REVIEW ARTICLE

Alternative Approaches for the Management of Huntington's Disease: A Narrative Review

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ABSTRACT

Huntington's disease (HD) is an autosomal neurodegenerative disease that involves movement disorders, cognitive impairments, and psychiatric symptoms. It is characterized by regionally selective cortical degeneration that proceeds from posterior to anterior cortical region which explains its heterogeneity. At present, the psychiatric symptoms of HD are mostly managed by antidepressant such as selective serotonin reuptake inhibitors or selective nor-epinephrine reuptake inhibitors, and atypical antipsychotics. Currently, there are no efficient pharmacological treatment available for HD. Thus, in order to avoid this void in effective pharmacotherapy, further supplemental and alternative approaches are being explored for the management of problems associated with HD. A literature review was performed using the databases PubMed and Google Scholar identifying clinical studies that were set to ameliorate the symptoms associated with HD. On critical analysis, it was found that alternative treatment modalities like music therapy, video games, Yoga, Physical therapy, and exercise-based programs have a potential and possible role in improving the symptoms of HD at varied degrees. (*Altern Ther Health Med.* 2024;30(2):68-75).

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INTRODUCTION

Huntington's disease (HD) is defined as a neurodegenerative disease that is autosomal and is characterized by movement disorders such as chorea and loss of coordination. Together with cognitive impairments, psychiatric symptoms like depression, psychosis, and obsessive-compulsive disorder are seen in HD patients.[1] Additionally, features like weight loss, cardiac failure, and skeletal muscle degeneration also occur in people suffering from HD.[2,3] There is a general shrinkage of the brain and deterioration of the caudate nucleus and putamen which make up the neurons in the striatum that carries signals to the basal ganglia.[4] It is also accompanied by specific damage to the efferent medium spiny neurons which is seen in the brain of HD individuals.[5] There is a regionally selective cortical degeneration that proceeds from posterior to anterior cortical region which explains its heterogeneity.[6] The genetic basis of HD involves an unstable variability in the CAG trinucleotide repeats in 5′ part of the HTT gene on chromosome 4 that is physiologically polymorphic.[7] The CAG repeat that normally ranges from 6 to 35 repeats gets expanded to 36 or more and the extent of this expansion decides the severity of the disease.[8] Peculiar motor symptoms, psychiatric features, and cognitive impairment are seen when the alleles repeat beyond 40 or more.[9]

Studies show that Huntington's disease, a neurodegenerative disorder, affects approximately 5.70 out of 100,000 people in Europe, North America, and Australia. In contrast, the prevalence in Asia is much lower, at 0.40 out of 100,000 people, possibly due to genetic differences. The cost of caring for one person with HD is approximately £21,605, with informal care costs being the largest portion. Therefore, it is crucial to provide adequate support to caregivers when planning care for HD patients. [10] An international task force constituted by the European Huntington's Disease Network (EHDN) recommends a certain set of guidelines that standardizes the implementation of pharmacological, non-pharmacological, and surgical treatment approaches for improving the quality of life of HD patients.[11]

With the discovery of a mutated HTT gene, the concept of predictive testing as a part of genetic counseling was

implemented for HD patients and was done via direct gene testing with 100% accuracy.[7] Predictive testing is done on asymptomatic individuals who have a higher chance of developing this disease due to their family history which helps in the enhanced prediction of the disease beforehand.[12] The program of genetic counseling is practiced as per the international guidelines set by the International Huntington's Association and World Federation of Neurology and consists of three sessions handled by a geneticist, psychologist, or psychotherapist where they advise the patient regarding the predictive testing.[13,14]

Apart from genetic counseling which allows early prediction of the disease, there is a lack of disease-modifying drugs for the treatment of HD as the available treatment regimen is symptomatic only. Tetrabenazine is the single drug approved by the US Food and Drug Administration in the United States to treat choreiform movements associated with HD [15]. Most trouble in HD patients is caused by psychiatric symptoms that are mostly managed with standard drug treatments such as selective serotonin uptake inhibitor (SSRI) or selective nor epinephrine uptake inhibitor (SNRI) antidepressants and atypical antipsychotics.[16] These treatments are also supported largely by case studies except in the case of one open-label trial with venlafaxine.[17]

Due to a lack of suitable pharmacotherapeutics that would help delay the progression of the disease or reduce symptoms associated, HD patients are turning to complementary and alternative medicines (CAM) that would compensate for the gap that has been created by the scarcity of conventional medicines. WHO defines CAM as a broad set of healthcare practices that are not part of the country's tradition or conventional medicine and are not fully integrated into the dominant healthcare system.[18] CAM approaches mainly include alternative medical systems, biologically-based therapies, mind-body therapies, energy healing therapies, and manipulative and body-based therapies.[18] Thus HD patients also approach these alternatives which include speech and language therapy, nursing, physiotherapy, and social care.[19]

METHODS

The literature sources for writing this narrative review were the databases of PubMed, Google Scholar, and Web of Science. Nature, Springer, and Elsevier journals which were searched for the latest updates by using various combinations of keywords. The keywords included Huntington's disease, alternative approaches, and therapies. The cross-references from the papers gathered from PubMed were also used to collect Huntington's disease and alternative approaches-related literature.

A total of 90 articles were obtained from the databases which were carefully reviewed and 46 articles were excluded by evaluating the abstracts and duplications. 44 articles remained for full text analysis where 13 articles met the inclusion criteria. Only alternative therapies that made an evident change in the symptoms of HD were considered.

ALTERNATIVE APPROACHES

Approaches like music therapy,[20-22] video games,[23] behavioral relaxation training,[24] multisensory environments,[25] community-based exercise programs,[26] community-based yoga programs,[27] rehabilitation,[28] physical therapy,[29] have been shown to improve the symptoms of HD at varied degrees. The clinical studies carried out under these approaches, parameters observed and their respective outcomes demonstrating the positive effects of complementary approaches have been enumerated in Table 1.

Table 1. Summarized clinical outcomes demonstrating the beneficial effect of alternative approaches in Huntington's disease.

Sl. No.	Clinical Study	Parameter Measured	Effects	References
1.	Single Blinded, multi-center randomized controlled intervention to assess the effect of music therapy	• Changes in expressive and communication skills • Changes in behavior	• Enhanced social-cognitive functioning. • Reduced behavioral problems.	20
2.	Multi-center randomized controlled trial to determine the effect of music therapy in comparison to group recreational therapy	Changes in expressive and communication skills	No added benefit of music therapy in contrast to group recreational therapy	21
3.	Music therapy assessment tool development with psychometric testing	• Physical presentation • Communication • Musical cognition • Psychological/behavioral attention	Development of MATA-HD tool for assessing the response of music therapy in HD patients	22
4.	Cross-over, randomized controlled clinical trial to assess the effect of Dance Dance Revolution, a video game exercise program	• Game performance • Participant perception • Safety • Spatiotemporal gait measurement • Four square step tests • Tinetti mobility test	• Decrease in double support percentage and forward walking. • Deduction in the heel-to-heel base of support during forward walking.	23
5.	Multiple-baseline design study used to investigate the use of behavioral relaxation training	• Behavioral measure of relaxation • Heart rate	Behavioral relaxation training may be useful as a preliminary posturing method to attain greater remuneration from autogenic, meditation, muscle relaxation, or else other procedures.	24
6.	Qualitative case study to observe the effect of Hatha yoga on HD patients	• Field engagement triangulation • Member checks reflexivity	Consigns HD-specific deficits	27
7.	A randomized, controlled two-group design to assess the effect of Multisensory environment (MSE) in HD patients	• Physiological measures- Blood pressure (BP), heart rate and respiratory rate, REHAB, and Behavior and Mood Disturbance (BMD). • Motor assessment: the dyskinesia section of SHRS. • Behavioral assessment using the Interact included as secondary measures during intervention sessions.	MSE produces a leisure effect and not a therapeutic effect in Huntington's disease.	25

Table 1. (contiued)

Sl. No.	Clinical Study	Parameter Measured	Effects	References
8.	A pilot study (Within-subjects design) to study the effect of Cognitive rehabilitation exercises, physical and occupational therapy, respiratory exercises, and speech interventions.	• Tinetti Scale • Physical Performance Test (PPT) • Zung Depression Scale • Barthel Index • Mini-Mental State Examination (MMSE). • Tinetti and Physical Performance Test (PPT)	Improvement of functional and motor performance in HD patients.	28
9.	Clinical trial to evaluate the effect of community-based exercise program in high-risk HD patients	• 10-meter walk test • Fatigue Impact Scale • Berg Balance Scale • The Timed Up and Go	Results showed better gait speed, balance, and fatigue measures	26
10.	Phase 2 randomized trials to assess the beneficial role of exercise in HD disease	• Stationary cycling • Resistance exercises • Home-based walking program	Planned exercise programs produced a beneficial role for HD patients	56
11.	Multidisciplinary rehabilitation program with cognitive stimulation to evaluate the cognitive performance of early to middle-stage HD patients.	• Neuropsychological tests	Neuropsychological measures were found to be stable	71
12.	Assessor blind, multisite, randomized pilot feasibility trial.	• Measures of mobility, self-efficacy, physical activity, and disease-specific measures of motor and cognition.	Physical activity self-management and coaching intervention are achievable and valuable.	29
13.	To demonstrate the reliability and validity of three HD-specific EOL measures.	• Internal reliability, test-retest reliability, floor and ceiling effects, convergent and discriminant validity, known groups' validity, measurement error, and change over time	Internal consistency and test-retest reliability were fewer than 0.70. measures were generally free of floor and ceiling effects and measurement error was minimal. Convergent and discriminant validity were consistent with well-known constructs in the field. Hypotheses for known group validity were partially supported. Measurement error was appropriate and minimal changes over time across the EOL measures.	93

Music Therapy

One of the important alternatives developed for patients with neurodegenerative diseases is music therapy.[30,31] It involves the use of music experiences and the relationship that exists between patient and therapist to produce a therapeutic change.[32] Music therapists play an important role in treatment planning, ongoing evaluation, and follow-up of music therapy and are part of a multidisciplinary team.[21] They evaluated cognitive behavior, communication skills, physical health status, and social functioning with the help of musical responses. Based on the patient's needs, therapists designed music sessions using music improvisation methods, write songs, discuss lyrics, and amenable music listening and learning done via music.[32] Music therapy has a positive response on emotional well-being and shows an increase in social response in people suffering from dementia.[33] They enhance emotional well-being by allowing the recollection of life experiences related to pleasant emotions. It can augment communication and contact is established ultimately at a stage where language deteriorates during the later period of dementia.[34,35] Sessions of music therapy have improved non-verbal communication in individuals with HD through song selection. .[36] Thus, music therapy can be considered a significant non-pharmacologic approach to enhance communication skills, decrease problems related to behavior, and produce an improved quality of life for people with HD.[21,37-39]

A multi-center randomized controlled intervention which was single-blinded was carried out by van Bruggen-Rufi et al. to assess the effect of music therapy, a non-pharmacological intervention that aims to improve the quality of life in patients with HD. The study consisted of 60 patients who were randomized based on a center-stratified block-permuted randomization design. The patients were enlisted from four long-term care centers that specialized in the care of HD. Changes in expressive and communication skills were measured using the Behavior Observation Scale Huntington's (BOSH) scale that studied the influence of music therapy in comparison to control. At the same time changes in behavior were estimated using the Problem Behavior Assessment-short version and BOSH scales. All the evaluations were done at baseline (8th week), at the end of the intervention (16th week), and 12 weeks after the final intervention. In this study, expressive and communication skills were targeted through music therapy to enhance social-cognitive functioning which would precede an improved quality of life and thus reduce behavioral problems in HD. It was found that the therapy produced the desired positive results in the tested population.[20]

Another multi-centered randomized control trial was conducted by O'Kelly and Bodak using sixty-three patients to determine the effect of group music therapy on communication and expressive skills in contrast to group recreational therapy for 16 weeks. The patients were recruited from long-term care centers with a Total Functional Capacity (TFC) score of ≤ 7. The measurements were done at baseline, 8, 16, and 28 weeks using the BOSH and Problem Behavior Assessment-short version scales. The resulting scores of the two groups were equated using a linear mixed model that consisted of repeated measures. The results concluded that providing group music therapy once a week for 16 weeks did not have any added benefit on behavior or communication when compared to group recreational therapy.[21]

A music therapy assessment tool for patients with advanced HD was developed and prior psychometric testing was conducted. Initially, focus groups and field testing were used to establish the content and face validity of the Music Therapy Assessment Tool for Advanced HD (MATA-HD). Later, the psychometric properties of MATA-HD were tested in terms of its construct validity, internal consistency, and inter-rater and intra-rater reliability with 19 patients over 10 group music therapy sessions. The resultant MATA-HD tool included a sum of 15 items across six subscales that include physical presentation, communication, musical cognition, psychological/behavioral, and arousal/attention. Good construct validity of $r \geq 0.7$ was found for all six items on the scale of MATA-HD. A beneficial

internal consistency across 11 items with a general focus on engagement in therapy was suggested by Cronbach's α of 0.825. A mean intra-rater ICC reliability of 0.68 and inter-rater reliability (IRR) Intra-Class Coefficient (ICC) scores averaged 0.65 was also procured. Advanced training and retesting gave a mean of IRR ICC of 0.7. This data indicated that MATA-HD is a good tool for assessing the response of HD patients to music therapy authenticating the benefit of music therapy in treating HD patients.[22]

Video Games

It has been proved that approaches that mitigate or prevent gait and balance problems will benefit the population with HD paving the way for exercise as an option for the mitigation of such problems.[28] Various research suggests video game-based exercise as an intervention that increases practice volume, duration of attention, and patient compliance when compared to conventional exercise programs.[40,41] Video games that involve energetic, harmonious exercise have already improved problems related to balance, mobility, fall risk, and cognition substantially in other cases of neurodegenerative disorders such as Parkinson's disease.[40,42]

A cross-over, randomized controlled clinical trial was carried out by Kloos et al. to assess the viability, admissibility, and reliability of a video game exercise program done in the presence of a supervisor conducted via Dance Revolution in persons with HD. The study was single-blinded and involved eighteen ambulant individuals with HD and went on for 6 weeks. The individuals played the Dance Revolution game with and without a supervisor for 45 minutes twice per week for 6 weeks. Performance during the game, participant perception of the game, and safety were all measured. Spatiotemporal gait measures, the Four-Square Step Test which measures the rapid stepping that occurs when we change a direction or to circumvent obstacles at the time of walking, and the Tinetti Mobility Test which evaluates balance and gait in elderly or patients were performed.[43,44] Activities were assessed using the Specific Balance Confidence Scale, and the World Health Organization Quality of Life. Each measurement was made before and after each intervention. After participation in the trial, individuals showed a considerable decrease in double support percentage and forward walking. Individuals with less severity of motor symptoms showed deduction in the heel-to-heel base of support during forward walking. The remaining assessments did not show any significant changes with the intervention.[23]

Behavioral Relaxation Training

Behavioral relaxation training is a newly emerged technique that is planned to teach ten behaviors directly that have been related to relaxed conditions.[45] These ten behaviors include the components of the finest posture for relaxation, corroborated with electromyography research[46], as well as abridged breathing rate and communications. This training process follows a behavioral skill training design which includes vocal and physical prompts, modeling, instructions, rehearsal, and response. The method was established with learning-disabled teenagers who had obscurity benefitting from gradual muscle relaxation.[45]

The development of behavioral relaxation training is possibly valuable for both evaluation and training in relaxation. In terms of evaluation, the ten training behaviors can be examined as straight measures of relaxation, which has been deficient in both the clinical as well as research domains.[45-47] Nevertheless, the Behavioral relaxation training approach follows a similar outline as social skills training which has been effective with a range of clinical populations with mentally handicapped groups.[48] Patients suffering from Huntington's disease are one possible population who could benefit from the relative simplicity of the behavioral relaxation training approach.[24]

Fecteau et al. conducted a multiple-baseline design study which was used to investigate the probable use of behavioral relaxation training with two HD patients who showed advanced disease. Behavioral measures of relaxation and heart rate were significantly improved. The findings suggested that behavioral relaxation training may be abundantly investigated with other patient populations who cannot meet the cognitive demands of traditional procedures such as progressive muscle relaxation. Behavioral relaxation training may establish valuables to psycho-geriatric, mentally retarded, and chronic institutionalized populations who need a decline of arousal. Lastly, the study concluded that behavioral relaxation training may be useful as a preliminary posturing method to help attain greater remuneration from autogenic, meditation, muscle relaxation, or other procedures.[24]

Multisensory Environment

Due to the amalgamation of cognitive, behavioral, and motor dysfunctions associated with HD, persons in the mid-late stages are frequently not capable of accessing or taking advantage of standard forms of treatment.[49,50] Even though, relaxation techniques have been recommended as a valuable type of activity for HD people,[24,51] the multisensory environment (MSE) is a promising substitute for standard relaxation techniques. It consists of a silent room with an assortment of sensory equipment arranged to stimulate the primary senses, without necessitating intellectual or structured responses and depending on immediate pleasurable sensation. MSEs were first introduced for children with learning disabilities and were afterward applied to adults with thorough and manifold learning disabilities as well as with dementia.[52,53]

Another underlying principle in using MSEs is the significance of stimulation in human development and implementation.[54] Sensory deprivation can have severe sound effects and institutions have been seriously criticized for failing to provide ample stimulation, which is measured as a contributory factor in 'institutional neurosis'.[55] The cognitive, behavioral, and vocalization problems faced by HD individuals gravely restrain their interaction with their surroundings.[25]

Even though the effect of MSEs may not fluctuate among dementia and HD patients, this remains unclear. Therefore, it

was considered required to study the effects of MSEs before introducing them into the clinical management of HD patients.[25]

Leng et al. carried out a comparative study to determine the effect of controlled MSE on behavioral, motor, and physiological responses of persons with HD concerning therapeutic (sustained effects) or leisure (immediate effects) activity. A randomized, controlled two-group design (Pilot study) was carried out. Twelve HD patients were recruited for this purpose. Eight patients attended 30-minute sessions over four weeks of multisensory stimulation (MSE, treatment group) or relaxation activities (control group) were attended by HD patients as an intervention. During the intervention session, physiological measures like blood pressure (BP), heart rate, and respiratory rate were measured. During the evaluation of rehabilitation for patients with Huntington's disease, the Rehabilitation Evaluation Hall and Baker (REHAB) and Behavior and Mood Disturbance (BMD) scales were used. The St. Hans Rating Scale (SHRS) was used to assess motor function and dyskinesia. Within the sessions, the MSE group showed several positive effects. Interact, a form of therapy, showed significant differences in immediate effects on mood between the groups. There was also a significant difference in changes over time in stimulation levels and mood within the groups. No physiological effects were observed in either group. Two patients in the MSE group received medication changes during the study period. The MSE group showed short-term improvements in mood and behavior in response to the intervention, which were significantly different from the control group. However, these results do not provide evidence of a therapeutic outcome of the MSE in HD. These results suggest a possible leisure effect. [25]

Community-Based Yoga Program

Several reports explain the acceptability, safety, and feasibility of community-based exercise programs for HD patients.[26,56] A study conducted by Clark demonstrated that an 8-week community-based group exercise program shows improvement in gait, balance, and fatigue [26]. For the development of the program, the authors suggested a combination of yoga as yoga can enhance flexibility, lower fringe strength, balance, depression and anxiety, muscle control, and cardiopulmonary functions.[57] Other studies have suggested the positive influence of yoga on attention and body responsiveness.[58]

Ulanowski et al. conducted a study to observe community-based yoga, which was carried out by a physiotherapist, for persons who are affected by HD. The qualitative case study method was used to observe the Hatha Yoga which is an essential part of yoga used to attain the utmost state of consciousness and meditation.[59] It was carried out by a certified yoga trainer who was a neurologic physiotherapist. A semi-structured interview with the instructor, participant observations, and structured participant surveys from the collected data. Data were classified and thematically estimated. Strategies for rigor included field engagement, triangulation, member checks, and reflexivity. Five major themes came up that showed the worth and role of yoga in persons affected by HD. They were insistent on mindfulness, that yoga is amendable and accessible, precise communication, yoga upholds a sense of population and yoga poses suitable for HD-specific deficits. This study concluded that Yoga carried out by a physiotherapist can be customized to allow the involvement of HD patients, consigns HD-specific deficits, and promulgate a sense of community to appendage traditional physiotherapy.[27]

Community-based Exercise Program

Behavioral and cognitive alterations commonly related to HD, like apathy and depression,[9,60] stance prominent blockades to long-term exercise involvement. The absence of uniformity in adherence to exercise prescription is common, especially once unattended.[61,62] During the development of the program, research showed substantial effects of community-based fitness programs on certain neurological patient populations.[63,64] This program also provides social support and extrinsic motivation that could facilitate the blockades associated with physical activity in HD people.[26]

Cognitive and physical impairments play a significant role in how HD patients adhere to an exercise program. In comparison to the home-based exercise community, gym-based programs provide a better structure and support for the patients. Thus, in terms of both general health and disease modification, exercise is a potential substitute that validates the importance of research in this area.[56]

Clark et al. explained an evidence-based plan for a community-based exercise program to get better gait, balance, and tiredness for persons who are diagnosed with and at risk for HD. The program was planned, and four key features were included: community-based set layout for persons with HD, caregivers, and persons at risk for HD, individualized treatment within the set, circuit instruction, and use of event measures. The 10-meter walk test, Fatigue Impact Scale, Berg Balance Scale, and Timed Up and Go were included as Pre and post-outcome measures. Subjects confirmed progress or continuation of abilities in all measures with no undesirable events. This report explained the amalgamation of the facts, clinical proficiency, and patient principles to widen and execute individuate, community-based exercise sets, meant to get better gait speed, balance, and fatigue measures for HD persons and those at risk of HD.[26]

Busse et al. conducted phase 2 randomized trials to evaluate the viability, well-being, and suitability, and to determine the advantage of a planned exercise program [56]. Thirty-one subjects were randomly selected for the intervention or control group. An independent home-based walking program done twice a week along with a supervised gym session of stationary cycling and resistance exercises formed the study. Retention, adherence rates, and adverse events were observed. For the assessment of benefit, measures of disease severity, physical abilities, and the quality of life were included. The observed retention rate was 81%. No related adverse events were observed, and the intervention

was well tolerated by most of the subjects. Moderate effect sizes for cognitive outcomes and walking measures were also evaluated. The clinical outcomes suggested that the planned exercise program had a beneficial role for HD patients and larger-scale trials were acceptable.[56]

Rehabilitation in Huntington's disease

There is mere research that investigates the efficacy of rehabilitation for persons affected with HD. There are only a very limited number of journal articles reporting about rehabilitation outcomes at an observational level, often limited by small sample size, poor data regarding disease severity, cognitive and functional ability in patients, and failure to use well-known and validated measurement tools for measuring therapy outcomes [65]. Despite these frailties, the studies showed several shreds of evidence that aid physiotherapy and respiratory exercise for the management of motor & balance impairment as well as for the eating and swallowing complications respectively. Rehabilitation in Huntington's disease has also established a firm scientific basis and speculative support in mice model studies which suggests that environmental stimulation hampers the degenerative defeat of cerebral volume in the mice.[66-69] The rehabilitation program was successful in delaying the onset of the disease in mice by enhancing the environment. Thus it was evident that employing a rehabilitation program would be a good suggestion for humans also.[28,70]

A study by Zinzi et al. investigated the sound effects of an exhaustive, inpatient rehabilitation program on persons affected by HD. A pilot study using a within-subjects design was conducted. Forty subjects in the early and middle stages of HD were selected for an exhaustive, inpatient rehabilitation procedure. Cognitive rehabilitation exercises, physical and occupational therapy, respiratory exercises, and speech therapy were included as an intervention. This program involved three-week admittance periods of intensive treatment that could be repetitive three times a year. At the start of each admission, a standard clinical evaluation was performed by using the Tinetti Scale and Physical Performance Test (PPT), Zung Depression Scale, Barthel Index, and Mini-Mental State Examination (MMSE). Tinetti and Physical Performance Test (PPT) were also used at the end of each admission to evaluate the events in terms of motor and functional performance. Every three weeks of treatment, improvement in motor performance and daily life activities were observed. No carry-over effect from one to the next admission was evident but at the same time, no motor decline was noticed over two years which represented those patients maintained a stable level of cognitive, functional as well and motor performance. It was concluded that intensive rehabilitation treatments may certainly influence the upholding of functional and motor performance in HD patients.[28]

In a study, van Walsem evaluated the variations in cognitive performance by conducting secondary analyses on participants with early to middle-stage HD who were part of a one-year rehabilitation program. It included cognitive stimulation as a non-specific cognitive intervention along with physical interventions. It was a one-year multidisciplinary rehabilitation program that included comprehensive neuropsychological assessments. 31 out of 37 patients with early to middle stages of HD were enrolled for this purpose. Socio-demographic and clinical data were noted. For the measurement of cognitive functions, a battery of neuropsychological tests was used before and after the intervention. To explain the sample characteristics descriptive statistics was used. Cognitive measures were compared by parametric (Paired sample *t* tests) and nonparametric (Wilcoxon Signed ranked tests) at both time points. Scores of the cognitive assessment tests were found to be lesser post-intervention. It was concluded that an intensive multidisciplinary rehabilitation program was usually well tolerated and viable, with no indication of deleterious effects on cognition for HD patients. Neuropsychological measures overall remained stable following a multidisciplinary rehabilitation program, however, continued progression of cognitive impairment was evident on one of the scales suggesting that disease progression is not impeded. A randomized controlled trial was required to confirm these conclusions.[71]

Physical therapy in Huntington's disease

Physical therapy might play a key role in aiding HD individuals to sustain their independence in daily living activities by focusing on both losses and constraints in functional activities. Despite the potential effect of physical therapy to support HD individuals, indication supports that HD individuals are not constantly mentioned for physical therapy, especially in the early stages of HD.[72-74] This lack may be responsible for the limited scientific support for the usefulness of physical therapy interventions in HD.[75-77] Although Pre-clinical (animal models) and small-scale clinical studies of physical therapy have proved that focused physical activity, environmental improvement, and guidance may be helpful, the main mechanisms include clinical verdict, skill, trial, and error remain the same through which all the interventions are acceptable.[72,78-83]

The Physiotherapy Working Group of the European Huntington's Disease Network (EHDN) established a Clinical Guidance Document (evidence-based) to enlighten optimal management of physical therapy HD Patients and expedite care uniformity internationally in 2009.[84] This document was largely based on expert opinion the only constrained evidence at the time. To expedite guidelines translation into clinical practice, seven therapy-based divisions were established. These divisions give a framework for managing the impairments range and activity constraints within the disease phases. For the enhancement of physical functions, cognition, mood, mobility, and quality of life (QOL) in HD patients, several studies have analyzed the viability and effectiveness of physical therapy interventions since 2012. The Guidance Document was amended to integrate the latest literature within a succinct, user-friendly Clinical Practice Guideline in 2017.

The recommended specific physical therapy interventions for HD patients involve aerobic exercise (grade A) evidence, alone or in combination with resistance training to recover fitness and motor function, and accomplished gait training

(grade A) evidence to progress spatiotemporal gait features. Additionally, there is weak grade B evidence that exercise training recovers balance but does not display a decrease in the falls frequency; inspiratory and expiratory training progresses breathing function and volume; transfers training, getting up from the ground, and delivering approaches to caregivers for physical activity involvement in the midst ages (HD) may recover performance. There is professional unanimity for the usage of positioning devices, seating adaptations, and training of caregivers in the late stages of HD.[85]

Several studies imply that lifestyle elements, involving physical activity and particular motor training, may help run neuronal networks.[86,87] These kinds of interventions applied in long-term HD, neurodegenerative disorders have the potential to sustain function and simplify self-regulating living. Still, long-term self-management abilities for physical activity are hardly deemed in clinical tests and home-based remedies.[88]

Assessor blind, multisite, randomized pilot feasibility trial was conducted in which forty-six patients were enrolled (22 for physical intervention and 24 for social intervention). HD patients were assigned to the ENGAGE-HD physical activity coaching intervention or a social interaction intervention. The outcomes included mobility, self-efficacy, physical activity, and disease-specific measures of motor and cognition were measured.

Retention rates in the physical intervention (77%) and social intervention (92%) were found. Least participation criteria were attained by 82% in the physical intervention and 100% of participants in the social intervention. No indication of among group treatment impacts on function was found; though, surges in self-efficiency for exercise and self-reported physical activity levels in the physical intervention aid to predefined intervention logic paradigm. This study concluded that physical activity self-management and coaching intervention in HD patients is realistic and valuable beyond investigation.[29]

Till there no HD-specific tools exist to support persons with HD patients, their relatives, and clinicians in finding and directing end-of-life (EOL) preferences for HD patients. The research team created and confirmed the psychometric properties of modern ways to evaluate end-of-life (EOL) issues in HD individuals. These means HDQLIFE Meaning and Purpose, HDQLIFE Concern with Death and Dying[89], and HDQLIFE End of Life Planning[90] were created to measure HD Quality of Life (HDQLIFE). These measurements might be useful in clinical care and research areas.[91] These new measures give a base for the collection of data about EOL matters and preferences and may enable a clearer understanding of these matters and enhance communication between relatives and contributors.[92] To support the clinical value i.e., reliability and validity of these measures, no comprehensive data is available yet.

As there is no way to assess for end-of-life predilections that have been supported for clinical purposes in HD. A study was conducted by Carlozzi to determine the consistency and authenticity of three EOL measures (HD-specific) for usage in clinical research. Internal reliability, test-retest reliability, measurement error, floor and ceiling effects, known-groups validity, convergent and discriminant validity, and change over time to systematically assess the reliability and validity of the HDQLIFE EOL measures were examined. Internal consistency and test-retest reliability were found to be less than 0.70. The measures were usually free of floor and ceiling effects and measurement error was negligible. Convergent and discriminant validity were reliable with well-known concepts in the field. Hypotheses for known group validity were partly validated. Measurement error was appropriate and there were slight changes over time throughout the EOL measures. It is concluded that this study helps in the clinical effectiveness of the HDQLIFE EOL measures in HD patients.[93]

CONCLUSION

Huntington's Disease, an autosomal neurodegenerative disease, is mainly characterized by movement disorders. Usually, there is a general shrinkage of the brain and deterioration of the caudate nucleus and putamen, with specific damage to efferent medium spiny neurons which is seen in the brain of HD individuals. The available treatment regimen for HD is symptomatic only and Tetrabenazine is the only drug used to treat choreiform movements that have been permitted in the UK for HD. Most of the psychiatric symptoms associated with HD are managed with standard drug treatments such as SSRI or SNRI antidepressants and atypical antipsychotics. Due to the lack of disease-modifying drugs for the treatment and effective prevention of HD, alternative methods are being explored. In this review, the beneficial effects of music therapy, video games, yoga, and community-based exercise programs were investigated. Sufficient clinical trials prove that these alternate therapies play a pivotal role in decreasing the complications associated with HD.

AUTHOR DISCLOSURE STATEMENT

The authors declare no conflict of interest.

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