, and time (PICOT) was used and included population (people clinically diagnosed with Parkinson’s disease), intervention (non-contact boxing exercises), outcome (better QOL), and time (after participating in the boxing program). The recommendations are developed to ensure high-quality reviews by emphasizing systematic approaches. The relevant aspects addressed were the research question, search approach, methods, quality appraisal, and the analysis method. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2020) was also used to facilitate an efficient review process (see Appendix A). The PRISMA flow diagram delineates the number of studies identified, the inclusion and exclusion criteria, and the reasons for the exclusion.

The Kennesaw State University librarian supported the search process along with an electronic search. The databases searched were PubMed, CINAHL, and MEDLINE from 2013 to 2023. References in retrieved literature supplemented the database search. The following words were used for the searches: parkinson's disease OR parkinson disease OR parkinsons disease OR parkinsons OR parkinson's, boxing OR "boxing exercise" OR "rock steady boxing" OR RSB, quality of life OR well-being OR well-being OR life satisfaction, MESH headings (MH)
included “Parkinson disease”, “boxing” and "Psychological Well-Being") OR (MH "Personal Satisfaction") OR (MH "Quality of Life").

2.2 | Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were determined before initiating the search. The study included English-published peer-reviewed journals, quantitative and qualitative journal articles, clinical studies, and meta-analyses. The articles had to include non-contact boxing exercises, and the participants were clinically diagnosed with Parkinson’s disease. All population sizes and age ranges were formed. It was decided that the included range of years for article selection was 2013-2023 due to CDC isolation guidelines during the COVID-19 pandemic and many people not participating in community gatherings from 2020-2022. Finally, QOL, HRQol, and qualitative PDQL data are included and assessed in the outcome measures.

Exclusion criteria included studies with participants diagnosed with secondary parkinsonism or other neurological disorders. Conference posters, grey literature, and non-peer-reviewed articles were not included to maintain the integrity of the integrative review. Finally, to examine relevant and new evidence any articles published before 2013 were omitted.

2.3 | Selection Process

The initial comprehensive search identified 59 articles from databases and reference reviews, followed by a title and abstract screen (figure 1). Two independent reviewers (JBK, MR) completed screens of full-text reviews to identify eligible studies. Ten duplicate records were removed before the screening, and 28 were removed for the following reasons: focusing on generalized exercise or no boxing exercise (15), population is not Parkinson’s disease focus (9), and QOL factors not examined (4). Out of 21 records identified for eligibility, two were
excluded because they were poster abstracts, one was an abstract article, one was not from a peer-reviewed journal, one was out of the search date range, five did not include QOL assessment and one literature review that included articles included in this review. Ten articles were included in this integrative review to synthesize the evidence of the effect of boxing exercises and QOL in PwP. PICOT was initiated to ensure rigor. Reducing the risk of bias was incorporated by initiating the article selection process was conducted in two stages; the first stage considered titles and abstracts. The second stage involved a careful review of the complete publication. Two reviewers independently assessed citations at each stage of the review. A PRISMA diagram is included to trace the selection of studies included and excluded in the review. The search results were exported into a bibliographic management database, Zotero.

2.4 | Data Extraction and Analysis

A data matrix was created to review and analyze the extracted review articles and studies. A doctoral-prepared scholar served as an auditor and analyzed the information. All findings that supported QOL data relevant to boxing exercise and PwP were extracted for relevance and included in a data matrix for comparison (see Appendix B).

2.5 | Characteristics of Included Studies

The ten articles included three countries between 2013 and 2023: the United States (n=7), Canada (n=2), and the Netherlands (n=1). The quantitative studies (n=4) included in this integrative review ranged from 29 participants to 1709 participants; phenomenological (n=2), perspective (n=1), and retrospective (n=1) qualitative studies included participant counts ranging from 8 to 62. Finally, this review includes a mixed methods study (n=1), included six participants, and a literature review (n=1) that included six studies. Two out of 10 boxing
exercise programs were not affiliated with RSB and were led by a specialized PD physiotherapist or a boxing trainer. The QOL data obtained were from self-administered testing. The QOL data for two qualitative studies were obtained in two different interview-style environments. One was an interview at a mid-western University, and the second conducted interviews in homes, coffee shops, or the boxing gym. Studies considered include quantitative methods measuring QOL by PDQ-39, PDQ-8, PDQL, EQ-5D, HRQoL, and qualitative data.

2.6 | Ratings and Quality

The ratings and quality of articles are listed in Table 1. 10 articles were analyzed, and the JHNEBP rating tool (Dang et al., 2021) categorizes good evidence quality from A (excellent), B (good quality), which positively supports change. Research level appraisal ranges from I-III by deciphering research evidence and IV-V evidenced by a clinical practice guideline or integrative review. Research designs ranged from Level I (n=1), Level II (n=3), Level III (n=4), and Level V (n=2). Nine were rated a Quality level of B and two-level C. The ratings were based on evidence supporting the PICOT question, sample size, limitations, and reliability of acquired data.

3.0 | Results

This review included ten articles that included QOL and the effect of boxing exercises in PwP. The data was limited, and detailed exploration needed to be expanded upon in most cases. Several theories warranted further investigation into the analysis of QOL and specific exercises such as boxing. A convenience sample of 14 PwP participated in a 12-week community-based boxing program. Despite no improvements in the disease severity, QOL improvements were maintained while participating in a boxing exercise program (Sangarapillai et al., 2021). A more
rigorous study design with a control arm and a larger sample size is recommended to research this phenomenon further. A study by Patel et al. (2023) suggests that the benefits of a community-based boxing program contributed to decreased scores in the PDQ-39 and better QOL. This theory combines the benefits of exercise and the enrichment of the social domain, contributing to measurable improvements. Again, a more rigorous study design, larger sample size, and a control arm are needed to investigate this further. It is suggested that perceived QOL can significantly affect a person's well-being more than documented clinical outcomes (Patel et al., 2023). This would be an important insight for further research. Overall, QOL data demonstrated improvement when engaging in group boxing exercises; however, causality cannot be concluded with this correlation. Two studies did not measure any changes in QOL. Two characteristics that did appear to make these study results appear as outliers were: (i) no trainer with PD education/training (Patel et al., 2022), and (ii) this study utilized EQ-5D as a measurement (Dawson et al., 2020). The evidence is still considered a valuable contribution to this integrative review. Quantifying evidence-based applications and functional outcomes is challenging due to affecting variables. Still, qualitative data allows for a more robust lens into how PwP and multiple effective measures perceive QOL.

3.1 | Boxing Programs

Research has demonstrated that PD-specific boxing offers varied exercise techniques, is adaptable, and motivational (Brunet et al., 2022). Rock Steady Boxing (RSB) is a non-profit organization developed in 2005 by Scott Newman when a friend introduced him to boxing to help him relieve the stress of living with a PD (Wilson T., 2018). RSB was designed as a program for people with all PD levels. These exercises include agility, speed, and endurance
skills. The PD-specific classes are led by trained coaches that are certified at the headquarters of RSB. This program has been multiplying, and as it reaches more PwP, and increased data is needed on the support the marketed effects of RSB and PD impairments.

All but five articles reviewed utilized RSB as the PD-specific boxing training. Three are affiliated with RSB, Boxing 4 Health, and BOX (Combs et al., 2013; MacCosham et al., 2021; Lowery et al., 2023). The remaining studies created their boxing exercise concept, including various techniques, pre- and post-warmup, and social components (Patel et al., 2023; Domingos et al., 2022). In the study conducted by Patel et al. (2023), randomized controls and intervention groups were not included in rigorously evaluating boxing exercise's effects on symptoms of PD. A trained professional developed the boxing program in a community gym. This deflates the integrity of the boxing exercises designed for PwP and PD-specific modifications for this community. Consequently, the outcome measures showed no significant change in the PDQ-39 QOL measures. In a randomized controlled trial by Domingos et al. (2022), boxing with and without kicking techniques were compared and evaluated for improved balance, feasibility, and safety with QOL as a secondary outcome. A physiotherapist specialized in PD led the training sessions with a boxing trainer. The boxing alone sessions include punching movements and dual-task challenges, and the boxing with kicking techniques added kicking movements, weight shifting exercises, and multi-directional stepping. Overall, no additional benefits were found with the addition of kicking techniques, nor differences in quality of life. However, the group without kicking showed a significant within-group improvement in the PDQ-39.

3.2 | Quality of Life as a Primary Outcome
Two articles focused on QOL as a primary outcome measure (Larson et al., 2021; Hermanns et al., 2021). The published data has been limited to small studies, and the most extensive analysis of RSB by Hermanns et al. (2021) is informative. Three outcome scales and participant characteristics were compared. Current RSB participants (n=1333), past participants (n=166), and never-participants (n=210) were compared, and the RSB participants reported significantly better HRQoL measured by the PDQ-39 and Self-Efficacy for Exercise (SEE) scale. Due to the nature of the cross-sectional survey and the data being self-reported conclusions, the study is limited and unable to conclude causality. However, this can suggest that boxing can be a quality-of-life-affecting exercise modality.

The specific domain of a positive change in social life (70.3%) associated with RSB is an example of a specific exercise and impact on HRQoL in PwP (Larson et al., 2021). This aligns with the anecdotal suggestion that social support from a boxing program influences participation. Fatigue is one of the most common non-motor symptoms reported and is closely related to HRQoL (Larson et al., 2021). Evidence for pharmacological intervention in treating fatigue is limited (Herlofson & Kluger, 2017). The self-reported fatigue improvement by 63% of RSB participants included in the study by Larson et al. (2021) is worthy of further research into an ascribed intervention of RSB and fatigue improvement. Again, applying generalizability would not be plausible due to the small sample of the control group and limited statistically significant results (Larson et al., 2021).

Hermanns et al. (2021) conducted a mixed methods study, including RSB sessions with pre- and post-design and a one-on-one focus group. Quantitative data was obtained using the PDQ-39, and the results showed an improved QOL from baseline to 12 weeks. The top
two QOL improved subscales were social support and stigma and reduced depressive symptoms, according to the Center for Epidemiologic Studies Depression (CES-D) scale. Other studies have introduced research to support that boxing has positively impacted PwP and QOL (Larson et al., 2021; MacCosham et al., 2019; Combs et al., 2013). However, due to COVID-19 and isolation precautions, a small sample size (n=6) and incomplete data collection confirm that this is not a robust study but a contribution to further research recommendations.

3.3 | QOL Secondary Outcome

The retrospective observational study by Dawson et al. (2020) assessed the impact of RSB and clinically relevant PD outcome measures. New and returning students were compared in baseline (BL) data and post-completion of a 16-week class. The QOL was measured as a secondary outcome using the EQ-5D survey. There were no significant changes in BL data; however, the new RSB group reported a slight increase in the EQ-5D self-perceived pain. Data from this study cannot determine which aspects of the program led to the results. This was an open-label study; a clinical diagnosis was not required for PD; only verbal confirmation of disease was included. This study used no controls, and no variables that could affect outcomes were considered. Ultimately, this study needed to address the underlying mechanisms in RSB to measure QOL outcomes effectively.

Boxing exercises were compared to sensory exercises, and QOL was a secondary measurement outcome in the randomized controlled study Sangarapillia et al., (2014). The protocol included an RSB-certified coach and a sensory intervention designed for PwP. The purpose was to assess which exercise would improve motor symptoms and QOL. The results of QOL measured by PDQ-39 showed statistically significant improvements and were maintained
throughout the boxing program despite the lack of improvement in disease severity symptomology.

3.4 | QOL and Psycho-Social Outcome

Perceived QOL has been mentioned in recent literature to significantly impact a patient’s well-being compared to clinical outcomes (Oliveira de Carvalho et al., 2018). A qualitative analysis explored the participants' self-reported improvements in a boxing program affiliated with RSB, Boxing 4 Health. Participants reported changes in physical functioning (motor domain), increased ease in the activity of daily living (ADL) tasks, a greater sense of social support, and better self-perceived QOL (MacCosham et al., 2019). Some individuals reported gaining confidence, a sense of accomplishment facilitated by the activities, and belongingness with a group.

A study by Combs et al. (2013) hypothesized that the randomized participants in boxing training (BOX) and a traditional exercise group (EX) would both improve function and HRQoL over 12 weeks. PDQL scores. Both groups showed significant improvements in HRQoL data. During informal interviews, participants in the BOX group expressed gratitude for being able to participate in a PD-specific exercise program. Considering this, the findings may indicate that community-based exercise can improve perceived QOL in PwP regardless of the type of exercise.

A qualitative study of eight male participants diagnosed with PD offered insight into the meaning of regular participation in two modes of vigorous exercise, including RSB (Borrero et al., 2022). The social connections built through the RSB were reported as increasing hope and confidence by the participants of this study. The themes that emerged from this study align with
other literature regarding the benefits of a group exercise environment and camaraderie, sustained motivation, and personal achievement (Hunter et al., 2019). The participants were diagnosed with idiopathic PD and a Hoehn & Yahr score 2.0. They were all presently participating in RSB, a purposive sampling strategy. The general population of PwP is not represented in this study, and RSB was not the only form of activity the participants included in their exercise routines. However, the interviews showed that group-based exercise programs have essential implications for PD, and RSB plays a vital role in the participant’s lives.

An article reviewing current research by Lowery et al. (2023) explored evidence regarding the influence of boxing on functional outcomes and QOL. The finding supported limited research evidence, precisely four articles from 2011-2021 evaluating QOL factors and boxing. Three out of the four studies found an improvement in QOL. Overall, QOL was recommended as an essential consideration when considering an exercise intervention for PwP. Exercise is encouraged in managing PD; additional considerations were included in the recommendation based on the literature reviewed when working with this community and an intense exercise such as boxing.

4.0 | Discussion

Numerous studies reviewed within this literature analysis indicate that non-contact boxing exercise has the potential to affect the QOL of individuals with Parkinson's Disease positively. This effect is reflected in several aspects, such as psychological well-being, social interaction, and overall self-perception. Exercise, particularly a community-based exercise like RSB, has non-motor symptom benefits for many PwP. There needs to be more data supporting evidence that QOL improves after participating in a boxing exercise program specialized for the
PD community. Details, including sub-domains of QOL, were not identified in most articles, making it difficult to draw any specific conclusions on the specific QOL areas affected by boxing. However, the ability of RSB to improve the sense of belonging and improvement of other symptoms such as depression and other quality-of-life-affecting factors are worthy of further investigation.

Concerning PwP and specific forms of exercise, such as boxing, no one form has proven to be more beneficial (Morris et al., 2019). PD progresses at different rates in individuals over five to 30 years of diagnosis. This time frame can affect what may be the most beneficial form and intensity of exercise for the individual. Boxing exercises are considered high-intensity, and there is little clarity on the time of participation to attain the benefits and gains of this exercise modality. Guidelines for modifications are needed to accurately prescribe boxing exercises as a beneficial component of a PD patient's exercise routine.

This integrative review provides compelling evidence that non-contact boxing exercise programs can positively affect the QOL of PwP. The review data implies a multidimensional impact on various QOL domains, including physical, psychological, and social aspects. However, the specific effects and the degree of impact may vary based on program design, exercise components, and the study's rigor.

5.0 Limitations

Significant limitations are noted in all articles except the study by Sangarapillai et al. (2014). Further research must address respondent bias, generalizability limitation due to the participant's demographics, concomitant medication or review of non-pharmacological
management, and washout. These considerations will allow for more direct contributions of QOL changes to boxing programs. Also, it is difficult to attribute changes in QOL if the participants are engaged in other physical activities and controls are not used. The specific psycho-social effects of PwP and participation in a group boxing exercise warrant further investigation. Finally, there are no focused long-term studies. This is essential for practitioners when issuing recommendations to PwP and considering their disease state and symptoms.

6.0 | Further Research

Partnerships with organizations such as RSB can contribute to implementing evidence-based research and bridge practitioners and the PD community. Utilizing a unified and science-based exercise program offers a streamlined and reliable foundation for the prescribed program. Boxing is community-based, and limited studies have shown that the social component and interpretation of QOL potentially correlate with PWP. More detailed research is needed to explore this phenomenon and expand on the importance of participation in this program and its positive attributes to QOL.

7.0 | Conclusion

Comparative studies associating increased QOL and boxing exercises for PwP are limited, but there is evidence suggesting QOL is affected in the social and depressive domains. However, the data is weak, and direct correlations are worthy of continued research. Qualitative studies give the best patient insight, and integrating a tool to capture this experience for quantitative data is challenging but necessary. There is no cure for PD, and presently, pharmacological, and adjunct interventions are the only available prospects to help alleviate and
manage the symptoms. Practitioners who participate in the care of PwP are faced with few options for recommendations in managing motor and non-motor symptoms. As PD progress, individuals report moderate to severe disruptions in mobility, reduced self-efficacy, depression, and decreased QOL (O’Malley et al., 2021). Available evidence suggests physical exercise, such as RSB, can intervene with modifications tailored to the participant's ability (Combs et al., 2013). A few notable improvements in more recent studies have been proposed in boxing exercises and QOL; however, the research quality and design present limitations.

The trend of social and interpersonal relationships made while participating in boxing exercises invites practical implications for health professionals. Armed with current information, when opportunities are present for nurses and other HCPs, recommending specific exercise programs is essential. Nurses, physical therapists, and advanced practitioners have many touch points with this population, and consideration of an exercise program specifically tailored for PwP is crucial for the community. Engaging opportunities, incorporating research, and expanding support options for the effects of QOL and the growing trend of boxing exercise can impact a community with few life quality preserve options.
References


Appendix A

**PRISMA**

Identification of studies via databases and registers

- Records identified from:
  - CINAHL (n = 14)
  - PubMed (n=33)
  - MedLine (n=6)

- Records removed before screening:
  - Duplicate records removed (n =10)

Identification of studies via other methods

- Records identified from:
  - Reference searching (n = 4)

Screening

- Records screened (n =45)
- Records excluded**human** (n = 28)

Included

- Reports sought for retrieval (n = 4)
- Reports excluded:
  - (n=3)
    - Reason 1: poster presentation (n =2)
    - Reason 2: before 2013 (n=1)

- Reports sought for retrieval (n = 17)
- Reports assessed for eligibility (n =17)
- Reports excluded:
  - (n=8)
    - Reason 1: Non Peer Reviewed Journal (n = 1)
    - Reason 2: Abstract Article (n=1)
    - Reason 3: no QOL included or measurement (n =5)
    - Reason 4: Articles reviewed included (n=1)

- Reports assessed for eligibility (n =3)
- Reports excluded:
  - (n=3)
    - Reason 1: poster presentation (n =2)
    - Reason 2: before 2013 (n=1)

- Studies included in review (n =10)
**Appendix B**

**Data Matrix**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Publication Year</th>
<th>Title of article</th>
<th>Research Type</th>
<th>Journal title</th>
<th>Database</th>
<th>Population</th>
<th>Boxing Exercise Type</th>
<th>QOL Measurement</th>
<th>Summary</th>
<th>Level and Quality of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batard, Belinda, Vela, Chien, Rutherty, Milone and Negre Denneau</td>
<td>2022</td>
<td>High satisfaction and improved quality of life with Rock &amp; Roll boxing in Parkinson's disease: results of a large scale survey</td>
<td>Qualitative / Phenomenological approach</td>
<td>Disability and Rehabilitation</td>
<td>CINAHL</td>
<td>1709</td>
<td>Boxing (100% male)</td>
<td>PDQ-39</td>
<td>Non-parametric test since data is not normally distributed. Descriptive statistics used for qualitative questionnaire analysis.</td>
<td>Level I/Quality B</td>
</tr>
<tr>
<td>Patel, Nakhi Aiken, Menon, Lorimer, Mathias, Alnayel</td>
<td>2021</td>
<td>A pilot study of a 12-week community based boxing program for Parkinson's disease</td>
<td>Qualitative</td>
<td>Journal of Clinical Neurology</td>
<td>CINAHL</td>
<td>14 PwP and 88 women</td>
<td>Boxing</td>
<td>PDQ-39</td>
<td>Non-parametric test since data is not normally distributed. Descriptive statistics used for qualitative questionnaire analysis.</td>
<td>Level I/Quality B</td>
</tr>
<tr>
<td>Rocco, Lino Miller, Stephen A and Hallows, Elizabeth</td>
<td>2020</td>
<td>The meaning of regular participation in vigorous intensity exercise among those with Parkinson's disease</td>
<td>Mixed Methods Study</td>
<td>Disability and Rehabilitation</td>
<td>PubMed</td>
<td>0 males, 0 females</td>
<td>Exercise groups</td>
<td>PDQ-39</td>
<td>Non-parametric test since data is not normally distributed. Descriptive statistics used for qualitative questionnaire analysis.</td>
<td>Level I/Quality B</td>
</tr>
<tr>
<td>Stephanie A. Gevitz, M. Ray Smith, Nancy Crespo,, Anna Dukas, Dilek McLean, Nicholas Heyman</td>
<td>2019</td>
<td>Community-based group exercise for people with Parkinson disease: a randomized controlled trial</td>
<td>Randomized controlled trial</td>
<td>Medicine</td>
<td>MedSci</td>
<td>31 PwP convenience sample</td>
<td>Exercise groups</td>
<td>PDQ-39</td>
<td>Non-parametric test since data is not normally distributed. Descriptive statistics used for qualitative questionnaire analysis.</td>
<td>Level I/Quality B</td>
</tr>
<tr>
<td>Dawson, Richard A. Mc, Kaye, Jennifer Kapt, Laura (Lori) Masuda, Brooks McCauley, Michelle M. McGinnis, Kim</td>
<td>2018</td>
<td>Boxing Exercise as Therapy for Parkinson's Disease</td>
<td>Retrospective Observational Study</td>
<td>Topics in Geriatric Rehabilitation</td>
<td>CINAHL</td>
<td>62 PwP participants</td>
<td>Exercise</td>
<td>EQ-5D</td>
<td>Non-parametric test conducted. Advanced PD excluded. 80-90% did not have significant change. Accept to new participants change in pain and this was not significant demonstrated by a color.</td>
<td>Level I/Quality C</td>
</tr>
<tr>
<td>Michelle Henderson, PhD, RN, MAd, BC, CNC, PRETM, PNP, (Professor), Beth Maelstand-Smith, PhD, RN, Professor, Nadine Danner, MSN, RN, PhD, (Assistant Professor)</td>
<td>2017</td>
<td>Efficacy of boxing in improving the quality of life of people with Parkinson's disease</td>
<td>Mixed Methods Study</td>
<td>Journal of the American Association of Nurse Practitioners</td>
<td>CINAHL</td>
<td>60 PwP in focus group recruited by RSB certified coach at RSB gym.</td>
<td>Boxing</td>
<td>PDQ-39, self-reported system improvement (PDQ-39)</td>
<td>Thematic study, physical and non-physical benefits reported and interactions with others. Most comments were centered around non-physical benefits: encouragement, rapport, and motivation.</td>
<td>Level I/Quality C</td>
</tr>
<tr>
<td>MacClenahan, Bradley, Ray, Benke and Stover, Fronce</td>
<td>2016</td>
<td>A Qualitative Phenomenological Exploration of the Experience of Individuals with Parkinson’s Disease Engaged in a Boxing Program with Parkinson’s Disease Engaged in a Boxing Program</td>
<td>Phenomenological study</td>
<td>Canada</td>
<td>The Qualitative Report</td>
<td>Reference box</td>
<td>Boxing</td>
<td>PDQ-39, self-reported system improvement (PDQ-39)</td>
<td>Thematic study, physical and non-physical benefits reported and interactions with others. Most comments were centered around non-physical benefits: encouragement, rapport, and motivation.</td>
<td>Level I/Quality C</td>
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</tbody>
</table>