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Quality of life as an outcome indicator in patients with seasonal affective disorder: results from the Can-SAD study

ERIN E. MICHALAK[1]*, GREG MURRAY[2], ANTHONY J. LEVITT[3,4], ROBERT D. LEVITAN[3,5], MURRAY W. ENNS[6], RACHEL MOREHOUSE[7], EDWIN M. TAM[1], AMY CHEUNG[3,4] AND RAYMOND W. LAM[1]

[1] *Division of Clinical Neuroscience, Department of Psychiatry, University of British Columbia; Mood Disorders Centre, UBC Hospital, Vancouver, BC, Canada*; [2] *Faculty of Life and Social Sciences, Swinburne University of Technology, Hawthorn, Australia*; [3] *Department of Psychiatry, University of Toronto, Toronto, ON, Canada*; [4] *Mood Disorders Program, Sunnybrook and Women's College Health Sciences Centre, Toronto, ON, Canada*; [5] *Mood and Anxiety Disorders Program, Centre for Addiction and Mental Health, Toronto, ON, Canada*; [6] *Department of Psychiatry, University of Manitoba; Mood Disorders Program, Health Sciences Centre, Winnipeg, MB, Canada*; [7] *Department of Psychiatry, Dalhousie University, Saint John, NB, Canada*

ABSTRACT

Background. Although a host of studies have now examined the relationship between quality of life (QoL) and non-seasonal depression, few have measured QoL in seasonal affective disorder (SAD). We report here on results from the Can-SAD trial, which assessed the impact of treatment with either antidepressant medication or light therapy upon QoL in patients diagnosed with SAD.

Method. This Canadian double-blind, multicentre, randomized controlled trial included 96 patients who met strict diagnostic criteria for SAD. Eligible patients were randomized to 8 weeks of treatment with either: (1) 10 000 lux light treatment and a placebo capsule or (2) 100 lux light treatment (placebo light) and 20 mg fluoxetine. QoL was measured with the Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q) and the Medical Outcomes Study (MOS) Short-Form General Health Survey (SF-20) at baseline and 8 weeks.

Results. Both intervention groups showed significant improvement in QoL over time with no significant differences being detected by treatment condition. Q-LES-Q scores increased significantly in seven of eight domains, with the average scores rising from 48·0 (S.D. = 10·7) at baseline to 69·1 (S.D. = 15·6) at week 8. Treatment-related improvement in QoL was strongly associated with improvement in depression symptoms.

Discussion. Patients with SAD report markedly impaired QoL during the winter months. Treatment with light therapy or antidepressant medication is associated with equivalent marked improvement in perceived QoL. Studies of treatment interventions for SAD should routinely include broader indices of patient outcome, such as the assessment of psychosocial functioning or life quality.

INTRODUCTION

Seasonal affective disorder (SAD) is a mood disorder characterized by recurrent episodes of major depression that occur with a seasonal, most frequently winter, pattern (Rosenthal *et al.* 1984). In epidemiological studies using diagnostic interviews conducted in Canada and the USA, between 0·4% and 2·7% of the general population were found to have winter SAD (Blazer *et al.* 1998; Levitt *et al.* 2000; Levitt & Boyle, 2002). A prevalence rate of 2·4% has

* Address for correspondence: Prof. E. E. Michalak, Division of Mood Disorders, Department of Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC, Canada V6T 2A1. (Email: emichala@interchange.ubc.ca)

been reported for a general population sample in the UK (Michalak *et al.* 2001). For a diagnosis of SAD, patients must experience symptoms of clinical depression during the autumn and winter, with full remission to normal mood (or switch into hypomanic or manic episodes) during the spring and summer seasons. The condition can be characterized by both typical (e.g. depressed mood, loss of interest, lack of energy) and atypical (e.g. over-sleeping, carbohydrate craving, weight gain) depressive symptoms. According to the DSM-IV classification system, a diagnosis of any variety of major depressive disorder (MDD) requires that the patient exhibit significant problems functioning psychosocially as a consequence of their depression. However, only a few studies have systematically examined either psychosocial functioning (Allen *et al.* 1993; Schlager *et al.* 1995) or the more encompassing notion of quality of life (QoL) (Michalak *et al.* 2004, 2005) in patients with SAD. Furthermore, although many studies have now assessed the impact of treatment interventions for conditions such as non-seasonal MDD and bipolar disorder upon QoL, only one previous study has examined the effect of treatment upon QoL in patients diagnosed with SAD. In that study, the authors (Partonen & Lonnqvist, 1996) examined the effects of antidepressant treatment in patients with seasonal ($n=32$) and non-seasonal ($n=151$) depression, assessing health-related QoL (HRQOL) with the Medical Outcomes Study (MOS) Short-Form General Health Survey (SF-20; Stewart *et al.* 1988) and broader QoL by the 15D (Sintonen, 1998). The 15D provides an overall score between 0 and 1 (where higher scores are indicative of better QoL) in addition to separate scores for each of the questionnaire's 15 dimensions. We extracted baseline QoL scores for the group of patients with SAD from data provided by the authors. Our examination of these data indicated that levels of physical functioning (as measured by the SF-20) were reasonable ($73{\cdot}9 \pm 29{\cdot}7$, range 0–100 where higher scores indicate better health), but mental health functioning seemed to be markedly impaired ($38{\cdot}7 \pm 14{\cdot}6$) compared to general populations norms (Linzer *et al.* 1996). Patients with SAD showed mean scores of 0·75 (S.E. = 0·03) on the 15D QoL measure. In comparison, mean 15D scores in a Finnish general population sample (age 35–54) were reported to be 0·94 (Sintonen, 1998).

SAD has been shown to be responsive to treatment with both daily exposure to bright artificial light, known as light therapy, and antidepressant medications. More than 70 controlled trials of light therapy for SAD have now been conducted, and three meta-analyses have concluded that the treatment intervention is efficacious (Lee & Chan, 1999; Thompson, 2001; Golden *et al.* 2005), leading expert and consensus clinical guidelines to recommend light therapy as a first-line treatment for the condition (Lam & Levitt, 1999; American Psychiatric Association, 2000; Kennedy *et al.* 2001; Bauer *et al.* 2002). Although fewer studies have examined the use of medications for SAD, there is evidence that antidepressants are also an effective treatment intervention (e.g. Lam *et al.* 1995; Moscovitch *et al.* 2004). Two significant deficits exist, however, in the body of research examining treatment interventions for SAD. First, little previous research has systematically compared light therapy with antidepressant treatment for SAD. Second, scant attention has been paid to the impact of treatment interventions for SAD upon QoL. It should not be presumed that QoL outcomes will automatically reflect symptomatic outcomes. Two treatment interventions, for example, can have different side-effect profiles, which in turn can impact differently upon perceived QoL (e.g. Strejilevich *et al.* 2005). Alternatively, treatment interventions that show equivalent efficacy in terms of improving symptomatology can have disparate impacts upon the social or occupational functioning components of QoL (e.g. Shi *et al.* 2002). The aim of the present study was therefore to (i) quantify the impact of treatment on QoL among patients with SAD, and (ii) compare light therapy and antidepressant medication in this regard using data from a multicentre randomized controlled trial comparing the effectiveness of light therapy to the antidepressant fluoxetine. Finally, predictors of change in QoL with treatment were explored. The primary results, with further details concerning the methods and additional results for this trial, have been published separately (Lam *et al.* 2006; Murray *et al.* 2005*a*, *b*). Here we report specifically on the impact of the two treatment

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interventions upon patients' perceptions of their life quality.

METHOD

Protocol

This randomized, double-blind study was approved by a Clinical Research Ethics Board at each centre. After giving written, informed consent, eligible participants entered a 1-week baseline phase without treatment to regularize their sleep–wake schedule (patients were instructed to sleep only between 22:00 and 07:00 hours) and to identify spontaneous responders. Patients who were significantly improved after the baseline week (defined as 25% or greater improvement in depression scores) were dropped from the study. Otherwise, they were randomly allocated to one of two treatment conditions for 8 weeks: (1) active light therapy plus placebo capsules, or (2) placebo light therapy plus active drug. Patients returned to the clinic for outcome assessments at weeks 1, 2, 4 and 8, or at unexpected termination. QoL was assessed by self-report at weeks 1 and 8.

Participants

Participants were recruited by referral and advertisements at mood disorder clinics in Vancouver, Winnipeg, Toronto and Saint John. The inclusion criteria for the study were: (1) male and female out-patients aged 18–65 years; and (2) major depressive episodes with a seasonal (winter) pattern as determined by a Structured Clinical Interview for DSM-IV (SCID; Williams *et al.* 1992) modified to include criteria for seasonal pattern (Levitt *et al.* 2000). In addition, participants were required to have a score of 20 or higher on the Hamilton Depression Rating Scale (HAMD), the 17-item version ($HAMD_{17}$), or a score of 14 or higher on the $HAMD_{17}$ if the 24-item version ($HAMD_{17+7}$; Williams *et al.* 1988) was 23 or higher. Patients had to meet these criteria, both at initial assessment and at the end of the baseline week.

The exclusion criteria for the study were: (1) pregnant or lactating women and sexually active women of child-bearing potential who were not using medically accepted means of contraception; (2) serious suicidal risk in the judgment of the investigator; (3) DSM-IV diagnoses of organic mental disorders, substance use disorders, including alcohol, active within the last year, schizophrenia, paranoid or delusional disorders, other psychotic disorders, bipolar I disorder, panic disorder or generalized anxiety disorder not concurrent with major depressive episodes; (4) serious unstable medical illnesses; (5) retinal disease that precluded the use of bright light; (6) history of severe allergies and/or multiple drug adverse reactions; (7) current use of certain other psychotropic drugs; (8) current use of beta blocking drugs; (9) use of antidepressants or mood-altering medications within 7 days of baseline; (10) previous use of fluoxetine or light therapy; (11) formal psychotherapy started within 3 months of baseline or initiated during the study period; (12) shift work or southbound travel during the protocol. Participants were entered in the study during the autumn/winter from 15 September and enrolment was stopped by 15 February to reduce the possibility of spontaneous spring remission. The study was conducted over three winter seasons (2000–2003).

Light treatment

The active light treatment consisted of daily exposure to a white fluorescent light box (Uplift Technologies Inc., Model Daylight 10 000, fitted with an ultraviolet filter and rated at 10 000 lux at a distance of 14 inches from screen to cornea) for 30 min as soon as possible after awakening, between 07:00 and 08:00 hours. The control (placebo) light treatment was an identical light box fitted with a neutral density gel filter to reduce light exposure to 100 lux. Patients were given verbal and written instructions on the use of the light box and a measurement tape was used to ensure proper positioning. Patients were also instructed to avoid spending an excessive or unusual time outdoors during the entire study period. Illumination intensities were confirmed by digital photometer.

Medication treatment

The active medication treatment was a daily, fixed dose of 20 mg fluoxetine taken between 07:00 and 08:00 hours, whereas the placebo was an identical capsule containing inert filler.

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QoL outcome measures

QoL was assessed with two scales. HRQOL was assessed by using the 20-item MOS SF-20 (Stewart *et al*. 1988). The self-rated SF-20 was designed to assess perceived health status, and provides a score from 0 to 100 for each of six dimensions (physical, social and role functioning, mental health status, health perceptions and bodily pain), where 0 represents worst possible health and 100 best possible health. Previous research has shown that internal reliability estimates for the dimensions range from 0·81 to 0·88 (Stewart *et al*. 1988). Broader QoL was assessed with the Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q; Endicott *et al*. 1993), a 93-item self-report measure of the degree of enjoyment and satisfaction in various areas of daily living. The Q-LES-Q was developed and validated for use in depressed outpatients and has eight summary scales derived from 91 items that reflect major domains: physical health, mood, leisure time activities, social relationships, general activities, work (if applicable), household duties (if applicable) and school/coursework (if applicable). The relevant summary scales of the questionnaire are averaged to produce a mean QoL score (both domain and mean scores are expressed as percentages, with higher values reflecting better QoL). The scale also contains single items that rate 'overall life satisfaction and contentment' and 'satisfaction with medications (if any are taken)'. The Q-LES-Q has good psychometric properties and has been shown to be sensitive to change in response to treatment in clinical populations (Endicott *et al*. 1993).

The primary symptom outcome measure for the study was the HAMD. Like other SAD studies, we used the HAMD that best reflects severity of depression in SAD, namely the 24-item version ($HAMD_{17+7}$), consisting of the $HAMD_{17}$ plus the seven-item version of the atypical addendum ($HAMD_7$). Board-certified psychiatrists blind to treatment assignment conducted depression ratings. A semi-structured interview, the Structured Interview Guide for the HAMD, SAD version (SIGH-SAD), was used to increase reliability. Clinical response was defined as 50% or greater reduction from baseline in $HAMD_{17+7}$ depression scores at the last visit, while clinical remission was defined as clinical response plus a score of 8 or less on the $HAMD_{17+7}$. Other outcome measures included the Clinical Global Impression (CGI) scale, and the patient-rated Beck Depression Inventory II (BDI-II).

Statistical analysis

Baseline levels of QoL were compared against criteria for the Q-LES-Q set by Rapaport *et al*. (2005), and relations between QoL and depression at baseline explored using Pearson's correlations and non-linear regression analyses. Mixed (between–within) analysis of variance (ANOVA) was used to compare the two treatments in terms of their effects on Q-LES-Q and SF-20 (both mean and domain scores). Predictors of treatment-related change in mean SF-20 and mean Q-LES-Q (measured as simple pre- *versus* post-treatment change scores) were investigated using two hierarchical regressions. In these analyses, baseline levels of QoL were controlled by entering the relevant baseline QoL measure (SF-20 or Q-LES-Q) at Step 1. At Step 2 were added general demographic variables that, in the absence of direction from the existing literature, warranted inclusion as potential correlates of QoL response to treatment; that is, age, gender and bipolar *versus* unipolar diagnosis ('polarity'). Treatment group was added to the model at Step 3 and at Step 4 the impact of treatment efficacy was tested with the addition of treatment-related changes in depression (measured as a simple change score in $HAMD_{17+7}$, with more negative scores indicating greater improvement in mood).

All treatment variables remained coded and the analysts and investigators were blinded to variable identity during the primary analysis and interpretation. All analyses were performed using SPSS version 11 (SPSS Inc., Chicago, IL, USA).

RESULTS

Depressive symptomatology at baseline

A total of 96 patients were randomized to treatment, with 81 available for pre- *versus* post-analyses. Table 1 shows clinical information for patients in the two treatment conditions; no significant differences were noted in any of the clinical variables at baseline. Depression scores

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Table 1. *Clinical information for study sample (n = 96) by treatment group**

	Light therapy (n = 48)	Fluoxetine (n = 48)
Sex (% female)	64·6	68·8
Age (years), mean (S.D.)	42·3 (9·2)	44·6 (11·3)
Marital status (% married)	50·0	41·7
Number of previous winter episodes, mean (S.D.)	11·0 (8·1)	10·5 (8·0)
Number of previous total episodes, mean (S.D.)	11·8 (8·6)	11·8 (8·6)
Diagnosis: bipolar II disorder, %	4·2	6·3
Past psychiatric contact, %	27·1	29·2
Lifetime psychiatric hospitalization	4·2	4·2
Family history of mood disorder, %	41·7	43·8
Previous (pharmacological) antidepressant treatment, %	45·8	33·3
Previous psychotherapy, %	22·9	27·1
CGI Severity Scale, mean (S.D.)	4·2 (0·6)	4·1 (0·6)
Global Assessment of Function, mean (S.D.)	57·2 (6·3)	58·5 (5·7)

CGI, Clinical Global Impression; S.D., standard deviation.
* No significant between-groups differences were detected.

Table 2. *Pre- and post-treatment QoL scores for MOS SF-20 and Q-LES-Q (mean scores and individual domain scores presented in each case, except where noted otherwise, n = 81)*

		Pre-treatment, mean ± S.D.	Post-treatment, mean ± S.D.
MOS SF-20	Physical functioning	83·6 ± 19·3	85·0 ± 21·5
	Role functioning	80·2 ± 29·5	80·2 ± 28·4
	Mental health	41·4 ± 17·0	66·7 ± 21·8***
	Health perceptions	51·5 ± 21·8	65·3 ± 23·8***
	Pain	54·4 ± 26·3	57·5 ± 27·4
	Social functioning	74·1 ± 31·2	82·2 ± 25·9*
	(Mean SF-20 score)	64·2 ± 14·4	72·8 ± 17·2***
Q-LES-Q	Physical health	47·1 ± 13·7	64·6 ± 18·5***
	Mood	52·7 ± 15·3	73·7 ± 17·4***
	Leisure activities	53·2 ± 17·7	68·6 ± 18·9***
	Social relationships	47·8 ± 14·6	68·0 ± 16·9***
	Household duties (n = 78)	51·3 ± 17·5	70·4 ± 19·0***
	Work activities (n = 64)	51·5 ± 20·1	70·9 ± 19·3***
	School/course work (n = 17)	44·4 ± 21·0	57·4 ± 24·0
	General satisfaction	48·1 ± 11·9	69·5 ± 17·0***
	(Mean Q-LES-Q score)	48·0 ± 10·7	69·1 ± 15·6***

QoL, Quality of life; MOS SF-20, Medical Outcomes Study Short-Form General Health Survey; Q-LES-Q, Quality of Life Enjoyment and Satisfaction Questionnaire; S.D., standard deviation.
* $p < 0{\cdot}05$, *** $p < 0{\cdot}001$. Significance values refer to main effect of time in a mixed-between analysis of variance (ANOVA), which included treatment group as a factor.

were not significantly different between the two groups at baseline, and as reported elsewhere (Lam *et al*. 2006), analysis of symptomatic outcome indicated that both $HAMD_{17+7}$ and BDI-II decreased significantly over time, with no differences detected by treatment condition.

QoL at baseline

QoL as measured by both the Q-LES-Q and SF-20 was markedly impaired at baseline (see Table 2). For example, using the criterion of Rapaport *et al*. (2005), two standard deviations below the community norm on the 'general activities' domain of the Q-LES-Q, 85·1% of the sample exhibited severely impaired QoL.

Not surprisingly, at baseline, QoL showed moderate effect-size negative correlations with levels of depression as measured on the $HAMD_{17+7}$ ($r = -0{\cdot}34$ and $r = -0{\cdot}42$ for Q-LES-Q and SF-20, respectively, $p < 0{\cdot}001$ in

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each case). Baseline QoL was also reliably associated with the $HAMD_{17}$ score at baseline ($r = -0{\cdot}37$ and $r = -0{\cdot}38$ for Q-LES-Q and SF-20 respectively, $p < 0{\cdot}001$ in each case). The $HAMD_7$ atypical symptoms scale showed a smaller negative association with baseline QoL ($r = -0{\cdot}13$, $p > 0{\cdot}05$ and $r = -0{\cdot}24$, $p < 0{\cdot}05$ for Q-LES-Q and SF-20, respectively). The baseline relationship between QoL and depression was not entirely linear, however. Nonlinear regression analyses found that linear, quadratic and cubic polynomials all explained significant proportions of the association between $HAMD_{17+7}$ and Q-LES-Q scores [$F(1, 93) = 12{\cdot}57$, $p < 0{\cdot}005$; $F(2, 92) = 6{\cdot}92$, $p < 0{\cdot}01$; $F(2, 92) = 6{\cdot}95$, $p < 0{\cdot}01$, respectively] and between $HAMD_{17+7}$ and SF-20 scores [$F(1, 93) = 15{\cdot}65$, $p < 0{\cdot}001$; $F(2, 92) = 7{\cdot}78$, $p < 0{\cdot}005$; $F(2, 92) = 7{\cdot}79$, $p < 0{\cdot}005$, respectively]. This pattern of results indicates a complex relationship between the two types of variables and constitutes statistical grounds for the separability of the QoL and depression constructs.

Changes in QoL following treatment

Analyses of QoL outcome revealed non-significant interactions between treatment condition and time for domain and mean scores of the Q-LES-Q and SF-20 measures. Patients in the light group showed average improvements in Q-LES-Q of 20·56 (S.D. = 13·11) compared with improvements of 21·77 (S.D. = 17·04) in the fluoxetine group [$F(1, 79) = 0{\cdot}13$, N.S.]. The corresponding findings for SF-20 scores were 7·82 (S.D. = 15·49) in the light group and 9·38 (S.D. = 14·39) in the fluoxetine group [$F(1, 79) = 0{\cdot}22$, N.S.].

Given that treatment condition had no effect on QoL outcomes, the results presented here are only for the main effect of time. As shown in Table 2, mean scores on both SF-20 and Q-LES-Q showed significant improvement with treatment [$F(1, 80) = 26{\cdot}96$, $p < 0{\cdot}001$, partial $\eta^2 = 0{\cdot}25$, and $F(1, 80) = 150{\cdot}09$, $p < 0{\cdot}001$, partial $\eta^2 = 0{\cdot}67$]. Post-treatment, the proportion of the sample defined as severely impaired against community norms for the Q-LES-Q fell to 25·9%. At a domain level, the Q-LES-Q physical health, mood, work, household, leisure, social relationships and general activities domains were all significantly improved post-treatment. For the SF-20, health perceptions, mental health and, less markedly, social functioning domains were significantly improved.

Predictors of treatment-related change in QoL

After demonstrating that treatment with either light or fluoxetine was associated with substantial improvement in QoL, we investigated potential predictors of change in QoL. As shown in Table 3, the two dependent variables generated identical patterns of findings. After controlling for baseline levels of QoL at Step 1, the addition at Step 2 of three demographic variables (age, gender and polarity of diagnosis) did not improve the fit of the model. In accord with the bivariate analyses reported above, the inclusion of treatment group at Step 3 was also not significant. Fit of the model was significantly improved, however, with the addition of change in depression (Step 4); improvements in depression were significantly associated with improvements in QoL.

The association between improvements in depression and improvements in QoL was also borne out in categorical analyses of remitting *versus* non-remitting participants. Compared to non-remitting participants ($n = 37$), remitters ($n = 44$) showed a significantly greater increase in QoL [status × time interaction: $F(1, 79) = 24{\cdot}40$, $p < 0{\cdot}001$, and $F(1, 79) = 11{\cdot}51$, $p < 0{\cdot}005$ for Q-LES-Q and SF-20, respectively].

DISCUSSION

The present study was designed to assess the impact of treatment with either antidepressant medication or light therapy upon QoL in well-diagnosed patients with SAD. Few previous studies have measured perceived QoL in this clinical population. SAD is of some scientific interest to the QoL researcher in that it possesses a unique course; patients with winter depression must show onset and full remission of symptoms during a clearly specified window of winter months. Depressive episodes persist, on average, for 10 ± 8 weeks (Leonhardt *et al.* 1994) and, for patients who are cognisant of their diagnosis, there is an end in sight with the coming spring months. Some (e.g. Michalak *et al.* 2002), but not all (e.g. Pendse *et al.* 2004), research has suggested that SAD is typically a mild-moderate form of depression in comparison to non-seasonal MDD. SAD also differs

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Table 3. *Results of hierarchical regressions predicting change in SF-20 and Q-LES-Q with treatment*

Dependent variable	Step	*F* change	Adjusted R^2	Predictor	β	*t*
ΔSF-20	1	7·39**	0·08	SF-20 baseline	−0·30	−2·72**
	2	0·38	00·05	SF-20 baseline	−0·29	−2·50*
				Age	−0·11	−0·95
				Gender	−0·05	−0·46
				Polarity	0·03	0·26
	3	0·26	0·04	SF-20 baseline	−0·29	−2·48*
				Age	−0·11	−0·96
				Gender	−0·05	−0·41
				Polarity	0·03	0·26
				Treatment	0·06	0·51
	4	37·42***	0·37	SF-20 baseline	−0·43	−4·44***
				Age	−0·07	−0·71
				Gender	−0·01	−0·05
				Polarity	0·02	0·17
				Treatment	0·07	0·77
				$\Delta HAMD_{17+7}$	−0·58	−6·12***
ΔQ-LES-Q	1	11·33**	0·12	Q-LES-Q baseline	−0·36	−3·37**
	2	1·10	0·12	Q-LES-Q baseline	−0·33	−2·66*
				Age	−0·07	−0·60
				Gender	−0·17	−1·57
				Polarity	0·07	0·63
	3	0·27	0·11	Q-LES-Q baseline	−0·33	−2·67**
				Age	−0·07	−0·60
				Gender	−0·17	−1·5
				Polarity	0·07	0·64
				Treatment	0·06	0·52
	4	84·35***	0·59	Q-LES-Q baseline	−0·47	−5·40***
				Age	0·01	0·08
				Gender	−0·09	−1·25
				Polarity	0·05	0·65
				Treatment	0·08	1·07
				$\Delta HAMD_{17+7}$	−0·69	−9·18***

ΔSF-20, change in Short-Form General Health Survey with treatment; ΔQ-LES-Q, change in Quality of Life Enjoyment and Satisfaction Questionnaire with treatment; $\Delta HAMD_{17+7}$, change in $HAMD_{17+7}$, the 24-item version of the Hamilton Depression Rating Scale (HAMD), with treatment; Polarity, unipolar *versus* bipolar diagnosis.

* $p<0·05$, ** $p<0·01$, *** $p<0·001$.

from non-seasonal depression in its presumed biological aetiology, which in a sense shifts the locus of responsibility away from the individual. Because of these singular features, QoL findings in relation to other forms of depression may not generalize readily to SAD and, conversely, QoL findings in relation to SAD may shed light on the broader literature on QoL in mood disorders.

As noted above, the present sample showed severe QoL impairment at baseline compared with community norms. Perhaps more significantly, baseline levels of QoL were also markedly impaired relative to other patient groups. The mean of 41·4 for the SF-20 mental health domain, for example, compares with a mean of 60 in patients with bipolar disorder (Cooke *et al*. 1996) and approximately 73 in primary care patients (Linzer *et al*. 1996). Similarly, mean baseline Q-LES-Q score in the present sample was 48·0, representing poorer QoL than that reported by patients with post-traumatic stress disorder (Rapaport *et al*. 2002), chronic MDD (Miller *et al*. 1998), obsessive compulsive disorder (Koran *et al*. 2002) and panic disorder (Rapaport *et al*. 2000). Indeed, Q-LES-Q scores in the present sample were comparable to those found in hospitalized psychiatric patients (Rapaport *et al*. 2001) and in patients suffering years, and sometimes decades, of dysthymia (Rapaport *et al*. 2005). Finally, the proportion of the present sample meeting the criterion of Rapaport *et al*. (2005) for severe impairment is equivalent to the 85% found among patients with chronic and/or double depression.

How should we explain the relatively marked impairment in QoL found among those with a non-chronic, often mild-moderate variant of

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recurrent depression? A possible explanation is that there may be more than one factor underpinning QoL reports; one factor might be the relatively objective long-term impact of a chronic illness (e.g. loss of social networks due to chronic avoidance; Rapaport *et al.* 2005), another factor might be the subjective appraisal of an acute decrease in well-being (e.g. the perception that one's social world is significantly less satisfying than it should be). Future research, perhaps combining self-report with objective measures of QoL, could explore the reference points that are used by mood disorder patients as they make QoL assessments; the present data point to the hypothesis that accessible memories of functioning during lighter months might partly explain the markedly low QoL experienced by SAD patients in winter.

Treatment for depression using either bright light or fluoxetine was associated with significant, moderate/large effect-size improvements in QoL, as measured on the mean SF-20 (and two of its constituent domains) and the mean Q-LES-Q (and seven of its constituent domains). Just as our sample reported markedly low QoL at baseline, QoL improvements with treatment were relatively large in comparison to those found in the treatment of non-seasonal depression. For example, mental health domain scores from the SF-20 were approximately 25 percentage points higher post-treatment in the present SAD sample. In comparison, a 19-point increase in mental health domain scores has been reported with fluoxetine treatment of newly diagnosed patients with MDD (Lonnqvist *et al.* 1994). Post-treatment changes in Q-LES-Q scores were similarly pronounced, with mean scores rising by approximately 21 percentage points. In comparison, a 12-week study of treatment of early onset dysthymia with sertraline, imipramine or placebo found only an 8-point change in Q-LES-Q mean score in the two active intervention arms, and a 4-point change in the placebo arm (Rapaport *et al.* 2005).

Improvement in QoL was strongly related to positive anti-depressant response (measured either continuously or categorically). Consistent with the proposition raised above, it seems that among patients with SAD, the presence of a major depressive episode is a significant challenge to otherwise adequate QoL. Indeed, we readministered the QoL scales to a subset ($n=26$) of the present sample during the summer months and found QoL levels comparable to community norms during this euthymic phase of the disorder (Michalak *et al.* 2005). Many patients with SAD report higher than average functioning in the spring/summer months, which is often manifest clinically as subthreshold hypomania that enhances rather than deters functioning. The reports of marked QoL dysfunction when depressed might reflect the perceived change in level of functioning from these lofty levels, even if absolute levels of depression are only moderate.

It is important to note that, while treatment-related changes in QoL were strongly predicted by antidepressant response, the data provided no evidence that QoL and depression variables are mutually redundant. At baseline, approximately 16% of variance in QoL scores was explained by the linear relationship with depression scores, with more complex polynomial trends also significant. The present findings therefore encourage (*a*) routine inclusion of QoL measures in SAD treatment outcome studies, and (*b*) further basic research into the trait and state vulnerabilities and resiliences that separately manifest in depression and QoL scores (Michalak *et al.* in press).

Our research is not without its limitations. First, the wide range of alternatives and the lack of a gold standard make the selection of QoL instruments as outcome measures complex. We chose the Q-LES-Q for the present study as it was developed for use in psychiatric populations and shows relatively sound psychometric properties. Importantly, the Q-LES-Q appears to be sensitive to treatment-related changes in QoL (Endicott *et al.* 1993); indeed, the scale detected greater treatment-related changes than did the SF-20, a more concise, health-related measure of QoL that is less popular in QoL assessment than its longer counterpart, the SF-36. Second, participants in the present study were treatment-seeking patients who were recruited to participate in a clinical trial and may not be representative of all patients with SAD. Third, as noted earlier, subjective descriptions of well-being may be affected by state-dependent aspects of the disorder (Atkinson *et al.* 1997), and future research would benefit from adding objective measures of functioning.

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DECLARATION OF INTEREST

None.

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