A randomized controlled trial of mindfulness-based stress reduction to manage affective symptoms and improve quality of life in gay men living with HIV

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Abstract To determine whether MBSR groups would help gay men living with HIV improve psychosocial functioning and increase mindfulness compared to treatment-as-usual (TAU). Methods: 117 participants were randomized 2:1 to MBSR or TAU. No new psychosocial or psychopharmacological interventions were initiated within 2 months of baseline. Standardized questionnaires were administered pre-, postintervention and at 6 months. An intent-to-treat analysis found significant benefits of MBSR: at post-intervention and 6 months follow up, MBSR participants had

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S. Bishop Toronto Institute for Contemporary Psychoanalysis, Toronto, ON, Canada significantly lower avoidance in IES and higher positive affect compared to controls. MBSR participants developed more mindfulness as measured by the Toronto Mindfulness Scale (TMS) including both TMS subscales, curiosity and decentering, at 8-week and 6 months. For the sample as a whole, increase in mindfulness was significantly correlated with reduction in avoidance, higher positive affect and improvement in depression at 6 months. MBSR has specific and clinically meaningful effects in this population.

Background and rationale

Human immunodeficiency virus (HIV) disease is a highly stigmatized, life-threatening, chronic illness that can significantly decrease emotional well being and quality of life and heighten susceptibility to mental health disorders (Leiberich et al., 1997; Farber & McDaniel, 2002; Eisenberg & Blank, 2004; Klimas et al., 2008; Whetten et al., 2008). Studies have found higher rates of trauma and post-traumatic stress disorder in people living with HIV (Whetten et al., 2008) and, in a large sample of HIV⁺ outpatients in the US, 47.9% had at least one major psychiatric disorder in the previous year (Bing et al., 2001). Since enhancing and preserving quality of life is generally considered a primary outcome goal in the contemporary treatment of disease, psychosocial treatments that reduce stress and emotional distress and improve psychological functioning should be routinely offered as part of standard care of HIV patients (World Health Organization, 2009). In addition, highly distressed patients are less likely to adhere to HIV antiretroviral therapies and are at a higher risk for treatment failure (Repetto & Petitto, 2008).

A growing literature supports the value of psychosocial interventions for people living with HIV (Kelly et al., 1993; Markowitz et al., 1995; Goodkin et al., 1999; Antoni et al., 2002; Sherman et al., 2004; Belanoff et al., 2005; Hansen et al., 2006; Crepaz et al., 2008)]. Most studies of group therapy have involved multi-modal cognitive behavioural therapy (CBT) packages, consisting of various cognitive and behavioural therapy techniques. A recent meta-analysis found CBT groups are efficacious in improving various psychological states (depression, anxiety, anger and stress) in people living with HIV both over short term follow up and over 1 year follow up (Carrico et al., 2005; Hansen et al., 2006; Crepaz et al., 2008) as well as in increased immune system functioning (Antoni et al., 2002). In addition to CBT, other psychosocial interventions are being examined for their active ingredients, specific competencies and techniques, theoretical and practical approaches and their implication for people living with HIV.

One treatment that has received greater recent attention is mindfulness-based stress reduction (MBSR) which has been shown to address psychological symptoms and is of interest to other patient populations with chronic conditions (Baer, 2003; Grossman et al., 2004; Ledesma & Kumano, 2009; Hofmann et al., 2010). MBSR includes both formal mindfulness meditation practices as well as cultivating mindfulness of daily activities. In contrast to approaches such as CBT cognitive restructuring techniques which focus on changing the content of cognitions, MBSR aims to build skills in being able to focus awareness on the elements of experience (e.g., sensations, emotions, cognitions, motivations) by cultivating curiousity, openness, and acceptance towards them, as well as learning how to decentre from them (Bishop et al., 2004). "Acceptance" here involves softening defenses and experiencing events more fully, and implies a quality of warmth (Hayes et al., 1999; Germer, 2005); while "decentering" means learning to recognize and experience thoughts and emotions as passing events rather than as direct apprehensions of reality (Teasdale et al., 1995). Participants are coached on how to generalize these skills to daily life in order to better cope with stressors, be more involved in their own health care, and live life in a more engaged, vital way (Kabat-Zinn, 1990).

MBSR has been adapted for specific disease populations, with cancer patients the most studied. A meta-analysis found that MBSR interventions improved the mental health of cancer patients (Cohen's effect size d 5 = 0.48) (Ledesma & Kumano, 2009). MBSR has demonstrated relief of anxiety, stress, fatigue and general mood and sleep disturbance in cancer patients, as well as improving psychological aspects of their quality of life (Ibid). Studies of MBSR for other medical populations also demonstrated decreases in depression in individuals living with fibromyalgia (Sephton et al., 2007) and decreases in psychological distress and improvement in well-being for people with rheumatoid arthritis (Pradhan et al., 2007).

There have been two previous studies of MBSR for people living with HIV, both were focused mainly on biological outcomes. In a quasi-experimental nonrandomized design, Robinson et al. (2003) found MBSR participants (N = 24) compared to the comparison group (N = 10) experienced improved immune system functioning in the form of increased activity and number of natural killer cells, however no significant differences were found for psychological, endocrine or functional health variables. Participants self selected MBSR intervention or control condition rather than randomization and the dropout rate of 48% was higher than the range reported in the MBSR literature (Baer, 2003).

Creswell et al. (2009) conducted a randomized controlled trial with 47 participants that provides an initial indication that MBSR can buffer CD4+ T lymphocyte declines in HIV-1 infected adults. Participants in the 8-week MBSR program maintained CD4+ T lymphocyte count from baseline to post- intervention while controls had a drop (time × treatment condition interaction, P = .02). This effect was independent of antiretroviral (ARV) medication use. Additional analyses indicated that treatment adherence to the mindfulness meditation program, as measured by class attendance, mediated the effects of mindfulness meditation training on buffering CD4+ T lymphocyte declines. However, the study did not report psychological measures. The drop-out rate was 28%.

While these two studies provide evidence that potential PsychoNeuroImmunology (PNI) effects of MBSR for people living with HIV are worthy of more study, their results were mixed on its acceptability with this population and there was a lack of rigorous assessment on psychological benefits beyond PNI effects.

We conducted an MBSR pilot (n = 34) that demonstrated promising results in reducing distress in gay men living with HIV. We developed an MBSR manual adapted for gay men living with HIV based on standard MBSR principles and practices (Kabat-Zinn, 1990; Santorelli, 1999). The manual incorporated the operationalized definition of mindfulness in the Toronto Mindfulness Scale to provide a heuristic tool to help focus the activities of the group leader within sessions and throughout the intervention (Bishop et al., 2004; Lau et al., 2006). Following the pilot, we carried out a randomized-controlled trial with participants assigned to an 8-week MBSR group (intervention) or standard care (control) with standardized measures taken pre-, post- and 6-month follow up.

Hypotheses

We hypothesized that following the intervention:

- Participants receiving MBSR would demonstrate greater improvements in psychological functioning in terms of affectivity, anxiety, depression, and HIV-related distress compared to controls;
- Participants receiving MBSR would demonstrate enhanced ability for mindfulness, compared to those participants who did not receive the MBSR treatment;
- Improved mindfulness ability would be correlated with decreases in anxiety and depression; and
- Intervention effect would be sustained over the 6-months follow up period.

Methods

Participants

Study participants were referred through an HIV psychiatry clinic or self-referred through advertisements at various hospital, community health clinics and newspapers between 2004 and 2007 in Toronto. Inclusion criteria included being male, aged 18-70 years, living within 1 hour of the hospital, and having a diagnosis of HIV. Subjects with active current major depression, substance abuse or significant cognitive deficit were excluded. High levels of depression or substance abuse are known to interfere with, or pose a barrier to, making use of a group interventions. There are also standard concerns in the MBSR field that the challenges of developing a daily mindfulness practice might have iatrogenic effects on the avoidant coping which characterizes major depression and substance abuse and that all three conditions would likely create challenges in developing the cognitive and meta-cognitive skills (Bishop et al., 2004) inherent in mindfulness practice. Current treatment (psychotropic pharmacological or psychosocial interventions) for a period of at least 2 months was acceptable, however subjects were asked not to initiate new treatment following recruitment into the study. Consent was obtained from the Mount Sinai Hospital Research Ethics Board as well as was registered at clinicaltrials.gov as per mandatory requirements for randomized trials involving human subjects.

Pre-randomization psychosocial screening

• Candidates underwent an initial assessment by a staff psychiatrist, followed by an individual assessment with the MBSR group facilitator to ensure patients met

inclusion criteria and agreed to group requirements in terms of attendance of 8 sessions and a daylong retreat and doing the homework.

Randomization procedure

• A randomization free-ware, software program (Network, 1997) was utilized to generate a random allocation sequence 2:1 in favor of the group intervention for each cohort of up to 30 eligible participants. Unequal randomization has been highly recommended for clinical trials utilizing group interventions and for cost efficiency with modest reduction in power (Torgerson and Campbell, 2000). Random allocation was based on place numbers within a block or cohort that represented the order in which the participants were processed for the study. Blinding was not feasible; study staff were not aware of a potential participant's group membership until the whole cohort was assigned at the same time.

MBSR group intervention

The MBSR group intervention is manualized and adapted from Kabat-Zinn (1990), consisting of eight 3-h weekly sessions and a daylong retreat with about an hour or more of homework per day, 6 days per week. Group sizes varied from 14 to 18 participants. Individuals were taught mindfulness skills geared towards enhancing their awareness of and relationship to current experience (such as sensations, emotions and thoughts) rather than focusing on the content and reappraisal of thoughts and interpretations of experience (Teasdale et al., 2000). The mindfulness skills learned involved generic strategies for stress and pain, rather than structured techniques targeting specific problems.

Individuals were asked to report on the use of any ongoing treatments, including psychosocial treatments, during the follow-up period. After the study, all controls were offered participation in MBSR groups.

Measures and instruments

- A battery of standardized, psychological measures was given at baseline (prior to randomization), 8 weeks and 6 months post intervention. Primary outcome measures include the assessment of HIV-specific distress using the Impact of Event Scale and anxiety and depressive symptoms using the Hospital Anxiety and Depression Scale.
- The *Impact of Event Scale* (IES) is a self-report 15-item scale assessing the effect of living with a stressful life

event (in this case, events associated with HIV) (Horowitz et al., 1979). Individuals are asked to rate the frequency of intrusive or avoidant thoughts and experiences in the past 7 days. Responses are rated on a 4-point scale with scores ranging from 0 to 75. A cut-off point of 19 was suggested for the IES total score indicating a moderate or severe impact (Horowitz, 1982).

- The *Hospital Anxiety and Depression Scale* (HADS) is a commonly used self-report questionnaire for depression and anxiety (Snaith and Zigmond, 1983) with an anxiety subscale (HADS-A) and a depression subscale (HADS-D), both containing seven items, ranging from 0 to 21. A cut off point of 8 for "possible cases" is suggested for both HADS anxiety and HADS depression subscale, after a review of 747 studies by Bjelland et al. (2002).
- The Positive and Negative Affect Schedule (PANAS) consists of 10 positive affects (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active) and 10 negative affects (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid) (Watson et al., 1988). Items are measured on a five-point scale from one (very slightly or not at all) to five (extremely). The PANAS provides a means of assessing dimensional constructs of depression and anxiety ranging from symptom free to highly symptomatic as well as key aspects of positive psychological functioning and quality of life not predicted by the absence of symptoms of anxiety and depression, such as energy, vitality and engagement in life and social activities (Watson et al., 2005; Watson & Clark, 2006; Dunn et al., 2009)
- The Toronto Mindfulness Scale (TMS) is a self-report mindfulness measure, which includes total score and two sub-scales: curiosity, with items like "I was curious about my reactions to things," and decentering, with items like "I found myself observing unpleasant feelings without getting drawn into them" (Lau et al., 2006). The original 42-item scale was administered in the study, but the results were analyzed based on the 13-item scale subsequently developed by Lau et al. (2006). Prior to completing the questionnaire, participants are instructed to "sit quietly for the next 15 min and pay attention to your breathing or anything else that might arise." Afterwards, participants are asked to describe the degree to which each of the 42 items described what they just experienced on a 5-point scale from 0 (not at all) to 4 (very much). This scale measures an individual's ability to generate mindfulness, defined as a mode of curious, decentred awareness dependent on the development of a composite set of skills.

All measures were administered at baseline, post group intervention (8 weeks) and at 6-month follow up. A measure of treatment expectancy, the Marlowe Crown Social Desirability Scale (MCSD), was administered at baseline to assess potential socially desirable responding bias for both groups.

Statistical Analysis

Baseline demographic variables were compared between intervention and control group using descriptive statistics and ANOVA. Any baseline variables that were significantly different between the two study arms were controlled for during Repeated Measures Analysis of Variance for primary and secondary outcomes.

An "intent-to treat" analysis was performed for the 14 subjects missing T2 data and 21 subjects missing T3. A Linear Mixed Model Analysis in SPSS 17.0 was used to measure time effect and group effects (intervention vs. control). The Linear Mixed Model handles missing data more effectively than Repeated Measures Analysis of Variance. An effect size was calculated using Cohen's d for each pair (intervention vs. control) comparison.

Finally, Pearson Product Moment Correlation was carried out to explore the relationship between changes in MBSR ability and main psychological outcome measures, All statistical significance levels were set at P = 0.05, with two tailed test.

Results

Sample Characteristics

Among the 252 people who enquired about the study, 189 were interested and 142 potential participants met initial screening criteria and were further screened for eligibility using inclusion/exclusion criteria. The final study sample consists of 117 participants with 78 being randomized to the MBSR group and 39 to the control (see Fig. 1 for CONSORT (Moher et al., 2001) details on participant flow). Twenty-one participants discontinued the intervention for the following reasons: did not like program (n = 9), health issues (n = 4), emotional issues (n = 4), and commitment issues (n = 4). All of them were included in the intent to treat analysis. Demographic data are shown in Table 1. Participants ranged from 25 to 64 years of age with mean age of 44. The mean number of years living with HIV was 11 (ranging from 1 to 24). Information was also collected on participants' education, occupation, income and partner status (see Table 1 for demographic de-

Fig. 1 Consort flow sheet



tails). Statistical analyses of the baseline data demonstrate both study arms were similar on age, education, occupational status, income, marital status and years of living with HIV.

Psychological functioning at baseline

This is a sample of individuals with moderate to severe distress and who are clearly struggling with coping with HIV. Psychological adjustment and coping are central to HIV management and the MBSR intervention in this study was specifically adapted to improve HIV+ patients' ability to cope more effectively with stressors (Temoshok & Wald, 2008).

Distress associated with having HIV as measured by the total score of the IES (see Table 1) was high. For the entire sample, the IES was $35.0 \ (\pm 16.1)$, above the threshold of 19 identified by Horowitz as having severe impact from HIV. In fact, it met the cut off value of 35 reported by Neal et al. (1994) for severe PTSD; with about 54.7% above this cut-off.

For HADS anxiety, the mean of 10.0 (\pm 3.8) was above the cut-off point of 8, with about 72.6% of the sample above this threshold. For depression, the mean of 8.55 (\pm 3.5) was above the HADS cut-off point of 8, with about 63% of the sample above the threshold. Study participants had both significantly lower positive affect (27.2 ± 8.2) compared with a general adult population (32.1 ± 7.3) (*P* < 001) (40), and significantly higher negative affect (25.6 ± 8.3) compared with the same UK sample (15.2 ± 5.2) (*P* < 0.01).

The TMS was validated with a sample of Americans (heterogeneous medical patients) and Canadians (cancer patients) (Lau et al., 2006). Participants in the current study had significantly lower mindfulness ability in terms of curiosity (10.9 ± 5.4) than the mixed medical sample (19.5 ± 23.4) (P < 0.01), as well as decentering (13.0 ± 20.01) 5.8 vs. 19.2 ± 24.0 respectively) (P < 0.05). The TMS scale seems to be measuring a reflective, introspective selfawareness distinct from ruminative styles of self-focused attention or self consciousness, while the decentering scale in particular is negatively correlated with psychiatric symptoms and psychological distress as measured by the BSI (Lau et al., 2006). The frequency and severity of psychological morbidity accompanying HIV is often higher than in other disease populations (Grassi et al., 1997; Dew et al., 1997) or than in populations at risk for HIV (Ciesla & Roberts, 2001), and the lifetime prevalence of psychopathology is higher in those populations at risk for contracting HIV such as gay men than the general population

Table 1 Baseline characteristics (N = 117)

Variable	MBSR (N = 78)	Control $(n = 39)$	Statistics
n (%)			
Education			
High school or lower	17 (21.8)	9 (23.1)	n.s.
College/university	52 (66.7)	25 (64.1)	
Graduate school	9 (11.5)	5 (12.8)	
Occupation			
Employed full-time	18 (23.1)	10 (25.6)	n.s.
Employed part-time	13 (16.7)	4 (10.2)	
Unemployed/other	47 (60.2)	25 (64.1)	
Marital status			
Single, never married	51 (65.4)	22 (56.4)	n.s.
Married/common law	20 (25.6)	13 (33.3)	
Separated, divorced	7 (9.0)	4 (10.3)	
Currently receiving psychotherapy or counseling	47 (60.3)	19 (48.7)	n.s.
Currently receiving prescription for HIV treatment	68 (87.2)	35 (89.7)	n.s.
Mean (SD)			
Age in years	42.9 (7.1)	45.5 (6.7)	n.s.
Years with HIV	9.4 (6.0)	10.0 (6.7)	n.s.
Psychological measures			
IES total	35.0 (16.0)	35.0 (16.6)	n.s.
IES avoidance	18.8 (9.1)	17.9 (9.2)	n.s.
IES intrusion	16.2 (8.7)	17.1 (8.8)	n.s.
HADS depression	8.5 (3.8)	8.7 (3.1)	n.s.
HADS anxiety	10.1 (3.9)	9.9 (3.6)	n.s.
Positive affect (PANAS)	27.2 (8.1)	27.2 (8.4)	n.s.
Negative affect (PANAS)	26.4 (8.3)	24.1 (8.3)	n.s.
TMS total	28.8 (11.4)	26.7 (10.9)	n.s.
TMS curiosity	11.2 (5.2)	10.4 (5.8)	n.s.
TMS decentering	13.3 (6.1)	12.4 (5.4)	n.s.
Marlowe crown social desirability measure	7.6 (2.8)	7.1 (2.7)	n.s.

(Fergusson et al., 1999; Herrell et al., 1999; Cochran & Mays, 2000; Cochran et al., 2003). That these challenges seem to be suppressing the very attentional capacities targeted in this intervention highlights the need for specific studies testing and adapting MBSR for this population.

Intervention impact on psychological functioning

There were no statistically significant group differences on baseline psychological measures, nor differences in the treatment expectancies. Over the study period, there was a time effect for all psychological measures with the exception of positive affect, indicating that an improvement took place for the entire sample regardless of group membership. An intent-to-treat analysis comparing results between 78 group participants and 39 control subjects was conducted. Hypothesis one was partially supported in that MBSR participants demonstrated reduced scores on the IES avoidance subscale and improved positive affect (PANAS) compared with controls at 8 weeks post intervention and at 6 month follow-up (Table 2). These significant time \times treatment interaction results were also demonstrated visually in Figs. 2 and 3.

The lack of difference between intervention and controls on depression, anxiety, and the IES intrusion subscale could be due to lack of power or the observed improvement that also occurred in the control group, suggesting that participation in a research study with repeated assessments would be beneficial in itself.

The intervention impact on mindfulness ability

As hypothesized, for the TMS total score, along with its two subscales, curiosity and decentering, there was a statistically significant increase among participants in the intervention group at the 8-weeks and 6 month follow-up

Table 2 Psychological measures

Variable	MBSR Mean (SD)	Control Mean (SD)	Statistics Linear mixed model analysis	Cohen's d
IES total				
Time 1	35.0 (16.0)	35.0 (16.6)		0.00
Time 2	24.6 (16.3)	26.4 (16.8)	Time effect F = $16.3, P < 0.00$	-0.11
Time 3	22.7 (16.2)	30.3 (18.7)	Time by Group interaction $F = 2.2$, n.s.	-0.43
IES intrusion				
Time 1	16.2 (8.7)	17.1 (8.8)		-0.10
Time 2	11.5 (8.8)	12.8 (9.0)	Time effect F = $12.3. P < 0.00$	-0.15
Time 3	10.5 (8.7)	13.8 (8.8)	Time by Group interaction $F = 0.7$. n.s	-0.38
IES avoidance				
Time 1	18.8 (9.2)	17.9 (9.2)		0.10
Time 2	13.0 (8.5)	13.6 (8.2)	Time effect F = 13.7. $P < 0.00$	-0.09
Time 3	12.2 (8.7)	16.5 (10.1)	Time by Group interaction $F = 3.3$. $P < 0.05$	-0.46
Positive affect				
Time 1	27.2 (8.5)	27.2 (8.5)		0.00
Time 2	30.7 (9.3)	26.8 (8.4)	Time effect $F = 1.7$. n.s.	0.44
Time 3	31.3 (9.4)	25.9 (9.2)	Time by Group interaction $F = 3.5$. $P < 0.05$	0.58
Negative affect				
Time 1	26.4 (8.3)	24.0 (8.4)		0.29
Time 2	20.7 (6.7)	21.1 (7.0)	Time effect F = 14.2. $P < 0.00$	-0.06
Time 3	21.0 (8.2)	21.5 (7.5)	Time by Group interaction $F = 1.4$. n.s.	-0.06
HADS depression				
ime 1	8.5 (3.8)	8.6 (3.1)		-0.03
Time 2	7.1 (4.0)	8.1 (3.5)	Time effect F = 5.0. $P < 0.01$	-0.27
Time 3	7.0 (4.3)	8.0 (4.0)	Time by Group interaction $F = 0.8$. n.s	-0.22
HADS anxiety				
Time 1	10.1 (3.9)	9.9 (3.7)		0.05
Time 2	7.9 (3.7)	8.7 (3.7)	Time effect F = 13.0. $P < 0.00$	-0.22
Time 3	7.8 (4.3)	8.4 (3.4)	Time by Group interaction $F = 1.1$. n.s	-0.15

(Table 3; Figs. 4 and 5). It is worth noting that despite the improvement in mindfulness in the intervention group at T2 and T3, the scores for curiosity and decentering were still below the average level reported in the literature (Lau et al., 2006).

Relationship between mindfulness and psychological functioning

We correlated the changes in total TMS and in its two subscale scores with changes in psychosocial measures. At T2 post intervention, significant positive correlations were found between TMS total and the curiosity and decentering subscales of the TMS with the positive affect subscale of the PANAS (alpha = 0.274, 0.236, 0.247 respectively, P < 0.01 for all three correlations). Increase in the decentering subscale at T2 was correlated with decrease in HADS depression subscale (alpha = -0.247, P < 0.01).

At T3 6 month follow-up, these correlations remained significant. In addition, an increase in TMS and its subscales were correlated with decrease in IES total and IES avoidance at a statistically significant level (Table 4). These findings lend support to hypotheses 3 and 4 that improved MBSR ability would be correlated with decrease in anxiety and depression and that the benefits of MBSR intervention were sustained over 6 months follow up period.

Discussion

This report utilized the Revised CONSORT guidelines for reporting randomized trials (Moher et al., 2001).

This study appeared to address difficulties in recruiting subjects observed in a previous controlled study (Robinson et al., 2003), suggesting its role in establishing feasibility



Fig. 2 Change in avoidance over time by study group



Fig. 3 Change in positive affect over time by study group

of conducting a trial on patients living with HIV, having a wide range of psychological functioning and being recruited from more natural clinical settings. There was a high degree of interest in the MBSR group in the gay HIV⁺ community sampled and even though a small subgroup declined the mindfulness intervention once randomized, most completed the study. In this respect, the study findings have implications for offering treatments such as MBSR in addition to standard care and in clinical settings. The MBSR treatment completion rate of 61.5% for the whole treatment and 82.1% for 4 sessions (considered a standard "dose" in the MBSR literature (Baer, 2003)) is within the standard treatment completion ranges found in the HIV group therapy literature for groups with people who have been living with HIV for diverse amounts of time, including those with advanced AIDS (Sherman et al., 2004) and in the MBSR literature as a whole (Baer, 2003). The impact of drop-out was controlled by the intent to treat analysis.

Psychological distress

There were significant group changes at T2 and T3 on measures of avoidance and positive affect between the study groups. The decrease in IES avoidance and increase in PANAS positive affect are consistent with the goals of a stress management intervention geared to addressing HIVrelated stressors. The IES, anchored to the experience of being HIV+, is sensitive to capture moderate yet prolonged distress states in individuals living with HIV and subsequent improvement post MBSR intervention. Benefits appeared to be sustained at 6 months.

Avoidance is a maladaptive form of coping with serious psychological implications including heightened risk for increased distress (anxiety and depression) and behaviours, particularly substance disorders (Folkman and Lazarus 1980; Carver et al., 1989; Hayes et al., 1999; John & Gross, 2004; Aldao et al., 2010). Decreases in avoidance indicate that those who received the mindfulness intervention may be less vulnerable to heightened depression and anxiety in the future.

Low positive affect (PANAS) has been shown to be highly correlated with depression and to a lesser degree with anxiety disorders (Kashdan & Breen, 2008). Other studies have shown a relationship between mindfulness and positive affect, including left-sided anterior neurological activation associated with positive affect (Brown & Ryan, 2003; Davidson et al., 2003). Increased positive affect is an important outcome for people living with a highly stigmatized condition who are struggling with social isolation and poverty (for example, most participants were "single/ never married" (including common law) (intervention arm, n = 51 (65.4%); control arm, n = 22 (56.4%)) and "unemployed" (intervention arm: n = 47 (60.2%); controls: n = 25 (64.1%)) and who must navigate a complex medical system and maintain a high level of medication compliance (Archer et al., 2008). People with high positive affect enjoy greater efficacy and require less effort in neural processing of working memory (Gray et al., 2005). They appreciate life more and are more confident (Costa and McCrae, 1980; Varg, 1997). High positive affect is related to increased social activity, appreciation of friends,

Variable	MBSR Mean (SD)	Control Mean (SD)	Statistics Linear mixed model analysis	Cohen's d
TMS total				
Time 1	24.5 (10.1)	22.8 (9.4)		0.17
Time 2	33.9 (9.4)	22.9 (9.5)	Time effect F = 6.33. $P < 0.00$	1.16
Time 3	31.4 (11.8)	23.2 (8.6)	Time by Group interaction $F = 5.9$. $P < 0.01$	0.78
TMS curiosity				
Time 1	11.2 (5.2)	10.7 (5.7)		0.08
Time 2	15.5 (4.9)	9.5 (5.5)	Time effect $F = 5.2$, $P < 0.00$	1.15
Time 3	14.3 (5.8)	9.8 (5.1)	Time by Group interaction $F = 9.3$. $P < 0.01$	0.82
TMS decenterin	ıg			
Time 1	13.3 (6.1)	12.4 (5.4)		0.16
Time 2	18.4 (5.2)	13.5 (5.3)	Time effect $F = 4.2$. $P = 0.02$	0.93
Time 3	17.3 (6.4)	13.4 (5.0)	Time by Group interaction $F = 10.6$. $P < 0.01$	0.68





Fig. 4 Change in TMS curiosity over time by study group



Fig. 5 Change in TMS decentering over time by study group

satisfaction in marriage, and assertiveness, and indicates a focused, alert, energetic, engaged and enthusiastic involvement in life (Watson et al., 1988; Watson & Pennebaker, 1989).

The lack of group differences in global measures of anxiety and depression using the HADS could be because of the amount of concurrent treatment in the study. The treatment-as-usual (TAU) arm was a naturalistic condition. At baseline, about 56% of participants were receiving ongoing psychotherapy or counselling (60% in MBSR and 49% in TAU, no group difference at p 0.05, see Table 1). Although no new treatment was initiated as per study inclusion criteria, the fact that half of the participants received ongoing treatment might explain the observed improvement in TAU group. To show intervention effect, MBSR would be required to demonstrate additional benefits above and beyond concurrent treatment in depression and anxiety for half of the sample. To demonstrate such an effect, if any, of MBSR on depression and/or anxiety, a larger sample size may be required.

We did not measure antiretroviral specific compliance. The reported rate of compliance with prescription drugs was high at baseline (83.3% in intervention and 84.2% in control groups reported "generally compliant"). At 6-month follow up, the rate remained at 83.5% (80.0% and 89.0% in intervention vs. control respectively). There was no time or group effect at p 0.05. We did not separate the compliance of antiretroviral drugs from other prescription

Table 4 Correlations (changebetween baseline and 6 monthfollow up)

	TMS total change score	Curiosity change score	Decentering change score	
IES total change score				
Pearson correlation	220*	193*	210*	
Sig. (2-tailed)	.017	.037	.023	
Ν	117	117	117	
IES avoidance change score				
Pearson correlation	286**	230*	291**	
Sig. (2-tailed)	.002	.013	.001	
Ν	117	117	117	
IES intrusion change score				
Pearson correlation	090	104	064	
Sig. (2-tailed)	.334	.264	.496	
Ν	117	117	117	
Positive affect change score				
Pearson correlation	.289**	.303**	.245**	
Sig. (2-tailed)	.002	.001	.008	
Ν	117	117	117	
Negative affect change score	e			
Pearson correlation	150	217*	090	
Sig. (2-tailed)	.106	.019	.335	
Ν	117	117	117	
HADS depression change sc	ore			
Pearson correlation	336**	250**	336**	
Sig. (2-tailed)	.000	.006	.000	
Ν	117	117	117	
HADS anxiety change score				
Pearson correlation	227**	169	265**	
Sig. (2-tailed)	.014	.068	.004	
Ν	117	117	117	

** Correlation is significant at the 0.01 level (2-tailed)* Correlation is significant at

the 0.05 level (2-tailed)

drugs such as psychotropics. However, based on the relatively high rate of compliance reported by participants, it would be unlikely that MBSR affected this variable in this study.

Mindfulness ability

The improvements in the TMS total score, along with its two subscales, curiosity and decentering, are consistent with the goals of the intervention group (Bishop, 2002; Bishop et al., 2004; Lau et al., 2006). TMS curiousity has been shown to be specifically related to greater mindfulness meditation experience and is associated with wanting to learn more about one's experience (Lau et al., 2006). The decentering subscale has been shown to predict clinical improvement in stress and distress (Ibid). These results suggest that individuals gained skill in mindfulness abilities that may ultimately be associated with enhanced coping with ongoing stressors and potentially leading to greater quality of life, however, caution is needed in interpreting the data: the TMS measures capacity to generate mindfulness in a single meditation session; more research is needed to demonstrate that mindfulness as measured by the TMS generalizes to the capacity to generate mindfulness in everyday life (Lau et al., 2006: 1462). Moreover, the construct that is being measured here is mindfulness as a mode of awareness that can be generated by exercising a set of skills, rather than mindfulness as a trait (Bishop et al., 2004:235).

While the increases in mindfulness skills were of the same order as those seen in the MBSR groups for mixed medical patients and cancer patients in the TMS validation study (Lau et al., 2006) (and in absolute numbers larger), the baseline and post group levels of mindfulness in the study sample as measured by the TMS were nevertheless extremely low compared to the TMS validation study. One explanation is that these scores may have been due to a conservative bias in the TMS: "the TMS assesses the level of mindfulness during a single point in time... participants... may develop the capacity to evoke mindfulness

generally, but may fail to do so effectively on a given testing session (e.g., at posttest for idiosyncratic reasons such as fatigue or extreme stress), resulting in misleading TMS scores" (Lau et al., 2006:1462). The authors recommend using multiple time points at pre, mid and post intervention (ibid). In future, better assessment of mindfulness propensity using the TMS could be determined by administering it every MBSR class.

Another possibility is that the lower baseline mindfulness scores may have been due to internalized HIV stigma. HIV shares many stressors with other illnesses such as functional losses and existential issues associated with a chronic, potentially life-threatening illness. HIV is also highly stigmatized, as is homosexuality: there is evidence that specific forms of discrimination can have independent effects on a population's mental health (Diaz et al., 2001). Besides the very real consequences of discrimination in limiting access to critical resources that determine the quality of membership in society (Room, 1995; Madanipour, 1998; Byrne, 1999; Shaw et al., 1999; Guidford, 2000; Galubuzi, 2004), stigma internalized as self-criticism and shame can have serious psychological effects including suppression of the attentional capacities (Gilbert, 1998) which mindfulness seeks to develop.

There is a growing literature on self-criticism and shame as a trans-diagnostic issue associated with experiential and behavioural avoidance, lack of self-efficacy, and destructive interpersonal patterns, and which underlies and permeates many psychological disorders (Tangney & Dearing, 2002; Gilbert & Irons, 2005; Zuroff et al., 2005). Two factors, the degree of self-directed hatred, hostility and self loathing that permeates self criticism and difficulties in generating feelings of warmth, soothing, reassurance and liking towards oneself, have been found to be particularly psychopathogenic (Gilbert & Procter, 2006). Self compassion and warm acceptance towards the elements of one's own experience are key in mindfulness and implicit in MBSR mindfulness training (Kabat-Zinn, 1990, 1998; Shapiro & Schwartz, 1999, 2000; Reibel et al., 2001; Segal et al., 2002), and it may be that they need to be made more explicit for this population. Perhaps integrating self-compassion practices that teach participants specific skills for generating self compassion and disengaging from preoccupation with the narratives of internalized stigma (Neff, 2003; Gilbert & Procter, 2006) may enhance MBSR treatment specificity for this population (Kocovski et al., 2009), potentially further raising mindfulness outcomes to levels comparable to other populations.

On a parallel note to the literature on the pernicious effects of self criticism and shame, studies have shown that the profile of the PANAS subscales at baseline (low positive affect and high negative affect) is negatively associated with mindfulness (Giluk, 2009) and correlated with "a

self-destructive" behavioural style. In contrast, the posttreatment profile of the intervention arm (high positive affect and low negative affect) is associated with a "selffulfilling" or "self-actualizing" personality style (Archer et al., 2008) and positively associated with mindfulness (Giluk, 2009). The psychologically unhealthy behavioural profile associated with low positive affect and high negative affect involves "subjective stress, energy and stress, lack of dispositional optimism, heightened pessimism, nonconstructive perfectionism, depression and anxiety, lower levels of coping behaviour, total stress at place of work, more Type-A behaviour, lack of stability and partner and partner relationships, external locus of control, impulsiveness etc." (Archer et al., 2008).

Finally we explored correlations between mindfulness and the other psychosocial measures (Table 4). There are significant positive associations between increases in mindfulness, decentering and curiosity with increases in positive affect immediately post intervention and at 6 months. In addition, at 6 months, the increase in mindfulness was associated with decreases in IES avoidance and HADS depression scores. Although correlations must be interpreted with caution and do not indicate causality and further work is required, such findings do support the notion that increased mindfulness ability may be associated with enhanced psychological functioning, a finding supported by recent literature (Leserman, 2008).

Limitations

The TAU arm was a naturalistic condition that did not completely control for the use of concurrent treatments whether it is antiviral or psychotropic medication, nor control for all variables in our MBSR intervention (i.e. time, attention). These variations pose a potential threat to study findings. Other designs were considered, such as inclusion of an education-oriented group arm to control for the attention and a more active intervention versus comparing the MBSR to standard care, however, we placed this study as a first step in investigating the effectiveness of our intervention, based on our promising pilot work, by initially comparing our MBSR intervention to a TAU control, rather than utilizing a more costly design to compare two new educational interventions against a control.

Most subjects were gay men almost all of whom had been infected with HIV through sex with other men; research is still needed to determine the effectiveness of MBSR with other HIV⁺ populations such as women, racialized groups and ethnocultural minorities.

Despite these limitations, the study had a number of strengths, for example, its prospective design, its focus on a unique population and within a natural clinic setting and its use of standardized measures and a manualized treatment approach.

Conclusions

The study provides us with some support that a mindfulness-based intervention aimed at reducing stress is acceptable and may have specific and clinically meaningful psychological effects in the population of gay men and men who have sex with men (MSM) living with HIV. Within the context of the array of services provided by a psychiatric clinic and its referral network, MBSR has a significant role to play in the overall treatment of gay men living with HIV. Future stress management intervention research should address the limitations of this study and the unique psychosocial needs of HIV-infected patients using briefer, more cost-effective formats where possible (Brown & Vanable, 2008).

The American Group Psychotherapy Association has recommended groups for PHA be used concurrently with other services (Sherman et al., 2004). This study suggests what MBSR may add to such a relatively rich treatment context: increased ability to generate mindfulness, decreases in avoidant coping with HIV stressors and increased positive affect. This would be helpful for PHAs in particular because of their high levels of self-criticism and difficulties in generating self warmth, all of which are associated with impaired psychological functioning status. MBSR could be provided by trained therapists from diverse professional backgrounds including social work, nursing, psychology or psychiatry (Santorelli, 1999), making it more easily integrated to psychiatric, medical and AIDS service organization services.

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