



## Mindfulness-based stress reduction for Tourette syndrome and chronic tic disorder: A pilot study



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### ABSTRACT

**Objective:** In this pilot study we sought to develop and test a modified form of mindfulness-based stress reduction (MBSR-tics) for the treatment of Tourette Syndrome (TS) and Chronic Tic Disorder (CTD). Our specific aims were: 1) To determine the feasibility and acceptability of an 8-week trial of MBSR-tics in individuals 16 and older with TS or CTD and 2) To determine the efficacy of an 8-week trial of MBSR-tics in individuals 16 and older with TS or CTD.

**Methods:** Eighteen individuals age 16–67 completed an uncontrolled open trial of MBSR-tics. The intervention consisted of 8 weekly 2-hour classes and one 4 hour retreat in the fifth or sixth week of the program. Symptomatic assessments were performed at baseline, post-treatment, and one-month follow-up.

**Results:** MBSR-tics proved to be a feasible and acceptable intervention. It resulted in significant improvement in tic severity and tic-related impairment. 58.8% of subjects were deemed treatment responders. Therapeutic gains were maintained at 1-month follow-up. Improvements in tic severity were correlated with increases in self-reported levels of mindfulness.

**Conclusions:** This small open pilot study provides preliminary support for the feasibility, acceptability, and efficacy of MBSR-tics for individuals 16 or older with TS or CTD. A larger randomized controlled trial with blind assessment is necessary to confirm these initial, promising findings.

Trial Registration Partners Clinical Trials Registry Number 2011P000606 ([clinicaltrials.partners.org](http://clinicaltrials.partners.org)).

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### Introduction

Despite recent advances in the treatment of individuals with Tourette syndrome (TS) and chronic tic disorder (CTD), there remains room for improvement. Pharmacological treatments, although effective, carry a substantial risk of unpleasant side effects [1]. Psychosocial interventions, such as Comprehensive Behavioral Intervention for Tics (CBIT; [2]) offer meaningful symptomatic relief without burdensome side effects but also fail to help a significant number of individuals (e.g., [3–5]). Thus, it is essential that we continue to develop and test alternative treatments. In this pilot study we sought to develop and test a modified form of mindfulness-based stress reduction (MBSR) for the treatment of TS and CTD.

MBSR was originally developed in 1979 by Jon Kabat-Zinn at the University of Massachusetts [6]. Through direct practice in meditation, MBSR promotes the development of nonjudgmental moment-to-moment awareness of one's perceptions, bodily sensations, thoughts, and emotions. Participation is highly experiential and centers around four primary meditative practices: sitting meditation, the body scan,

yoga, and walking meditation. In each of these exercises participants gain experience in directing their attention to the content of their moment-to-moment experience while refraining from any efforts to change their experience. Participants are encouraged to adopt a curious, patient, accepting, non-striving, and non-judgmental attitude toward themselves and their inner experience. MBSR has garnered empirical support as a treatment for a range of medical and psychological conditions including chronic pain, fibromyalgia, anxiety, binge eating disorder, and recurrent major depression (for review [7,8]). Of particular relevance to TS and CTD, mindfulness-based interventions have recently shown promise in the treatment of two commonly comorbid disorders: obsessive-compulsive disorder (OCD; [9,10]) and attention deficit hyperactivity disorder (ADHD; [11,12]).

The behavioral model of tic maintenance [2,13,14] posits that while tics are of neurobiological origin, there are important internal and environmental factors that make them more likely to occur. The most central assumption in the model is that tics are negatively reinforced every time that they relieve the individual from the discomfort associated with the premonitory urge to tic. Indeed, many individuals report that their tics are voluntary automatic reactions to the premonitory urge to tic [15]. Additional internal factors (e.g., stress or anxiety) and external factors (e.g., social attention, certain activities, caffeine) have also been associated with tic worsening [16]. Consistent with this model, we hypothesized that a modified version of MBSR for individuals with TS or

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CTD (MBSR-tics) might benefit individuals with TS and CTD in three possible ways. First, meditation has been shown to improve attentional control (for review [17]). Thus, we hypothesized that improved attentional control might increase participants' awareness of when their tics are about to occur, are occurring, and the factors that make them better or worse. This awareness is essential in enabling the individual to respond differently to the urges to tic. Second, meditative practice in observing and allowing one's internal experiences to transpire without trying to change them may help individuals sit with the discomfort of the premonitory urge and allow it to subside on its own without engaging in the tic, thereby breaking the cycle of negative reinforcement. Functionally, this aspect of the intervention was similar to the core intervention found in CBIT, competing response training, although the means of adopting this approach to the tics and the urges to tic were quite different. And third, MBSR has also been shown to decrease physiological arousal and emotional reactivity (for review [18]). Thus, we hypothesized that the intervention may reduce the stress, anxiety, and frustration that are commonly associated with tic exacerbation.

Our specific aims were: 1) To determine the feasibility and acceptability of an 8-week trial of MBSR-tics in individuals 16 and older with TS or CTD and 2) To determine the efficacy of an 8-week trial of MBSR-tics in individuals 16 and older with TS or CTD. We hypothesized that MBSR-tics would be feasible and acceptable to individuals with TS or CTD, as measured by dropout rate, patient satisfaction, patient feedback, and adverse events. We also hypothesized that MBSR-tics would result in a significant reduction in the severity of tics and the degree of tic-related impairment from pre- to post-treatment, as measured by the Yale Global Tic Severity Scale (YGTSS).

## Method

### Overview

In this open trial, all participants received MBSR-tics. Participants completed 13 visits over approximately 12 weeks. We first assessed participants for eligibility at a screening visit. Eligible participants then returned for a baseline assessment in the week prior to the start of classes. The MBSR-tics course consisted of 8 weekly 2-hour classes and one 4-hour retreat on a Saturday or Sunday during the 5th or 6th week of the program. Participants returned for a post-treatment assessment within one week of the last class, and a follow-up assessment approximately 1-month after the last class.

All study procedures were approved by the Partners Human Research Committee and carried out in accordance with the Code of Ethics of the World Medical Association. All participants provided written informed consent prior to completing any study procedures.

### Independent assessment

All clinician-rated outcome measures were administered by an independent evaluator (IE) who was not otherwise associated with the study. The IE had a doctoral degree in clinical psychology and received training from experienced raters on the study measures. Moreover, every assessment was recorded and 20% of the baseline assessments were randomly selected for co-rating by an experienced rater. To determine inter-rater reliability we computed Shrout-Fleiss intraclass correlation coefficients (ICC (3,1); [19] for our primary outcome measure: total tic severity score of the YGTSS. Inter-rater reliability was acceptable (ICC (3,1) = 0.89).

### Participants

We recruited participants via the Tourette Syndrome Association of Massachusetts, our program website, a clinical trials registry, flyers, and neighboring clinics. To be eligible for the study, individuals had to

be 16 years of age or older with a primary diagnosis of TS or CTD and have a total tic severity score on the YGTSS  $\geq 20$  (for individuals with motor and vocal tics) or 12 (for individuals with motor or vocal tics only). Participants were also required to be either not taking any tic suppressant or other psychotropic medications or be on a stable dose for 6 weeks prior to and throughout the study. Participants were excluded from the study if they were receiving concurrent psychotherapy for tics, had a comorbid Axis I disorder necessitating a higher level of care (e.g., psychotic disorder, bipolar disorder), current substance abuse or dependence, or had previously completed an MBSR program.

### Intervention

MBSR-tics generally adhered to the original curriculum as outlined by Kabat-Zinn (1990) and briefly described above. To adapt the course for individuals with tics we made the following modifications: offered shorter (2 h rather than 2.5 h) classes, smaller (5–7 participants) classes, provided psychoeducation regarding tics and the theory motivating this approach, developed a tic-specific sitting meditation, and developed practices for promoting mindfulness of the factors that make tics better or worse. The tic-specific sitting meditation became a cornerstone of the experiential practice and was incorporated into every class after its introduction in class three. Briefly, the meditation encouraged participants to mindfully notice any urges to tic, and to ride the urge to tic, like a wave, while anchoring oneself to the breath, until it subsided independently, without engaging in a tic or otherwise trying to change or eliminate the urge in any way. The course also included group discussion regarding the implementation of a mindful approach to the tics and urges to tic.

The course was co-taught by Dr. Reese and Ms. Vallejo. Dr. Reese has a Ph.D. in clinical psychology and extensive experience providing psychosocial interventions to individuals with tics. Ms. Vallejo has over 30 years of practice in mindfulness and over 10 years experience teaching it to others. She is a certified MBSR instructor and has previous experience successfully adapting the intervention for specific populations.

### Measures

#### Structured Clinical Interview for DSM-IV (SCID)

The SCID is the gold-standard in semi-structured diagnostic interviews to establish DSM-IV diagnoses [20]. We administered the SCID at screening to assess for the presence of current or past Axis I disorders. Consistent with recently published NIMH-funded ADHD research trials [21], we also administered supplementary questions from the Kiddie Schedule for affective disorders and schizophrenia-epidemiologic version (K-SADS-E; [22] modified for use in adults to assess for the presence of comorbid ADHD).

#### Yale Global Tic Severity Scale (YGTSS)

The YGTSS is the gold-standard clinician-rated instrument for assessing tic severity [23]. Motor and phonic tics are rated separately from 0 to 5 on five dimensions including: number, frequency, intensity, complexity, and interference. Thus, motor and phonic tic scores range from 0 to 25 and the combined total tic severity score ranges from 0 to 50. Additionally, an overall impairment score indicates the overall burden due to tics and is rated from 0 to 50. The YGTSS has demonstrated excellent internal consistency, and convergent and divergent validity [23]. We administered the YGTSS at screening, baseline, endpoint, and follow-up.

#### Clinical Global Impression-Improvement (CGI-I) Scale

The CGI-I is a well-established clinician-rated measure of improvement [24]. It is a 7-point measure of patient improvement relative to baseline. We administered the CGI-I at endpoint and follow-up. Consistent with other treatment outcome studies in TS and CTD

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