

Reductions in negative automatic thoughts in students attending mindfulness tutorials predicts increased life satisfaction

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[2500 words]

Introduction

In recent years, increasing attention has been directed to mental health promotion on university campuses due to an alarmingly elevated prevalence of university-based mental health problems. According to current estimates, almost a third of university students experience symptoms of depressed and anxious mood (Eisenberg, Gollust, Golberstein, & Hefner, 2007) and nearly a quarter also display maladaptive perfectionistic tendencies (Radhu et al., 2012). As many students are navigating a developmental transition to adulthood that includes coping with new academic, interpersonal, and financial demands (Archer & Lamnin, 1985; Abouserie, 1994), mental health promotion within higher education can better equip students with adaptive coping resources in the face of novel stressors.

Although counseling services within universities are well established, the dilemma confronting most higher education institutions concerns the costs and inefficiencies of traditional counseling. According to the report on counseling services in Ontario colleges (Lees & Dietsche, 2012), growth in student enrolment in Ontario universities saw a 26 percent increase between 2007 - 2012, while counseling resources rose only 4.6 percent. As a result, student to counselor ratios have been in the range of 1300-1500 students per counselor. In light of these statistics, development of group-based and autonomously practiced mental health promotion programs are an important alternative to ensure improved mental health in students.

In searching for such approaches, mindfulness meditation has shown significant potential as a cost-effective intervention. Mindfulness-Based Stress Reduction (MBSR) Kabat-Zinn, 1982) has become a widely adopted therapeutic strategy in North America and Europe, serving to introduce a secularized attention regulation practice that fosters non-judgmental moment-to-moment awareness (Kabat-Zinn, 2003; Kabat-Zinn, 2011). Ultimately, it promotes more objective perceptions less impeded by cognitive distortions and ruminations over past regrets and future uncertainties (Kabat-Zinn, 2003; Kabat-Zinn, 2011). During mindfulness sessions, participants are instructed to focus attention on breathing sensations as they observe cognitions, with an accepting and non-avoidant attitude (Bishop et al., 2004).

Mindfulness meditation has been used in clinical and non-clinical settings to help individuals manage adverse health conditions, counteract anxiety and depression, and prevent depressive relapses (Davidson et al., 2003; Fjorback, Arendt, Ørnbøl, Fink, & Walach, 2011; Kabat-Zinn, 1982; Kabat-Zinn et al., 1998; Ledesma & Kumano, 2009; Sipe & Eisendrath, 2012; Teasdale et al., 2000). More specific outcomes of mindfulness program participation include increased positive affect (Jain et al., 2007; Schroevers & Brandsma, 2010), self compassion (Chiesa & Serretti, 2009; Keng, Smoski, Robins, Ekblad, & Brantley, 2012), decreased rumination (Jain et al., 2007) and decreased perceived stress (Lane, Seskevich, & Pieper, 2007; Oman, Shapiro, Thoresen, Plante, & Flinders, 2008). In addition to interventional research with psychometric outcomes, neuroscientific evidence has linked mindfulness practice to improved attentional stability (Lutz et al., 2009), cortical inhibition (Guglietti, Daskalakis, Radhu,

Fitzgerald, & Ritvo, 2013), and better working memory capacity, and reduced mind wandering, as evidenced by improvements in academic test scores like the Graduate Record Exam (GRE) (Mrazek, Franklin, Phillips, Baird, & Schooler, 2013). Given these favourable mental health and attentional outcomes, mindfulness programs have also found applications within educational environments (Broderick & Metz, 2009; Napoli, Krech, & Holley, 2005).

Taken together, these observations prompted the current study assessing the effectiveness of a university-based weekly mindfulness tutorial program. In assessing variables associated with participation in the program, we were guided by a Cognitive Behaviour Therapy-based model that identifies negative automatic thoughts as important therapeutic change targets. Since mindfulness training entails non-judgmental awareness of cognitions, coupled with reorientation of attention to present-awareness, the negative impacts of automatic thoughts can be reduced, even without directly modifying their cognitive content.

We additionally assessed satisfaction with life as a global measure of mental health in this largely asymptomatic population given it represents an important mental health outcome associated with university attendance. Overall, it was hypothesized that regular attendance in weekly mindfulness meditation training sessions would improve student's mental health as indicated by reductions in negative automatic thinking and improvements in satisfaction with life.

Methods:

Subjects: N = 39 subjects, [#] males and [#] females, 17 years of age or older, currently enrolled at York University as part-or full-time students were recruited through postings on campus and in-class announcements with informational hand-outs at undergraduate courses. Recruitment took place in September 2012 with baseline measures administered in September and October, 2012 (T1) and follow-up measures administered during the later part of the semester (November through to December) (T2).

Intervention - Mindfulness Meditation Tutorials: The tutorials involved instruction in mindfulness meditation for 20 - 40 minute periods combined with brief talks about mindfulness practices and research findings. Participants could attend tutorial sessions convenient to class schedules, and were encouraged to attend each offered tutorial session via related email correspondence. Meditation tutorials were conducted at two campus locations for one hour on Mondays and Wednesdays, and at two separate hours on Tuesday (four hours in total) led by a faculty member and graduate students who were experienced practitioners of mindfulness. Tutorial attendance was noted at each session.

Outcome Variables:

Self-report measures

The demographics questionnaire contains inquiries about: undergraduate study major, age (in years), year of undergraduate schooling, ethnicity, previous experience with meditation (how many hours and frequency of practice), psychological disorders current or in the past (yes or no), psychological counseling current or in the past (yes or no) and current or past psychotropic prescription medication use (yes or no). The psychometric questionnaires represented four dimensions of interest: 1) anxiety and depression-related cognitions; 2) insomnia and sleep quality; 3) exercise adherence; 4) well-being.

Anxiety and depression - related cognitions:

- **Automatic Thoughts Questionnaire** (Hollon & Kendall, 1980) (ATQ). The ATQ was developed to evaluate four dimensions of personal automatic negative statements: a) personal maladjustment and desire for change; b) negative self-concepts and negative expectations; c) low self-esteem; d) helplessness (Hollon & Kendall, 1980).

- **Anxiety Sensitivity Index** (ASI) by Reiss *et al.* (1986) is frequently used to assess the fear of anxiety-related symptoms. It is a 16-item questionnaire with scores ranging from 0 - 64. The test-retest reliability of this questionnaire is reflected in a Pearson product moment correlation of 0.75.

- **Depressive Experiences Questionnaire** (Blatt *et al.*, 1976) was developed to help further examine continuities between normal and pathological forms of depression (Zuroff, Quinlan, & Blatt, 1990). The DEQ consists of 66 items rated on a 7-point scale which (Rude & Burnham, 1993) examine daily experiences common in both mild and severe states of depression that summate into three factors: Dependency, Self criticism, and Efficacy (Zuroff *et al.*, 1990). Factorial structure of the DEQ has been proved to be stable (Rude & Burnham, 1993; Zuroff *et al.*, 1990). Scoring of the DEQ can be applied according to gender, however most research utilizing the DEQ has applied female scoring parameters to both men and female (Viglione, Clemmey, & Camenzuli, 1990; Zuroff *et al.*, 1990).

- **Positive and Negative Affect Scale** (Watson, Clark, & Tellegen, 1988), was developed to assess two important mood dimensions with subscales consisting of 10 items each. Respondents' rate how they feel in a temporally graduated manner, i.e. right now, today, during the past few days, during the past week, during the past few weeks, during the past year and generally. For this study we chose to ask respondents to indicate how they feel right now, at the present moment. Internal consistency alpha rating for the positive affect portion is .88 and .87 for the negative affect portion of the scale.

- **Profile of Mood States (POMS)** (McNair *et al.*, 1981) was developed as a measure of psychological distress. For the purpose of this study, the POMS-SF (Short form) was administered, as developed by Shacham (1983) which contains 37 items scored to yield a global distress score and 6 subscales. The internal consistencies of these 6 POMS-SF subscales have an alpha > .80 (Shacham, 1983) and correlations between the original POMS and POMS-SF subscales all exceed .95 (Shacham, 1983).

Exercise Adherence:

- **Godin Leisure-Time Exercise Questionnaire** (GLTEQ) (Godin & Shephard, 1985) was developed as a simple measure of leisure time, and exercise behavior (Godin & Shephard, 1985). It allows for the possibility of examining changes in behavior following the initiation of a physical fitness program (Godin & Shephard, 1985). The reliability coefficients for maximal oxygen consumption and body fat were 0.83 and 0.85 respectively (Godin & Shephard, 1985).

Well-Being:

- **Mindfulness Attention and Awareness Scale** (MAAS) (Brown & Ryan, 2003) The MAAS is a 15-item scale designed to examine a core characteristic of dispositional mindfulness; open or

receptive awareness and attention to what is taking place in the present moment (Brown & Ryan, 2003). The MAAS was found to have good internal consistency, with alphas ranging of .82 and .87 in student and adult samples respectively and demonstrates convergent and discriminant correlations in the expected direction (Brown & Ryan, 2003).

- **Satisfaction with Life Scale (SWLS)** (Diener, Emmons, Larsen, & Griffin, 1985), assesses a respondents' satisfaction with life as a whole as a cognitive-judgemental process. The SWLS is a five item scale rated on a 7-point scale from *strongly disagree* (1) to *strongly agree* (7). SWLS has a two-month test-retest correlation coefficient of .82, and a good internal consistency alpha coefficient of .87 (Diener et al., 1985).

Statistical Analyses: Multiple regression analysis was employed to test associations between changes in mindfulness and automatic thoughts, and the outcome of changes in satisfaction with life. The baseline variables were included on the predictor side of the model rendering the interpretation of all posttest variables as the amount of change from pretest to posttest (Rausch, Maxwell & Kelley, 2003). Phrased in another way, we co-varied for all pretest variables and examined the relationships among the posttest variables.

Results:

Before conducting statistical analyses, all distributions were checked for normality and distributions were found to be normally distributed except for the Automatic Thoughts Questionnaire. The distribution for the latter was normalized with a logarithmic transformation. One subject did not complete the Mindfulness measure at outcome, reducing the sample size for this variable to N = 39.

Table 1 Pre-Post Means for the Psychological Outcomes

Variable	Pre Mean (SD^a)	Post Mean (SD)	Paired Sample t-Test
ATQ ^b	54.00 (22.62)	48.85 (21.15)	t(39) = 2.74, p = .009
SWL ^c	21.32 (6.43)	22.42 (7.05)	t(39) = -1.88, p = .067
Mindfulness	62.33 (13.79)	65.05 (10.84)	t(38) = -1.63, p = .110

^aSD – standard deviation; ^bATQ – Automatic Thoughts Questionnaire; ^cSWL – Satisfaction with Life

The only variable that changed reliably over the treatment period was the Automatic Thoughts Questionnaire, and there was a trend for an improvement in Satisfaction With Life.

Multiple regression analysis was employed to test the association between changes in mindfulness and automatic thoughts and the outcome of changes in satisfaction with life. Residual change scores were employed whereby the baseline variables were entered prior to enter the post treatment variables. The table below summarizes the regression analyses.

Predictor Variable	Unstandardized Beta	Std.^a error	Standardized Beta	p value
Mindfulness	-.129	.077	-.200	.101
ATQ ^b	-17.62	6.68	-.364	.013

^aStd. – standard error; ^bATQ = Automatic Thoughts Questionnaire

The overall model was significant ($F(5, 38) = 23.997, p < .0001$). The only predictor variable that accounted for a significant amount of the variance in satisfaction with life at outcome was automatic thoughts whereby a greater decrease (i.e., improvement) in negative automatic thoughts was associated with a greater increase (i.e., improvement) in satisfaction with life, $t(38) = -2.64, p = .013$.

Discussion:

Study results suggest attendance at a mindfulness meditation tutorial was associated with reductions in negative automatic thoughts (Automatic Thoughts Questionnaire) that predicted increased Satisfaction with Life assessed during the latter part of a single 3-month semester. This finding follows the hypothesis that the mindfulness tutorial largely consisting of meditation practice reduces tendencies to engage in nonproductive, self-pejorative cognitions that detract from well-being.

Mindfulness influences the prefrontal cortex by activating it with subsequently increased production and/or delivery of glutamate (Cheramy A, Romo R, 1987) stimulating the thalamus to increase secretions of gamma-aminobutyric acid (GABA) into the lateral posterior and geniculate nuclei (Armony & LeDoux, 2000 ; Cornwall & Phillipson, 1988). Increased GABA, is hypothesized to selectively inhibit the visual cortex (Andrews, Halpern, & Purves, 1997) and posterior superior parietal lobule (Bucci, Conley, & Gallagher, 1999) permitting meditators to specifically disregard and target selected stimuli, leading to enhanced focal attention (Newburg & Iversen, 2003). Evidence has demonstrated a decrease in GABA_B receptor activity in individuals with neuropsychiatric diagnoses compared to healthy controls (Barnow et al., 2009 ; Cryan & Kaupmann, 2005 ; Daskalakis et al., 2002 ; Daskalakis et al., 2008 ; Fatemi, Folsom, & Thuras, 2011; Ghose, Winter, McCarson, Tamminga, & Enna, 2011; Greenberg et al., 2000 ; Ishikawa, Mizukami, Iwakiri, & Asada, 2005; Klempan et al., 2009; Levinson et al., 2010 ; Levinson, Young, Fitzgerald, & Daskalakis, 2007 ; Liu, Fitzgerald, Daigle, Chen, & Daskalakis, 2009 ; Mizukami et al., 2002; Mizukami et al., 2000; Oblak, Gibbs, & Blatt, 2010; Sequeira et al., 2009; Zai, King, Wong, Barr, & Kennedy, 2005). Conversely, increases in GABA_B-mediated inhibition are associated with clinical improvements associated with cognitive behavioral therapy (Radhu et al.), electroconvulsive therapy (Bajbouj et al., 2006), repetitive TMS (Daskalakis et al., 2006) and with clozapine treatment in schizophrenia (Liu et al., 2009 ; Wu et al.).

The amounts of mindfulness practice likely varied from estimates based on tutorial attendance because subjects engaged in varying practice levels on their own time. However, tutorial provision demonstrated a cost-effective way of engaging students in a mental health promoting practice. The attendance of N = 39 students could have readily been scaled up to N = 80

students or even N = 160 students without changes in staff. While results don't yet directly indicate the mindfulness tutorial process is effective, they indicate a positive adjustment process during the semester that could be specifically targeted with mental health promotion, whether or not mindfulness is an actively implemented component. While reductions in negative automatic thoughts might seem an intuitive intervention target, findings suggest systematic reductions in were statistically associated with desired outcomes, i.e. satisfaction with life, in the academic context.

Interestingly, although the tutorials were a focus, the MAAS was not correlated with identified benefits. One explanation is that the first impact of mindfulness practice is a sensitization effect that can be self critical in nature such that individuals do not identify themselves as more mindful. Rather than more directly experiencing the self acceptance that can lead to more positive mood-related self report, their experience of negative mental states is devoid of the spiraling phenomena whereby pejorative reactions to negative self observations are more injurious than the experienced states themselves.

Limitations of the current study are largely related to modest sample size, a brief (3 month) intervention and psychometric self report. In future studies, more advanced designs will be implemented, including randomly allocated comparison groups, longer intervention and follow up periods and neurophysiological measures as well as psychometric self-report.

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