

Cognitive Behavioral Therapy in Movement Disorders: A Review

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Abstract: In addition to motor symptoms, patients with movement disorders often complain of psychiatric disturbances, including mood, anxiety, and impulse-control disorders and psychosis. These abnormalities are often misdiagnosed and left untreated, thus resulting in a worse prognosis and lower quality of life. Besides the use of standard pharmacological treatments, psychiatric abnormalities can be treated by means of nonpharmacological approaches. These approaches include various types of psychological therapies, the most widely used being cognitive behavioral therapy (CBT). We reviewed all articles, conducted until 2014, that contained primary data derived from clinical trials and case reports on the effect of CBT in the most common movement disorders. One randomized, controlled study and several uncontrolled studies on the efficacy of CBT in Parkinson's disease (PD) have shown a short-term benefit of depression and anxiety. In Tourette's syndrome (TS), CBT has been assessed in a number of large controlled clinical trials that have demonstrated an improvement in psychiatric disturbances and tics. There are no controlled studies on the efficacy of CBT in other types of movement disorders, such as dystonia, Huntington's disease, and essential tremor. Only a limited number of studies have evaluated the efficacy of CBT in the management of psychiatric disorders in movement disorders. The evidence available suggests that CBT is useful in TS and probably useful in PD. We recommend the planning of randomized, controlled clinical trials to investigate the effects of CBT and group CBT in the treatment of psychiatric disturbances in movement disorders.

Patients with movement disorders often complain of nonmotor symptoms, including psychiatric disturbances. Parkinson's disease (PD) is characterized by a high prevalence of depression, anxiety, impulse-control disorders (ICDs), and psychosis.^{1,2} Patients with Tourette's syndrome (TS) present a high frequency of attention deficit hyperactivity disorder, obsessive-compulsive disorders (OCD), abnormal social behavior, self-injury behavior, anxiety, depression, addictive disorders, and anger control problems.³⁻⁵ Depressive and anxiety symptoms and social phobia are present in patients with focal dystonia (blepharospasm, cervical dystonia, laryngeal dystonia, and arm dystonia) or generalized dystonia.^{6,7} OCD is a consistent comorbid disorder in myoclonic dystonia.⁸ In Huntington's disease (HD), psychiatric symptoms, particularly depression and psychosis, are a cardinal manifestation that may develop several years before motor or cognitive deficits and are extremely burdening for patients, families, and caregivers.⁹ Finally, essential tremor (ET) patients have an increased frequency of mood disorders, anxiety disorders, social phobia, and personality disturbances.^{10,11} In general, the

forementioned psychiatric disorders are often misdiagnosed and frequently left untreated, which leads to a worse prognosis and lower quality of life.

Pharmacological treatments are generally used for treatment of psychiatric disturbances in the various movement disorders,¹² though the efficacy of such treatments is often unsatisfactory and may be associated with a deterioration in motor functions.¹³ Nonpharmacological management may therefore be a useful alternative in treatment of psychiatric abnormalities in movement disorders. The best-known psychological therapies and social interventions currently available include psychodynamic therapy, family therapy, and cognitive behavioural therapy (CBT). CBT is a psychotherapeutic approach that addresses dysfunctional beliefs and emotions, maladaptive behaviors, and cognitive processes and contents through a number of goal-oriented, explicit systematic procedures. CBT highlights the centrality of a person's thoughts, appraisals, and beliefs in guiding feelings and actions, and focuses on the identification and modification of dysfunctional thoughts to improve affect regulation. CBT is also based on the assumption

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that emotional reaction and behavior depend on cognitive processing in a specific situation. CBT aims to introduce changes in the inner experience of the patient by means of cognitive and emotional restructuring through thoughts, beliefs, memories, feelings, and emotions. Changes in inner experience develop in a temporal continuum with a review of the past and planning for the future. By understanding interpersonal patterns and pathological beliefs, patients change their inner experiences through critical reflection and by experiencing alternative behavior. Various techniques, each of which is specific to the different disorders, are currently available, including cognitive, behavioral, environmental, biological, supportive, interpersonal, and experiential treatment.¹⁴

CBT is used for treatment of a variety of primary psychiatric conditions, including mood, psychosis, anxiety, personality, and eating disorders,^{15–18} and has successfully been used in various medical conditions with a psychological component, including chronic or acute pain, chronic fatigue syndrome, premenstrual syndrome, colitis, sleep disorders, obesity, and neurological diseases.^{19,20} Several factors make CBT particularly suited to treatment of psychiatric symptoms associated with movement disorders. Movement disorders are often associated with mood disorder, OCD, and fatigue, which are pathological conditions in which CBT is known to be effective. The aim of this article was to review studies that have employed CBT for treatment of psychiatric disturbances in the most common movement disorders (i.e., PD, TS, dystonia, HD, and ET) and evaluate their efficacy in these conditions.

Materials and Methods

A search of two electronic databases was performed to identify relevant articles: PubMed/Medline and PsycInfo. Our initial search strategy included the main term, that is, “Cognitive Behavioral Therapy”, combined with the following: “movement disorders”, “Parkinson’s Disease”, “Dystonia”, “Tourette Syndrome”, “Huntington’s disease”, “Tic Disorders”, and “Essential Tremor”. Research was limited to studies on humans that were written in English and addressed both movement disorders and CBT. We included all articles that contained primary data derived from clinical trials or longitudinal or cross-sectional studies conducted until 2014. We evaluated articles that had a *Diagnostic and Statistical Manual* (DSM) or International Classification of Diseases diagnosis of AXIS-I disorder, that used interventions with psychiatric disturbances as the primary focus, that adopted a controlled design, and that employed standardized primary outcome measures. Because no controlled studies were found for dystonia, HD, and ET, open studies and case series were also evaluated for these disorders. The level of evidence was based on neurological management guidelines drawn up by the European Federation of Neurological Societies.²¹

CBT in PD

Table 1 provides an overview of the participants’ characteristics, experimental designs, and main findings of studies that investi-

gated the efficacy of CBT in the treatment of psychiatric disorders in PD. A randomized, controlled clinical trial (RCT) compared the efficacy of individually administered CBT with that of clinical monitoring alone (i.e., with no new treatment) for depression in 80 PD patients, as measured by changes in the Hamilton Depression Rating Scale (HAM-D) score.²² CBT-treated patients received 10 weekly individualized sessions (60–75 minutes), whereas the control arm participants maintained stable medical regimens with no new interventions. The results revealed a significant improvement in both standardized depression and anxiety measures in the CBT group (the mean HAM-D score at the end of the study was 13.6 in the CBT group and 19.3 in the clinical-monitoring-alone group, whereas the mean Beck Depression Inventory [BDI] score was 9.7 in the CBT group and 17.4 in the clinical-monitoring-alone group). Secondary outcomes were anxiety, negative thoughts, sleep, quality of life, coping, social support, caregiver burden, and PD symptoms. Quality of life and social support were measured by the social functioning, physical role limitations, and physical disability subscales of the Medical Outcomes Study Short-Form Health Survey and by the Social Feedback Questionnaire. No significant group-by-time improvements were noted for secondary outcomes, including social support; however, significant changes from baseline were observed at the Medical Outcomes Study Short-Form Health Survey. Specific modifications from standard CBT include a greater emphasis on behavioral and anxiety management, as well as inclusion of a supplemental caregiver educational program. Individual sessions incorporated exercise, behavioral activation, thought monitoring and restructuring, relaxation training, worry control, and sleep hygiene. The CBT group displayed greater improvements in quality of life, coping, and anxiety, as well as a lower degree of motor decline. The improvement persisted at the 1-month follow-up. In an open treatment study²³ on 8 depressed PD patients, 12 weekly individual CBT sessions (50 minutes) improved depression, as measured by HAM-D scores, after the intervention, with 4 patients meeting remission criteria for depression (defined as HAM-D ≤ 7). The CBT session was highly structured and included setting agenda, mood check, bridge from last session, today’s agenda items, homework assignment, summary of session, and feedback from patient. CBT performed in 15 PD patients²⁴ led to a significant improvement in depression measures and negative cognitions, and an increased perception of social support over the course of treatment, as well as to a mild, though not significant, improvement in anxiety; mood improvement was sustained at the 1-month follow-up. Patients’ caregivers attended three to four psychoeducational sessions, which were held separately from patients’ treatment sessions and focused on strategies for offering appropriate support and ways to respond to patients’ negative thoughts in a targeted manner. The CBT sessions involved training in stress management, behavioral changes, sleep hygiene, relaxation techniques, and cognitive restructuring. Other studies have assessed the efficacy of CBT therapy in depression in small samples of PD patients.^{25–27} Two studies have evaluated the efficacy of group CBT for psychiatric

TABLE 1 Studies designed to investigate the efficacy of CBT on psychiatric disturbances in PD patients

| Reference | Primary Aim | Patients (n) | Intervention | Main Outcome Measures | Main Findings |
|---------------------------------|--|---------------------|---|--|---|
| Dobkin et al. ²² | Efficacy of CBT in PD patients with depression | 41 CBT, 39 controls | 10 weekly individual sessions of CBT vs. clinical monitoring alone | HAM-D, HAM-A, BDI | Significant improvement in depression, anxiety, quality of life, coping, and motor decline in CBT group |
| Farabaugh et al. ²³ | Efficacy of CBT on depression in PD | 8 | 12 weekly individual sessions of CBT | HAM-D | Significant improvement in depression; remission in 57% of participants |
| Dobkin et al. ²⁴ | Efficacy of CBT on depression in PD | 15 | 14 weekly sessions of CBT; 3–4 additional psychoeducational sessions for caregivers | HAM-D, BDI, STAI | Improvement in depressive symptoms and negative cognitions; increased perception of social support |
| Dobkin et al. ²⁵ | Efficacy of CBT on depression in PD | 3 | 12–14 sessions of cognitive-behavioral intervention; 3–4 separate caregiver psychoeducational sessions | HAM-D, STAI, BDI, IQ, AIFQ | Significant improvement in depressive symptoms |
| Feeney et al. ²⁶ | Efficacy of CBT on anxiety and depression in PD | 4 | 8 weekly group sessions of CBT | BDI-II, STAI-S | Significant improvement in depression; no significant improvement in anxiety |
| Cole and Vaughan ²⁷ | Efficacy of home-based CBT on depression in PD | 5 | 7 weekly brief home-based sessions of CBT | GDS-15, BDI-II, PDQL | Four individuals demonstrated a clinically reliable reduction in symptoms according to the GDS scores. |
| Troeung et al. ²⁸ | Efficacy of a group CBT for depression and anxiety in PD patients | 18 | 8-week group CBT treatment or waitlist (8-week clinical monitoring preceding treatment) | DASS-21 at Time 1 (pretreatment), Time 2 (post-treatment/postwaitlist) and 1- and 6-month follow-ups | Participants who received CBT reported greater reductions in depression and anxiety than waitlist participants. Improvement was maintained at follow-up period. |
| Berardelli et al. ²⁹ | Efficacy of a group CBT for depression and anxiety in PD patients | 7 | 12-week group CBT treatment | CGI, HAM-D, HAM-A, BPRS | Significant improvement in depressive and anxiety symptoms |
| Dobkin et al. ³⁰ | Telephone-based CBT on depression in PD patients | 21 | 10 weekly sessions with behavioral activation; 4 separate caregivers administered educational sessions. | HAM-D 17, caregiver burden, sleep | Improvement in depressive symptoms |
| Veazey et al. ³¹ | Efficacy of telephone-based CBT on depression and anxiety in PD patients | 5 | 8 weekly telephone-based sessions of CBT vs. 8 weekly telephone calls of support therapy | PHQ-9, BAI, PDQ-39 | Improvement in depressive and anxiety symptoms |
| Okai et al. ³² | Efficacy of CBT in PD patients with impulse control behaviors | 28 | 12 weekly individual sessions of CBT vs. standard medical care | CGI, NPI, ICBSS, BAI, BDI | Significant improvement in ICD severity, depression, and anxiety in CBT group |
| Yang and Petrini ³³ | Efficacy of CBT on sleep disorders in PD patients | 22 | 4 weekly sessions of CBT | PDSS, sleep diary | Significant improvement in total wake time, sleep efficiency, and PDSS score in CBT group |

TABLE 1 (Continued)

| Reference | Primary Aim | Patients (n) | Intervention | Main Outcome Measures | Main Findings |
|---------------------------------------|--|---|-------------------------|-----------------------------------|--|
| Rios Romenets et al. ³⁴ | Efficacy of CBT with bright-light therapy or doxepin (10 mg daily) for insomnia in PD patients | 18 patients were randomized, 6 to each group. | 12-week sessions of CBT | ISI, PSQI, PDQ-39, FSS, MoCA, CGI | Compared to placebo, doxepin and CBT improved ISI, PSQI, and FSS. In CBT, group was observed with a decline in PDQ-39. |

ICBSS, Impulse Control Behavior Symptom Scale; NPI, Neuropsychiatric Inventory; PDSS, Parkinson's disease sleep scale; HAM-A, Hamilton Anxiety Rating Scale; PHQ-9, Patient Health Questionnaire; STAI, State-Trait Anxiety Inventory; IQ, Inference Questionnaire; AIFQ, Adaptive Inferential Feedback Questionnaire; STAI-S, Subscale of the State and Trait Anxiety Inventory; BDI-II, Beck Depression Inventory–Second Edition; GDS-15, Geriatric Depression Scale; PDQL, Parkinson's Disease Quality of Life Questionnaire; PSQI, Pittsburgh Sleep Quality Index-sleep disturbances subscale; FSS, the fatigue severity scale; MoCA, Montreal Cognitive Assessment; DASS-21, Depression, Anxiety, Stress Scale-21; BPRS, Brief Psychiatric Rating Scale.

symptoms in PD.^{28,29} Group CBT proved useful in a waitlist-controlled trial conducted on 18 PD patients.²⁸ PD patients were included if they were diagnosed with at least one depressive and/or anxiety disorder according to DSM-IV criteria. Secondary outcomes were quality of life and depressive and anxious cognitions. The CBT techniques include psychoeducation, relaxation training, cognitive therapy, problem solving, and behavioral activation. A number of PD-specific adaptations were implemented. Group CBT patients displayed a significant improvement in depressive symptoms (mean reduction in depression of 3.91 compared with an increase of 0.29 for waitlist participants; $P = 0.011$), though not in anxiety symptoms (mean reduction in anxiety of 3.64 compared with 0.43 for waitlist participants; $P = 0.25$). Group treatment for individuals with PD affords several therapeutic advantages; as functional impairment worsens, individuals with chronic neurological diseases tend to experience increased stigma, withdrawal, and social isolation, which play a significant role in both the development and persistence of psychiatric comorbidity. The researchers of one open-label study showed that group CBT was useful in the treatment of depression and anxiety.²⁹ The improvement in psychiatric symptoms was accompanied by a reduction in motor symptoms and an improvement in quality of life, assessed with the Parkinson's Disease Quality of Life Questionnaire. The group CBT administered to the patients consisted of standard group CBT that was focused on the link between psychological distress and physical illness. Some sessions were aimed at understanding patients' vulnerability and their fear of the future; specific PD sessions were also held and included describing and sharing emotions after the diagnosis of PD, observation of mood changes, acceptance and evaluation of disease severity, and personal beliefs regarding the neurological disease, analysis of the content of thought and emotions related to the underlying disease, and the consequences of behavior (using the classic scheme of self-observation).

The effect of telephone-based CBT for depression in PD was investigated in 21 PD patients who met the DSM-IV criteria for primary major depressive disorder, dysthymia, or a not otherwise specified depressive disorder.³⁰ All participants received 10 sessions of individually administered telephone-based CBT along with four separate caregiver-administered educational sessions. Telephone sessions incorporated behavioral

activation, recommendations to gradually increase exercise, relaxation training, worry control, sleep hygiene, and anxiety management techniques. Telephone-based CBT was associated with significant improvements in the HAM-D 17; secondary endpoints included severity of depression and treatment response, anxiety, negative thoughts, quality of life, social functioning, physical role limitations, coping, social support, sleep, and caregiver burden. No significant effects were found on measures of quality of life assessed with the quality-of-life subscales (social functioning, physical role limitations, and physical disability) of the Medical Outcomes Short Form. The results were comparable to the additional in-person CBT pilot studies for PD, thereby demonstrating that the beneficial effects of telephone psychotherapy observed in other chronic medical conditions are not attenuated in PD. In another telephone-administered CBT study on the treatment of depression in PD, patients were randomized to either a "CBT arm" or a "support arm."³¹ Specific interventions included depression and anxiety education, relaxation training, cognitive therapy, problem solving, activity scheduling, exposure, and sleep-management skills. CBT arm patients displayed a mild improvement in depression and a significant improvement in anxiety both post-treatment and at the 1-month mark, whereas the support arm patients did not. Quality-of-life dimensions related to PD was assessed using the 39-item PD questionnaire (PDQ-39). The effect size was small for the post-treatment time point, with no differences between CBT- and support-treated patients.

CBT has also been used in PD for treatment of other psychiatric disorders. An RCT based on 12 weekly CBT sessions compared the efficacy of a CBT-based intervention with that of a control condition, both combined with standard medical care, for the management of ICD in 45 PD patients.³² The researchers used standard treatments of ICD in the general population adapted for PD, with additional components on communication and interpersonal relationships, executive dysfunction, and elements of case management. CBT plus standard medical care was found to be more effective than standard medical care alone in reducing severity of ICD in PD patients, as measured by the Clinical Global Impression (CGI) Assessment; in addition, the CBT-based intervention improved depression and anxiety. A study on 22 PD patients with insomnia³³ demonstrated that CBT facilitates improvement of sleep disorders. CBT sessions

include sleeping diary, reviewing participants' problems and expectations, and cognitive reconstruction; the main aim was to improve sleep by reducing unnecessary worrying. In another controlled study,³⁴ CBT was compared with doxepin and placebo for treatment of insomnia in PD patients. CBT treatment reduced the Insomnia Severity Index (ISI; -7.8 ± 3.8 vs. -2.0 ± 3.9 ; $P = 0.03$) as well as the examiner-reported clinical global impression of change ($P = 0.006$).

CBT in Chronic Tic Disorder and TS

Table 2 provides an overview of participants' characteristics, experimental design, and main findings. Behavioral treatments used in chronic tic disorders (CTDs) and TS include standard CBT, habit reversal (HR) training (HRT), and exposure with

response prevention. A recent meta-analysis of behavior therapy for TS identified eight RCT studies, which included a total of 438 participants, and found a medium-to-large effect size of behavioral treatments.³⁵ An RCT³⁶ on 232 patients with TS or CTD showed that a decrease of 25% of the Yale Global Tic Severity Scale (YGTSS) score was highly predictive of a positive response to behavioral treatment. One trial on 6 TS patients showed that CBT, self-monitoring, and relaxation techniques had a similar efficacy on tic severity.³⁷ The study by O'Connor et al.,³⁸ performed on 76 patients with either TS or CTD, assessed whether CBT is equally effective when combined with existing medication or administered without medication. Measures included the Tourette Syndrome Global Scale (TSGS), the Beck Anxiety Inventory (BAI), and the BDI. The results showed that CBT is effective both alone and when

TABLE 2 Studies designed to investigate the efficacy of CBT on psychiatric disturbances in adult TS patients

| Reference | Primary Aim | Patients (n) | Intervention | Main Outcome Measures | Main Findings |
|----------------------------------|---|--|---|------------------------------------|--|
| Jeon et al. ³⁶ | To compare 3 statistical strategies for classifying positive treatment response | 232 TS or CTD patients | Comparison of behavioral treatment to supportive therapy. | YGTSS and CGI-I | A 25% decrease on the YGTSS predicted positive response on the CGI-I |
| Peterson and Azrin ³⁷ | Efficacy of HRT, self-monitoring, and relaxation training | 6 TS patients | Counterbalanced design, videotapes ratings | Tic severity | Improvement in tic severity with the 3 treatments |
| O' Connor et al. ³⁸ | Evaluating the effectiveness of CBT with and without medication | 76 TS or CTD patients | CBT in medicated or unmedicated TS and CTD patients | TSGS, BAI, BDI | No differences in CBT efficacy between medicated and unmedicated patients |
| Wilhelm et al. ³⁹ | Efficacy of CBIT | 122 TS patients | 8 sessions of CBIT vs. SP | YGTSS, CGI-I | CBIT was superior to control treatment in reducing YGTSS Total Tic score. |
| O' Connor et al. ⁴⁰ | Efficacy habit reversal for the management of CTD and habit disorder (HD) | 47 CTD and 43 habit disorders patients | 4-month treatment program vs. waitlist control group; awareness training, relaxation, and habit-reversal training | YGTSS | Changes in severity of TS disorder in the habit reversal therapy group |
| Deckersbach et al. ⁴¹ | Efficacy of HRT vs. SP | 30 TS patients | 14 individual sessions of HR or SP | YGTSS | HR, but not SP, reduced tic severity. Both groups improved in life-satisfaction and psychosocial functioning and remained stable at the 6-month follow-up. |
| Verdellen et al. ⁴³ | Efficacy of HRT | 32 TS patients | 14 session of HR I vs. SP | YGTSS | Changes in severity of TS disorder in the habit reversal therapy group |
| Wilhelm et al. ⁴⁴ | Evaluate the effect of ER vs. HR | 43 TS patients | Individual session of ER or individual session of HR | YGTSS, tic frequency registrations | Both treatment conditions resulted in statistically significant improvements on all outcome measures. |

SP, supportive psychotherapy.

combined with medications. TSGS total scores decreased significantly in both TS and CTD patients, with an improvement of 49% being observed in the overall TSGS scores of medicated patients and of 54% in nonmedicated patients. There was also a significant improvement in the BAI scores in the nonmedicated group, though not in the medicated group, as well as a significant improvement in BDI scores in both groups. A large, randomized trial focused on the effectiveness of comprehensive behavior therapy (CBIT), compared with supportive psychotherapy, in 122 patients with TS or CTD.⁴⁰ After three monthly booster sessions, patients who completed the treatment with behavior therapy displayed a significantly greater decrease in the YGTSS from baseline to endpoint than the control treatment group (24.0 ± 6.47 to 17.8 ± 7.32 vs. 21.8 ± 6.59 to 19.3 ± 7.40 ; $P < 0.001$; effect size = 0.57). Twenty-four of the sixty-three subjects (38.1%) in the CBIT group were rated as Much Improved or Very Much Improved on the CGI-Improvement Scale, compared with only 4 of 63 subjects (6.8%) in the supportive therapy group ($P < 0.0001$). Studies on the effectiveness of behavior therapies based on HRT in TS have yielded promising results.^{41,42} HRT is a “multicomponent behavioral treatment package originally developed to address a wide variety of repetitive behavior disorders.” These results confirmed the hypothesis that tics may be suppressed for prolonged periods of time by means of response prevention.⁴² The recently published European clinical guidelines on nonpharmacological intervention for TS⁴³ suggest that HRT is an effective treatment option for reducing tic severity. HRT consisted of awareness training, self-monitoring, relaxation training, competing response training, and contingency management. A randomized trial to compare the effects of HRT on tics, life satisfaction, and psychosocial functioning with those of supportive psychotherapy was performed in outpatients with TS.⁴⁴ The researchers confirmed that HR did reduce, whereas supportive psychotherapy did not reduce, tic severity over the course of treatment. Both groups displayed an improvement in life satisfaction and psychosocial functioning during active treatment. Reductions in tic severity (after HRT) and improvements in life satisfaction and psychosocial functioning (after both HR and supportive psychotherapy) remained stable at the 6-month follow-up. The effects of exposure plus response (ER) prevention were compared with those of HRT in 43 TS patients.⁴⁵ As outcome measures, the researchers used the YGTSS, 15-minute tic frequency recordings monitored in the hospital and 15-minute tic frequency recordings performed at home. Both treatment conditions resulted in statistically significant improvements in all outcome measures ($P < 0.001$). No significant differences emerged between the two treatment conditions in any of the outcome measures, although there was a tendency in favor of ER on the YGTSS ($P = 0.05$). The same researchers did not report any evidence of a rebound effect after ER prevention therapy sessions.⁴⁶

CBT has been also used, with good results, in children and adolescents with CTD and TS. A randomized, observer-blind, controlled trial of 126 children and adolescents with severe TS or CTD was conducted to determine the efficacy of a com-

prehensive behavioral intervention compared with supportive therapy and education aimed at reducing tic severity.⁴⁷ A greater improvement in symptom severity was observed in the group treated with a behavioral intervention. The results obtained in this group of children were assessed from baseline to endpoint by means of the YGTSS and compared to a control treatment group ($24.7-17.1$ in the treated group vs. $24.6-21.0$ in the control group; $P < 0.001$; effect size = 0.68). A recent study⁴² on 126 children with either CTD or TS investigated the acute effects of behavior therapy on secondary psychiatric symptoms and psychosocial functioning. Responders to behavior therapy at the end of the acute phase were reassessed at 3- and 6-month follow-up visits. At 6 months post-treatment, a positive response to behavior therapy was associated with decreased anxiety, disruptive behavior, and family strain, as well as improved social functioning. A retrospective study conducted on children and adolescents affected by OCD showed that the combination of CBT and sertraline in patients with a comorbid tic disorder was more effective than CBT alone, sertraline alone, or placebo.⁴⁸

CBT in Dystonia, HD, and ET

Only two studies have investigated the effects of CBT on psychiatric disturbances in patients with dystonia, though neither adopted an experimental design. A case report of 1 patient with cervical dystonia reported an improvement, which persisted at the 6-month follow-up, after CBT. In that case, CBT focused on catastrophic thoughts and abnormal illness beliefs.⁴⁹ In another case report, a patient was successfully treated, after three baseline assessments, by means of progressive relaxation, positive practice, and visual feedback. The improvement in behavioral and physiological symptoms (depression and anxiety) continued to be significant at the 2-year follow-up.⁵⁰ No controlled studies have specifically assessed the efficacy of CBT in HD. Only two studies that describe single cases are available. Freinhar et al., who investigated 1 patient with HD using psychopharmacological and behavioral therapy, reported improvements in depressive and anxiety symptoms.⁵¹ Another case report investigated the effectiveness of CBT in a patient who experienced depression and anxiety symptoms following a positive predictive test result for HD. CBT, focused on negative automatic thoughts, effectively reduced the patient's affective, behavioral, and physical symptoms, even at the 3- and 6-month follow-up examinations.⁵² Last, although ET is frequently associated with significant physical and psychosocial disability, as well as with an increased frequency of mood and anxiety disorders, particularly social phobia and personality disturbances, no studies have assessed whether CBT leads to an improvement in psychiatric disturbances in patients with ET.

Discussion

Given that psychiatric disturbances are one of the main determinants of quality of life in patients with movement disorders, alternative therapeutic interventions to pharmacological therapy

may be useful in such patients.^{13,53} In the present review, we examined clinical studies that assessed the effect of individual CBT and group CBT in the treatment of psychiatric disorders in the most common movement disorders. In PD, the majority of therapeutic interventions consisted of individual sessions of CBT. In two studies, treatments were conducted telephonically. Most interventions consisted of CBT alone, with few using a “mixed” approach combining CBT with other techniques. The efficacy of CBT in PD was tested using various outcome measures and interventions. Studies reported a significant improvement in depressive and anxiety symptoms when CBT was compared to placebo. Some of these studies also showed that the benefit of CBT was maintained in the follow-up period, though none evaluated the patients for more than 3 months. Initial evidence also supported the use of group CBT in PD. In conclusion, the results of one randomized, controlled study and several uncontrolled studies suggest that CBT applied to PD is probably effective (level B). However, further studies, conducted on larger patient samples and with longer observation periods, are warranted to confirm the efficacy and feasibility of CBT in PD. Another limitation of previous CBT studies in PD is that it is still unclear whether CBT has any influence on motor symptoms. More-definite conclusions can be drawn on the efficacy of CBT in CTD and TS. Indeed, CBT and HRT have been assessed in a number of large, controlled, clinical trials in TS patients, conducted on adults as well as on children and adolescents, who generally displayed an improvement in psychiatric disturbances and tics. Eight randomized, controlled studies on TS based on an appropriate sample size suggest that CBT, particularly behavioral techniques such as HRT and exposure with response prevention, is effective, yielding a level A of evidence (established efficacy). The efficacy of CBT in this condition is proven for both psychiatric disorders and tics. No conclusions can be drawn on the effects of CBT in the treatment of psychiatric disorders in dystonia and HD. The only published reports are based on case reports that point to a possible benefit in a range of psychiatric symptoms. No studies have been published on the effects of CBT in ET.

CBT leads to changes in brain areas that play important roles in emotional processing and emotion regulation. In patients with major depression, CBT is associated with activation of the prefrontal cortex, an increased metabolism in the hippocampus and dorsal cingulate cortex, and a decreased metabolism in the dorsal, ventral, and medial frontal cortex.⁵⁴ In OCD patients, CBT led to a reduction in blood flow in the caudate nucleus.⁵⁵ In phobia, brief courses of behavioral therapy led to marked reductions in paralimbic responses to offensive stimuli, which were in keeping with the clinical improvement.⁵⁶ By activating cortical processing through conscious control of thoughts and feelings, CBT enhances left cortical processing, inhibiting and regulating right hemispheric balance and subcortical activation. From the studies outlined above, it appears that CBT, when used in the treatment of primary psychiatric disorders, is associated with changes in specific brain networks that are, at least in part, associated with the pathophysiology of the various movement disorders. It may thus be hypothesized that the clinical

benefit of a psychotherapeutic approach to the treatment of psychiatric symptoms in movement disorders may induce changes in brain areas underlying the pathophysiology of motor disturbances in these conditions. It is therefore possible that the clinical benefit of a psychotherapeutic approach to treatment of psychiatric symptoms in movement disorders may induce changes in brain areas underlying the pathophysiology of motor disturbances in these conditions.⁵⁷

In conclusion, CBT may make a positive contribution to the treatment of psychiatric disturbances in movement disorders. Further trials on PD are needed to shed more light on the effect of both individual and group CBT. CBT trials should include PD patients in different stages of disease and should be designed to assess both motor and nonmotor symptoms. An evaluation of the effects of CBT on caregiver burden would also be useful. Controlled trials are needed to study the effect of individual and group CBT in patients with dystonia; given that cervical dystonia patients are those most likely to be affected by depression, anxiety, and coping problems, they are also those who may benefit most from psychotherapies. In ET, CBT, particularly group CBT, should include patients whose age, severity of tremor, and functional impairment are comparable. It is difficult to determine whether CBT may also be useful in HD patients, and inclusion in trials on HD should be restricted to patients with no or mild cognitive impairment or to mutation carriers; CBT may also be a useful aid to patients' caregivers.

Author Roles

(1) Research Project: A. Conception, B. Organization, C. Execution; (2) Statistical Analysis: A. Design, B. Execution, C. Review and Critique; (3) Manuscript: A. Writing of the First Draft, B. Review and Critique.

I.B.: 1A, 1C, 3A

M.P.: 1A, 1C, 3A

V.R.: 1A, 1C, 3A

M.B.: 1A, 1B, 3B

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