Cognitive-behavioral family treatment for childhood obsessive-compulsive disorder: A 7-year follow-up study

Emily Marie McHugh O'Leary a,*, Paula Barrett a,b,1,2, Krister W. Fjermestad a,c,1,3

a Pathways Health and Research Centre, PO Box 5699, West End, Brisbane, QLD, 4101, Australia
b The University of Queensland, Social Sciences Building (24), Brisbane, QLD 4072, Australia
c The Bergen Group for Treatment Research, University of Bergen, Faculty of Psychology, Christie's Gate 12, 5015 Bergen, Norway

1. Introduction

Obsessive-compulsive disorder (OCD) is an anxiety disorder which can substantially disable children’s functioning at home, at school, and with peers (Piacentini, Bergman, Keller, & McCracken, 2003). The World Health Organization (2002) has ranked OCD as one of the top 20 most disruptive illnesses in the world. In comparison to the adult OCD literature, the evidence-base for cognitive-behavioral treatment (CBT) for pediatric OCD consists mainly of case series and open trials of individual, family, or group-based treatments (Franklin et al., 1998; March, Mulle, & Herbel, 1994; Piacentini, Bergman, Jacobs, McCracken, & Kretchman, 2002; Scallion, Vitulano, Brenner, Lynch, & King, 1996; Thienemann, Martin, Cregger, Thompson, & Dyer-Friedman, 2001; Wever & Rey, 1997). To date, there have been only five randomized controlled trials (RCTs) of CBT for pediatric OCD (Barrett, Healy-Farrell, & March, 2004; Bolton & Perrin, 2008; Freeman et al., 2008; Pediatric OCD Treatment Study Team, 2004). A recent meta-analysis showed that CBT and pharmacotherapy were the only treatments effective in alleviating OCD symptoms, with CBT showing greater pooled effect sizes than pharmacotherapy (Watson & Rees, 2008). Exposure-based CBT, either alone or in conjunction with a serotonin reuptake inhibitor (SRI) is considered the frontline intervention for youth with OCD, and CBT alone the treatment of choice for pre-pubertal children with OCD (American Academy of Child & Adolescent Psychiatry, 1998; March, Frances, Carpenter, & Kahn, 1997; National Institute for Health and Clinical Excellence, 2005). Current estimates suggest that fewer than 10% of OCD patients receive adequate CBT (Blanco et al., 2006). Furthermore, a recent review of OCD treatments studies showed that only 10 of 16 studies reported follow-up data, and that the longest follow-up period was 18 months (mean = 8.1 months; Barrett, Farrell, Pina, Peris, & Piacentini, 2008). Consequently, there is a great need to assess the durability of acute psychological treatments for pediatric OCD.

One of the previous RCT's of CBT for OCD which did evaluate long-term outcome was conducted by Barrett and colleagues (2004). These researchers evaluated efficacy of CBT with a family component (cognitive-behavioral family-based therapy [CBFT]) and sought to assess the utility of individual CBFT and group CBFT, with the inclusion of a waitlist control condition. A total of 77 children and adolescents was included in the study. In contrast to the waitlist condition, both active treatment conditions produced...
significant reductions in diagnostic status and symptom severity ratings. There were no significant differences between treatment conditions and results were maintained at 3- and 6-month follow-up. In a follow-up to the original study, Barrett, Farrell, Dadds, and Boulter (2005) evaluated treatment effects at 12 and 18 months post-treatment for 48 participants. Results indicated treatment gains were maintained for all participants, with a total of 70% of participants in individual therapy and 84% in group therapy being diagnosis-free at follow-up. The present study is a 7-year follow-up to the original Barrett et al. (2004) study, and was designed to be a “snapshot” of diagnostic status and long-term durability of individual vs. group CBT for childhood OCD. Treatment durability was measured via assessments of participants 7 years post-treatment. These assessments measured two broad domains: (1) participant diagnostic status and symptom severity; and (2) self-reported levels of distress. As no previous study has followed up children receiving CBT for OCD later than 18 months post-treatment, we had no a priori hypothesis about the participants’ current diagnostic and symptomatic status. We did not expect a difference in long-term outcome for individual and group-based treatment conditions based on the results of the first follow-up (Barrett et al., 2005).

2. Method

2.1. Participants

The original study comprised of 77 children and adolescents (Barrett et al., 2004), 53 of which were in an active treatment condition. Because the children who were not involved in active treatment in the original study were offered treatment after the study, we attempted to contact all 77 original participants for the current follow-up. We initially attempted to contact all participants by telephone based on parent contact details on file. In the cases where contact details were out of date, attempts were first made to find updated contact details through Telephone Directory Services. In cases where this was not possible, searches were made in the Queensland Electoral Rolls. Out of the 77 original participants, we were unable to track down valid contact details for 14 of them. Of the remaining 63, 22 never answered or returned phone calls, all of whom were written to and asked to contact us. Two were unable to attend due to overseas travel, and several refused to take part due to confidentiality reasons. When many resources were directed towards locating these participants, the fact that many of the original participants were in a different developmental stage (e.g., moved away from home, change of names) and time constraints of the study meant that it was not feasible to pursue the remaining 14 participants. Based on our conversation with the family members of participants, the decisions to not be involved in the study seemed to be based on geographical reasons not symptomatology as the large majority of participants (90%) no longer lived at home and 40% were living overseas. Consequently, the final sample consisted of 38 participants (49% of the original total sample) with ages ranging from 13 to 24 years old (mean = 18.4; SD = 2.85). Nineteen of the participants were treated as part of the individual CBFT condition (current mean age = 17.6, SD = 2.75; with ages ranging from 13 to 22) and 19 participants took part in the group-based treatment (current mean age = 19.2, SD = 2.81; with ages ranging from 15 to 24). Fifty-three percent of the participants were male and 47% were female (individual = 47% male, 53% female; group = 58% male, 42% female). All participants were Caucasian. The majority of the sample (70%) was attending secondary school or University, and living with their parents (84%). The vast majority of participants (84%) reported that they were not currently receiving any psychological treatment (e.g., psychotherapy). Thirty-four percent were on Selective Serotonin Reuptake Inhibitor (SSRI) medication. Twenty-one percent reported another family member with OCD.

2.2. Measures

2.2.1. Diagnostic and symptom severity measures

2.2.1.1. Anxiety Disorders Interview Schedule – Child Version. The Anxiety Disorders Interview Schedule – Child Version (ADIS-CV; Silverman & Albano, 1996) was developed specifically to diagnose anxiety disorders in children and to differentiate these from other internalizing and externalizing disorders (Silverman & Eisen, 1992). Child and parent versions of the ADIS (ADIS-C/P) have exhibited good inter-rater and test-retest reliability (Piantamini & Bergman, 2000). The ADIS-C/P has demonstrated good sensitivity to treatment effects in both childhood anxiety research (Barrett, Dadds, & Rapee, 1996; Kendall, 1994) and childhood OCD research (Knox, Albano, & Barlow, 1996; Waters, Barrett, & March, 2001). Only the OCD-section of the Anxiety Disorders Interview Schedule was used in this study.

2.2.1.2. National Institute of Mental Health Global Obsessive-Compulsive Scale. The National Institute of Mental Health Global Obsessive-Compulsive Scale (NIMH-GOCS; Insel et al., 1983) is a clinician-rated device that consists of a single item measuring global diagnostic severity on a scale from 1 (minimal symptoms, within normal range) to 15 (very severe). The NIMH-GOCS also provides a scale of global improvement, ranging from 1 (very much improved) to 7 (very much worse), with 4 indicating no change. The NIMH-GOCS has demonstrated good to excellent test-retest reliability (Kim, Dysken, & Kuskowski, 1992).

2.2.1.3. Yale Brown Obsessive Compulsive Scale-SR. The Yale Brown Obsessive Compulsive Scale Self-Report (Y-BOCS-SR; Goodman et al., 1989) is generally considered the gold standard for measuring symptom improvement in OCD treatment studies (Stekete, Frost, & Bogart, 1996). The Y-BOCS is a 10-item self-report scale that assesses OCD on the two dimensions of obsessions and compulsions independently of each other. Each item is rated on a 5-point range from 0 (no symptoms) to 4 (extreme symptoms). Subscale scores are obtained for obsessions (items 1–5) and compulsions (items 6–10). Total scale scores range from 0 to 40. The Y-BOCS shows good reliability (α = .88 to .91) and excellent internal consistency (Goodman et al., 1989).

2.2.2. Self-report measures

2.2.2.1. Multidimensional Anxiety Scale for Children. The Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Connors, 1997) is a self-report measure that assesses anxiety symptoms in children across a number of scales, including physical symptoms, harm avoidance, social anxiety, and separation/panic. The MASC comprises 39 items assessing frequency of anxiety symptoms/concerns, with items being scored 0 (not at all) to 3 (often), and provides a total anxiety score. Research has indicated that the MASC has good internal reliability and convergent validity (March, 1997; March et al., 1997b).

2.2.2.2. The Multidimensional Anxiety Scale–Obsessive Compulsive Screen. The Multidimensional Anxiety Scale–Obsessive Compulsive Screen (MASC–OC; March, 1997) is a 20-item self-report inventory for assessing obsessive-compulsive symptoms in children and adolescents. The questions are scored on a 4-point Likert scale and the test derives a total score between 0 and 60.
Lower scores are indicative of lower levels of obsessive-compulsive symptoms.

2.2.2.3. Beck Depression Inventory-II. The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Garbin, 1988) is a widely used 21-item self-report inventory that assesses depressive symptomatology in the past two weeks. Each item is rated from 0 (no symptoms) to 3 (maximum severity). The total BDI-II score is obtained by calculating the sum of items 1–21 and ranges from 0 to 63. Internal consistency and test–retest reliability for the BDI-II is high (α = .92; α = .93; Beck, Steer, & Brown, 1996).

2.2.2.4. McMaster Family Assessment Device. The McMaster Family Assessment Device (FAD; Epstein, Baldwin, & Bishop, 1983) is a 53-item self-report questionnaire that assesses family functioning across six dimensions (problem-solving, communication, roles, affective responsiveness, affective involvement, and behavior control), in addition to an overall summary score of general functioning. The FAD items are scored along a 4-point rating scale, ranging from strongly agree to strongly disagree; higher scores indicate less healthy family functioning. The general functioning score is obtained by summing the item scores for that scale and obtaining a mean score (total/12 items). Based on previous studies, a score below 2.0 is considered in the healthy range of functioning. Research has documented significant agreement between mothers and fathers on five of the seven subscales (Akister & Stevenson-Hinde, 1992) and a series of studies have demonstrated that the FAD has adequate test–retest reliability, moderate correlations with other self-report measures of family functioning, and significant differentiation between clinic-rated healthy and unhealthy families (Epstein et al., 1983; Müller, Epstein, Bishop, & Keitner, 1985). In the present study, the general functioning subscale was used to measure overall family functioning at pre-treatment, post-treatment, and follow-up assessments.

2.2.2.5. Depression Anxiety Stress Scale-21. The Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995) is a short version of the original DASS self-report questionnaire containing 21 items assessing the severity/frequency of negative emotional symptoms. Respondents are required to rate the extent to which they experience each symptom on a 4-point Likert scale ranging from “did not apply to me at all” (0) to “applied to me very much” (3). The measure has three subscales (depression, anxiety, and stress), which are calculated by summing the scores of the relevant items. Clinical range, based on normative data, is defined as scores of 16.57 or above for stress, 12.75 or above for anxiety, and 9.26 or above for depression (Antony, Bieling, Cox, Enns, & Swinson, 1998). Studies investigating the psychometric properties of the DASS have reported good validity and reliability.

2.3. Procedure

All participants followed up in this study had completed a manual-based 14-week CBT program based on the original March and colleagues’ individual CBT program (March et al., 1994; March & Mullee, 1998). The FOCUS program (Freedom from Obsessions and Compulsions Using Cognitive-Behavioral Strategies; Barrett, 2009) involves 14 weekly sessions with the addition of two booster sessions 1 and 3 months after the completion of treatment. For more information regarding treatment protocol, post assessment, follow-up assessment, and pre–post-treatment outcome, refer to Barrett et al. (2004). At 7-year follow-up, participants were contacted by telephone or letter. Those who agreed to participate were either interviewed in person and filled out questionnaires on site, or were interviewed by telephone and returned questionnaires in the post. Assessments were standardized and involved adolescents answering the OCD-section of the Anxiety Disorders Interview Schedule. Based on the information from interviews and questionnaires, the severity of OCD was rated on the NIMH-GOCS by the same clinical child psychologist that rated the ADIS-CV. During the diagnostic interview, participants were also asked to provide information regarding additional treatment received during the follow-up period, including additional psychotherapy and pharmacology. The diagnostician was blind to treatment conditions of the study. Twelve of the participants were interviewed in person, and 26 were interviewed on the phone, depending on practical circumstances and participants’ preference. One participant did not want to talk on the phone herself and used her mother as a “translator.” Participants received a cinema ticket voucher for taking part in the follow-up. A senior clinical psychologist established group membership of participants by telephone following completion of the questionnaires.

2.4. Data analysis

One-way between-group multivariate analysis of variance (MANOVA), one-way ANOVAs, and χ² tests were conducted to examine differences associated with treatment condition.

3. Results

A series of independent sample t-tests was conducted on background and outcome variables to compare the participants who were followed up at 7 years post-treatment to the remaining cases. There were no differences on background variables between the 7-year follow-up sample and the original sample or the 18-month follow-up sample. There were a few outcome differences between the 7-year follow-up sample and the remaining original sample which are important to mention. Participants who were not followed up 7 years post-treatment had significantly higher NIMH (M = 5.76, SD = 3.75 vs. M = 4.00, SD = 2.15, t(75) = 2.24, p < .05) and CY-BOCS ratings (M = 15.59, SD = 9.82, vs. M = 9.12, SD = 8.01, t(73) = 2.89, p < .05) when measured just after treatment. However, at 3-month follow-up, this pattern was reversed, and the participants who were followed up 7 years later had significantly higher scores on both the NIMH (M = 4.43, SD = 2.25, vs. M = 2.48, SD = 1.28, t(44) = 3.62, p < .05) and the CY-BOCS (M = 10.91, SD = 7.18, vs. M = 5.78, SD = 6.25, t(43) = 2.56, p < .05). Analyses comparing the 7-year follow-up sample to the 18-month follow-up sample showed no differences on outcome variables. Due to the inconsistent pattern of differences at post-treatment, and the fact that we found no background or outcome variable differences at 18 months follow-up, we concluded that there are no major differences between the sample we managed to reach at 7 years post-treatment and the remaining sample on background and outcome variables.

Initial analyses examined associations between a range of personal characteristics, including age, and treatment condition. Results of a one-ANOVA with age as the outcome variable and treatment condition as the independent variable indicated no significant effect for treatment condition. Non-significant differences were found also for a range of indicators (gender, setting, medical treatment, education, living situation, current psychological treatment). Seven years post-treatment, 87% of participants were OCD diagnosis free with 79% responding in the individual condition and 95% responding in the group condition. Chi-square analyses used to test differences in responses for individual and group conditions revealed non significant differences 12 months (χ² [1] = 1.39, not significant) 18 months (χ² [1] = .12, not significant); and 7 year (χ² [2] = .533, not significant). There were no significant differences on the NIMH, three quarters (74%) of the sample scored no higher than 4 (no change), with over half of those reporting a score of 1 (very much improved) Fig. 1.
A one-way between-group MANOVA with treatment condition as the independent variable (IV) and six symptom measures (Y-BOCS, MASC; MASC–OC; BDI-II; DASS-21 and the FAD) as dependent variables (DV), and age in years as covariate was conducted to evaluate long-term outcome on diagnostic measures. Means and SDs for the six self-report measures are presented in Table 1. There were no significant multivariate effects (Pillai's Trace: \( F(6, 28) = 1.583, \text{ns} \)) for these six measures as a group. However, there was a significant multivariate effect for age (Pillai's Trace: \( F(6, 28) = 2.545, p < .05 \)). Follow-up examination of univariate effects (F tests) suggested that both age and group membership had significant effects on BDI-II. A follow-up two-way between-groups ANOVA was conducted with BDI-II as the DV and with group membership and age as independent variables, where age was collapsed into two levels for (13–18 vs. 19–24). There was a significant main effect for treatment condition (\( F(1, 33) = 4.850, p < .05 \)) such that those in the individual condition reported significantly higher average scores on the BDI-II (\( M = 7.68 \)) than those in the group condition (\( M = 3.59 \)). As such, all of the participants were under the cut-off levels for mild depression (Sorensen, Friis-Hasche, Haghfelt, & Bech, 2005). Individual group participants were far more likely to report depressive symptoms than group participants. Also, the main effect for age (\( F(1, 33) = 4.903, p < .05 \)) was significant such that those in the 19–24-year old age group (\( M = 9.644 \)) reported higher average BDI-II scores compared their younger counterparts (13–18; \( M = 3.50 \)). That is, older participants were far more likely to report depressive symptoms than younger participants. The two-way interaction between age and treatment condition was not significant, indicating that the effects for treatment condition and age group were independent of one another. As a check, a follow-up MANOVA was completed without BDI-II and with the two age groups included as IV. Both the multivariate and univariate effects were non-significant.

### Table 1

Means and standard deviations for diagnostic and symptom measures at follow-up points.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Post-treatment</th>
<th>12-Month follow-up</th>
<th>18-Month follow-up</th>
<th>7-Year follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Individual group</td>
<td>Individual group</td>
<td>Individual group</td>
<td>Individual group</td>
</tr>
<tr>
<td>NIMH-GOCS</td>
<td>Mean 3.50</td>
<td>3.31</td>
<td>3.10</td>
<td>2.96</td>
</tr>
<tr>
<td></td>
<td>SD 2.30</td>
<td>2.16</td>
<td>2.02</td>
<td>1.71</td>
</tr>
<tr>
<td>CY-BOCS</td>
<td>Mean 8.36</td>
<td>8.28</td>
<td>8.84</td>
<td>7.42</td>
</tr>
<tr>
<td></td>
<td>SD 7.33</td>
<td>7.33</td>
<td>6.67</td>
<td>7.37</td>
</tr>
<tr>
<td>MASC</td>
<td>Mean 50.37</td>
<td>39.09</td>
<td>46.18</td>
<td>30.21</td>
</tr>
<tr>
<td></td>
<td>SD 15.31</td>
<td>18.00</td>
<td>14.27</td>
<td>13.96</td>
</tr>
<tr>
<td>MASC–OC</td>
<td>Mean 20.55</td>
<td>16.58</td>
<td>17.5</td>
<td>12.39</td>
</tr>
<tr>
<td></td>
<td>SD 10.17</td>
<td>12.61</td>
<td>8.29</td>
<td>11.02</td>
</tr>
<tr>
<td>CDI</td>
<td>Mean 6.26</td>
<td>3.35</td>
<td>3.59</td>
<td>2.56</td>
</tr>
<tr>
<td></td>
<td>SD 6.59</td>
<td>4.82</td>
<td>3.17</td>
<td>4.71</td>
</tr>
<tr>
<td>BDI-II</td>
<td>Mean 7.68</td>
<td>3.59</td>
<td>7.33</td>
<td>6.67</td>
</tr>
<tr>
<td></td>
<td>SD 9.40</td>
<td>6.26</td>
<td>– –</td>
<td>– –</td>
</tr>
</tbody>
</table>

4. Discussion

Results of this follow-up study showed around 87 percent of the sample were diagnosis free 7 years post-treatment. Our results add weight to the findings reported in the original CBT controlled trial of Barrett et al. (2004, 2005) as the large majority of participants had not received or begun any additional therapy or medication since the completion of 18 month follow-up. The current study supports research showing that gains made during treatment can be maintained long term (March et al., 1994) and provides the strongest support to date for long-term stability of CBT treatment effects for children with OCD. Treatment condition of CBT delivery did not appear to influence OCD diagnosis or symptom level outcome. In fact, there was a non-significant trend for a higher percentage of remission in the group-based condition. This finding is consistent with other research showing no significant difference in treatment condition whether it be individual weekly, intensively (Franklin et al., 1998) or group (Barrett et al., 2004; Fischer, Himle, & Hanna, 1998), and in contrast to studies that suggest group-based treatment produces less success when compared with individual strategies (Fischer et al., 1998; Thienemann et al., 2001). The results also contradict previous reports that many patients do not respond optimally to treatment (Stanley & Turner, 1995).

This follow-up study showed that participants in the individual treatment condition were more likely to report depressive symptoms than group participants. It is possible that the social support and isolation buffer that group treatment might have represented for group participants prevented later development of depressive symptoms. Social problems are frequently reported among young OCD-sufferers (Piacentini et al., 2003). This could be used as an argument for providing group CBT rather than individual CBT for OCD clients. Although outcome on OCD symptoms is likely to be equal, group treatment might target co-morbid depressive symptoms through the social support and social skills training that the group treatment format represents. This argument is further strengthened by the fact that the original study (Barrett et al., 2004) found larger reductions in depression symptom scores in the group condition (measured by the Child Depression Inventory, CDI; Kovacs, 1992).

This follow-up also showed that older participants were more likely to report depressive symptoms than younger participants. The BDI-II might be less sensitive to depressive symptoms among the younger participants, as it is more commonly used for older respondents. However, our findings are in line with research showing that depressive symptoms are generally found to escalate through late adolescence (Wight, Sepúlveda, & Anshenensel, 2004). The older participants have lived with OCD symptoms for a longer time, which might explain the higher BDI-II scores.
period of time, and they may not have the familial support they did when they were younger. It is important to note that although estimates suggest that Major Depressive Disorder is ten times more prevalent in OCD patients than in the general population (Denys, Tenney, Van Megan, De Geus, & Westenberg, 2004), the participants in this follow-up study generally showed low levels of depressive symptoms. This might imply that the CBT received seven years previously has prevented further development of depressive symptoms and depressive disorders.

While this treatment study is the longest follow-up study to date published for child OCD, the results are compromised by the lack of statistical power associated with the small sample size. Lack of power may account for the lack of differences found across groups; hence, larger studies need to be conducted to attempt to replicate findings reported here. Reliability checks of ADIS-interviews were not possible as most of them were conducted on the telephone. However, the diagnostician conducting the ADIS-interviews has been trained in the ADIS by its’ author, Dr. Wendy Silverman, and written reports from these interviews were checked by a senior clinical psychologist. We cannot rule out the possibility of respondent bias in the sample, due to the number of original participants that did not respond to our contact attempts. We only collected self-report data from participants, and have no information from parents or other significant others regarding symptom levels or functioning. This may be a potential bias in our dataset as the results are based on participants “willing” to be involved in the study. This finding alone may suggest a greater level of wellness of those willing to be involved compared to participants who were not. It should also be noted that the sample consisted solely of Caucasian participants, which may limit generalizability of the results. Finally, the majority of participants were enrolled in an educational institution (e.g., secondary school or University) and as such may not be representative of the general population.

Although this study does not compare family-involvement to family non-involvement; sustainability of family-based approaches justifies inclusion of parents and siblings in CBT treatments for childhood OCD. This is also in line with coupled other research in this area (Storch et al., 2007; Valderhaug, Larsson, Götestam, & Picentini, 2007). There is a discussion in the child anxiety field about the role of parental involvement for treatment outcome, and it has been suggested that parental involvement only benefits outcome when parents are anxious themselves (Kendall, Hudson, Gosch, Flannery-Schroeder, & Suveg, 2008). Difficulties in establishing the role of parental involvement for outcome is partly due to the fact that details of what parental involvement in child treatment actually entails are often vaguely described in studies (Fjermestad, Hauge, Heievar, & Øst, 2009). The treatment program used in the original study (Barrett et al., 2004) clearly describes the details of the family condition, which included psychoeducation, problem-solving skills, and strategies to reduce parental involvement in the child’s symptoms. At least one parent from each family was required to attend each parent session, and siblings were invited to sessions. Thus, the treatment actively involves parents and the manual provides instructions of how to work with parents and actively involve them.

Given the above results, it appears that CBT is an effective long-term treatment approach for the management of childhood OCD. Group CBT is equally effective to individual CBT, and might so be justified based on cost-benefit analysis as well as clients’ and clinicians’ preferences. The dissemination of evidence-based protocols such as the FOCUS manual (Barrett, 2009) can provide significant and lasting results reducing suffering for children and adolescents with OCD, and preventing the young people from carrying the condition into adulthood.

Acknowledgements
We thank John Ellis Bradley and Peter Grimbeek for their help on statistical analysis.

Disclosure: The authors report no conflicts of interest. This work was supported in part by grants from the Meltzer Foundation Research Grant, University of Bergen, Norway

References