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Journal of Anxiety Disorders 22 (2008) 959–968

Journal of Anxiety Disorders

Promoting walking as an adjunct intervention to group cognitive behavioral therapy for anxiety disorders—A pilot group randomized trial

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Received 2 February 2007; received in revised form 24 September 2007; accepted 25 September 2007

Abstract

A group randomized trial of adding a home-based walking program to a standard group cognitive behavioral therapy (GCBT + EX) was compared with groups receiving GCBT and educational sessions (GCBT + ED). The study was implemented in an outpatient clinic providing GCBT for clients diagnosed with panic disorder, generalized anxiety disorder or social phobia. Pre- and post-treatment measures included the self-report depression, anxiety, and stress scale (DASS-21) and measures of physical activity. From January 2004 to May 2005, six groups were allocated to GCBT + EX ($n = 38$) and five to GCBT + ED ($n = 36$). Analysis of covariance for completed cases (GCBT + EX, $n = 21$; GCBT + ED, $n = 20$), adjusting for the group design, baseline DASS-21 scores, and anxiety diagnosis showed significant effect for GCBT + EX on depression, anxiety, and stress (regression coefficients = −6.21, −3.41, and −5.14, respectively, $p < 0.05$) compared to the GCBT + ED. The potential of exercise interventions as adjunct to GCBT for anxiety disorder needs to be further explored.

Keywords: Physical activity; Anxiety disorders; Group randomized trial; Intervention

1. Background

Anxiety disorders are among the most common mental health conditions in most developed countries with a yearly prevalence, all diagnosis combined, as high as 17% in the US (Kessler et al., 1994) or 10% in Australia (Andrews & Hall, 1999) and an estimated lifetime prevalence of 28.8% (Kessler, Berglund, Demler, Jin, & Walters, 2005). Anxiety disorders are recurrent with an increased risk of co-morbid depressive and addictive disorders developing if they remain untreated.

Despite existing effective pharmacological and psychotherapies, many sufferers report they prefer to manage the condition themselves (Issakidis & Andrews, 2002). Exercise is one of the self-help treatments that might be considered acceptable by health practitioners (Burbach, 1997; Mayer & Broocks, 2000) and by

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0887-6185/$ – see front matter © 2007 Published by Elsevier Ltd.
doi:10.1016/j.janxdis.2007.09.010

Exercice = traitement reconnu par les professionnels et les patients d'auto-assistance.

patients (Jorm et al., 2004). Its anxiolytic and antidepressant effect has been documented in a number of meta-analyses (Calfas & Landers, 1998; Lawlor & Hopker, 2001; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991; Stathopoulou, Powers, Berry, Smits, & Otto, 2006) and qualitative reviews (Burbach, 1997; Byrne & Byrne, 1993; Dunn, Trivedi, & O'Neal, 2001; O'Connor, Raglin, & Martinsen, 2000; Paluska, Schwenk, Paluska, & Schwenk, 2000). These reviews identified the paucity of intervention with clinical samples diagnosed with anxiety disorders, as opposed to depression (Dunn et al., 2001; Stathopoulou et al., 2006) or with anxiety diagnoses other than panic disorders (O'Connor, Raglin et al., 2000; O'Connor, Smith, & Morgan, 2000), therefore precluding establishing exercise efficacy as a mono or adjunctive therapy for anxiety disorders.

Biological and psychological properties of exercise have been suggested as the underlying mechanisms that might explain the effects of physical activity on anxiety such as providing distraction from unpleasant thoughts, improved response to stress, improved self-esteem or self-efficacy, all provide theoretical rationale for the improved psychological benefits by exercising; however, none of these hypotheses have been confirmed by sufficient empirical evidence (Hughes, 1984; O'Connor, Raglin et al., 2000; O'Connor, Smith et al., 2000; Paluska et al., 2000; Salmon, 2001). Most investigations on exercise and clinically anxious populations have focused on panic patients who often abstain from exercise for fear that aerobic activity may trigger symptoms resemble to panic attack (palpitations, sweating). Thus, from a behavioral perspective exposure to aerobic exercise might help them to correctly assess physiological arousal and reduce their fear (Broocks et al., 1998; Hughes, 1984). Non-controlled studies and case reports with panic patients supported the observation of improved symptoms with vigorous or moderate-intensity exercise (Dratcu & Dratcu, 2001; Martinsen, Strand, Paulsson, & Kaggestad, 1989; Sexton, Maere, & Dahl, 1989) and that exercise is safe for these patients (O'Connor, Smith et al., 2000). To date, only one randomized controlled trial assessed the therapeutic effect of vigorous-intensity exercise (jogging) compared to a drug treatment of proven efficacy and to a placebo on 46 outpatients diagnosed with panic disorder and agoraphobia. The pharmacological treatment improved anxiety symptoms significantly earlier, but at the end of the 10-week treatment exercise showed a significant effect over placebo and was not different to medication on all clinical measures, with the exception of Clinical Global Improvement by observer rater (Broocks et al., 1998).

Confirming that exercise is effective adjunct intervention is important since regular moderate-intensity physical activity (such as brisk walking) confers many other physiological health benefits (Pate et al., 1995). This may be particularly important due to the impaired fitness among individuals with anxiety disorders, which has been documented to be lower than the general population (Martinsen et al., 1989; Meyer, Brooks, Bandelow, Hillmer-Vogel, & Ruther, 1998; Taylor, Sallis, & Needle, 1985). Furthermore, epidemiological studies suggest that depressed and anxious patients are at a greater risk of cardiovascular disease morbidity and mortality than the general population (Fleet & Beitman, 1998; Sheps & Sheffield, 2001). Thus maintaining regular active lifestyle might be important on that ground alone.

Cognitive Behavior Therapy (CBT) is one of the most commonly used efficacious therapy for treating anxiety disorders (Chambless & Ollendick, 2001; Mitte & Mitte, 2005). Prescribing a more active lifestyle is a common component of the group CBT (Manicavasagar, 1995), and mental health clinicians are often encouraged to consider adding exercise to their preferred therapeutic armamentaria (Mayer & Broocks, 2000; Stathopoulou et al., 2006). However, the effects of exercise regimen as adjunctive to CBT have not yet been tested with clinically diagnosed anxiety disorders.

The aim of this study was to compare the treatment outcomes of patients receiving home-based walking program adjunctive to GCBT to those receiving the usual GCBT advice and additional educational sessions only.

2. Methods

2.1. Study design and participants

A group randomized trial was conducted from January 2004 to mid-May 2005. Participants were recruited from a free-of-charge outpatient anxiety clinic located in South Western Sydney. In the usual clinic procedures, referred clients were assessed for the presence, duration, and severity of any anxiety disorders using the Structured Clinical Interview for the DSM-IV (First, Spitzer, Gibbon, & Williams, 1997) by a psychologist trained in the use of this measure and other tools to assess co-morbid disorders (Wagner, Manicavasagar, & Silove, 2002). Clinicians were only involved in the study after they had achieved perfect inter-rater agreement with the clinic director based on audio taped interviews.

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critères de sélection

To be eligible for the study clients had to meet the DSM-IV criteria for primary diagnosis of generalized anxiety disorder, panic disorder, or social phobia, and to be offered a GCBT. Fig. 1 presents the study flowchart. Of the 196 referrals, 192 were invited to attend the first clinical interview (4 patients were mistakenly referred), 25 did not complete the clinical interview or were new referrals in the last month, 25 did not have a primary diagnosis of anxiety and were not qualified for receiving treatment in the clinic, and 57 had a primary diagnosis of anxiety but were offered individual-based CBT for various reasons (11 clients had other co-morbidities and the rest either refused or could not commit to a group timetable or had difficulties communicating in English). Thus, a total of 85 clients met the study eligibility criteria.

Taille de l'échantillon

Eligible clients were given an information letter explaining about the additional walking program being offered with the usual treatment. The letter also emphasized that participation was optional and that non-participation would not compromise their treatment. Three randomized lists were computer generated to ensure that the intervention was balanced within each diagnosis. Once a group of eight people of the same anxiety diagnosis was formed, the research center randomly allocated the group to receive either an exercise enhanced GCBT (GCBT + EX) or the usual GCBT plus three educational meetings (GCBT + ED). The University of New South Wales and the South West Sydney Area Health Service Human Ethics Research Committees approved this study.

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2.2. Data collection

Following the first clinical interview, clients completed a battery of validated self-report measures, at pre- and post-treatment (8 and 10 weeks) according to the usual clinic procedures (Wagner et al., 2002). Self-report physical activity measures, derived from the Active Australia Questionnaire (Australian Institute of Health and Welfare, 2003), were added to the clinic assessments at both time points.

The Active Australia Questionnaire, with established criterion validity (Spearman $r = 0.28–0.33$, ICC = 0.6–0.8) (Timperio, Salmon, Bull, & Rosenberg, 2002) and repeatability (kappa = 0.5, 95% confidence interval = 0.43–0.59) (Brown, Trost, Bauman, Mummery, & Owen, 2004), assessed physical activity behavior in the previous week. One modification was made to the question about walking, which was split into two questions for this study: ‘‘walking continuously to get to/from places for at least 10 min’’ was asked separately from ‘‘walking continuously for exercise or recreation,’’ the latter question being the specific focus of the current

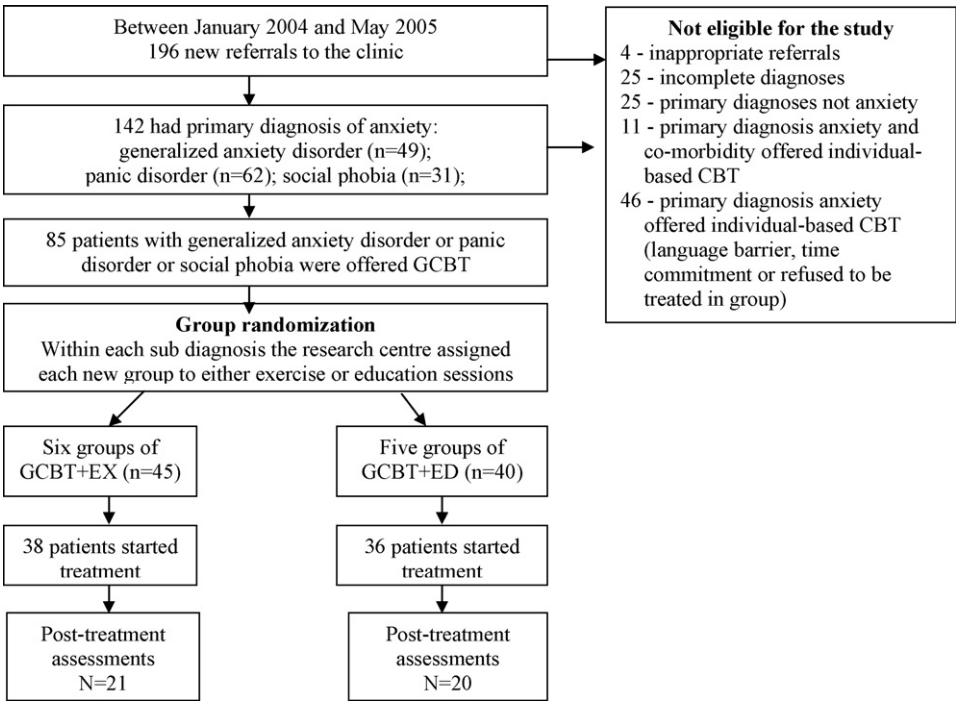

Fig. 1. Study flowchart.

program. Participants were asked to recall the number of times and the total minutes they walked "for exercise and recreation" in the last week. The other physical activity questions asked about the number of sessions and minutes participating in other moderate and vigorous physical activities in the last week, not including household chores or vigorous yard work.

2.3. Outcome measures

Primary outcomes were change in depression, anxiety, and stress scores, as measured by the Depression Anxiety Stress Scale (DASS-21). The 21-item DASS is a standardized measure and has Australian norm to assess severity of depression (7 items), anxiety (7 items), and stress (7 items) symptoms (Lovibond & Lovibond, 1995).

Secondary outcomes were change in minutes of walking "for exercise and recreation" from baseline to post-treatment. Total minutes of physical activity were calculated by summing up the minutes spent on exercise walking and other moderate and vigorous physical activities in the last week. Minutes of vigorous-intensity physical activity were doubled by a factor of 2 to account for its greater intensity as in the Active Australia Questionnaire protocol (Australian Institute of Health and Welfare, 2003). Participants were classified into three physical activity levels based on their accumulated total minutes (of all activities):

1. Sufficiently active: accumulating $\geq$150 min a week of exercise walking and/or moderate and vigorous physical activity reflecting compliance with current physical activity recommendations.
2. Moderately active: accumulating $\geq$30–149 min a week of any physical activity.
3. Inactive: accumulating $<$30 min a week of any physical activity.

2.4. Intervention and comparison group activities

2.4.1. The usual GCBT

The usual GCBT consisted of a 90-min session delivered once a week for 8 weeks for panic disorder and generalized anxiety disorder clients, or 10 weeks for clients diagnosed with social phobia. The treatment programme used standard behavioral and cognitive techniques as well as diagnosis specific techniques. It was accompanied by homework and exercises as a reminder of the skills learned in class. Treatment was standardized by the use of three manuals and guidelines developed in the clinic for each of the above diagnoses (Wagner, Dudaee-Faass et al., 2004; Wagner, Joukhador et al., 2004; Wagner, Joukhador, Manicavasagar, & Frilingos, 1999). As part of the GCBT manual, all clients received a brief general discussion about the importance of a healthy lifestyle including general information about the benefits of exercise and nutrition. All group sessions were facilitated by an experienced clinical psychologist and a clinical psychology student trainee.

2.4.2. Intervention group (GCBT + EX)

The program was delivered and monitored by an exercise trainer who met participants at the end of the GCBT sessions. The program aimed to gradually increase the number of 30-min sessions of moderate-intensity exercise clients engaged in, such as brisk walking, at the client's own choice of days, time, and environment. The goal being that at the end of the program clients would engage in brisk walking or other exercise five times or more a week for at least 150 min in total, in line with current Australian physical activity recommendations (Commonwealth Department of Health and Ageing, 1999). Pedometers were given to each participant to monitor their steps and a logbook to record the number of walks they did, the number of daily steps (or steps for each walk) and any other exercise they did in addition to walking. A weekly target of frequency and duration of the walks was introduced to each participant.

During the first three GCBT weeks, the program meetings were extended by 30 min to discuss the benefits of exercise, provide instructions for pedometer use and how to distinguish moderate-intensity from vigorous-intensity activities based on heart rate. In the subsequent weeks, meetings were shorter ($\leq$15 min) and focused on collecting logbooks, introducing the weekly targets and reinforcing exercise adherence.

2.4.3. Comparison group (GCBT + ED)

This group received three educational meetings (at the second, third, and sixth GCBT meetings) to balance the additional contact time given to the GCBT + EX groups. These meeting were conducted with the same exercise trainer but with a focus on healthy eating (i.e. the food pyramid, vitamin and mineral, type of fats, and fat and salt contents in food).

2.5. Statistical analysis

The intention to treat (ITT) principle was used to determine intervention effects first for completed cases (with pre- and post-measurements) and second by imputing missing values with the baseline data. Paired

t-tests for dependent sample were used to test significant within-individual changes in depression, anxiety, and stress scores from baseline to after treatment. Analysis of covariance (ANCOVA) was conducted with follow-up DASS-21 scores as the dependent variables, study allocation as the main effect after adjusting for baseline DASS-21 scores and for anxiety diagnoses. Additional ANCOVA was conducted to test possible interactions between diagnosis and the intervention. All ANCOVA analyses were adjusted for heterogeneity of variance (participants in the same group are more similar than participants in different groups) as groups and not individuals were allocated to treatment and comparison arm. The intervention effect sizes were computed as the standardized difference between two means using Cohen's *d* formula (Cohen, 1988), with negative sign indicating improvement. We used the SAS statistical software (Version 9.1 2002–2003, SAS Institute Inc., Cary, NC) in all analyses.

3. Results

During the study period, 85 clients who were eligible for the study (Fig. 1) formed 11 groups: 6 were randomly allocated to GCBT + EX ($n = 45$) and 5 to receive GCBT + ED ($n = 40$), but only 84% of the GCBT + EX ($n = 38$) and 90% of the GCBT + ED ($n = 36$) started the treatment (i.e., attended first or second treatment meeting). 74=n

Table 1 presents the sociodemographic characteristics of the two study groups and differences in DASS-21 scores and physical activity levels at baseline. No significant differences were found by age, gender, employment status, marital status, and by clinical diagnoses between the groups, as indicated by the chi-square statistics. Similarly, there were no significant differences between groups in DASS-21 mean scores at baseline or in means sessions and minutes of physical activity (using non-parametric tests) or in the distribution

Table 1
Participants' characteristics by study allocation and treatment completion

	GCBT + EX, $n = 38$	GCBT + ED, $n = 36$	Statistics (p-value)
Age (mean, S.D., years)	38.7 (12.1)	39.4 (11.9)	$t_{(71)} = 0.24$ (0.81)
Sex			
Female (%)	71	86	$\chi^2_{(1)} = 2.68$ (0.10)
Employment status			
Full or part time (%)	49	41	$\chi^2_{(1)} = 0.38$ (0.54)
Family status			
Single (%)	32	36	
Partnered/married (%)	38	45	$\chi^2_{(2)} = 1.17$ (0.56)
Other (%)	29	18	
Clinical diagnoses			
Generalized anxiety disorder (%)	29	42	
Panic disorder (%)	34	36	$\chi^2_{(2)} = 2.19$ (0.33)
Social phobia (%)	37	22	
DASS-21 ($n = 68$)			
Depression (mean, S.D.)	20.7 (12.6)	16.4 (11.3)	$t_{(66)} = -1.48$ (0.14)
Anxiety (mean, S.D.)	19.0 (9.7)	18.6 (10.7)	$t_{(66)} = -0.16$ (0.87)
Stress (mean, S.D.)	22.0 (8.8)	21.6 (9.1)	$t_{(66)} = -0.17$ (0.87)
Past week physical activity ($n = 67$ baseline)			
Median sessions (IQR)[a]	2 (1–5)	2 (0–5)	$\chi^2_{(1)} = 0.00$ (1.00)
Median minutes (IQR)	110 (10–205)	90 (0–210)	$\chi^2_{(1)} = 0.04$ (0.84)
Physical activity levels			
Inactive (<30 min) (%)	36	35	
Moderately active (30–149 min) (%)	18	21	$\chi^2_{(2)} = 0.06$ (0.97)
Sufficiently active (≥150 min) (%)	46	44	
Adherence[b] to GCBT treatment (%)	79	68	$\chi^2_{(1)} = 1.41$ (0.24)

[a] IQR: Inter-quartile range.
[b] Attended 5 out of 8 meetings or 7 out of 10 of social phobia.

of physical activity levels. Stratification of physical activity levels by anxiety diagnosis (data not shown) indicated that the highest proportion of inactivity (50.0%) and the lowest proportion of "sufficiently active" (36.4%) were reported by panic disordered clients.

Adherence rate was determined by the clinic as attending at least two thirds of the GCBT meetings, which was 5 out 8 meetings for panic and generalized anxiety disorders clients and 7 out of 10 meetings for social phobia groups. About 73% of the participants ($n = 54$) adhered to the GCBT treatment (79% in the GCBT + EX and 69% in the GCBT + ED, $p = 0.35$). However, self-reported mental health scores at baseline and at post-treatment were available only for 55% ($n = 41$) of the clients who started the treatment, defined as "completers."

Table 2 compared "completers" to those who were lost to follow, defined as "non-completers." Non-completers had significantly lower mean weekly sessions ($p = 0.03$) and mean minutes ($p = 0.04$) of total physical activity than completers and had a higher proportion of "inactivity" than completers (48% vs. 26%, $p = 0.17$), suggesting that those who were more active were more likely to complete treatment. However, there were no significant differences between "completers" and "non-completers" in sociodemographic characteristics, diagnoses distribution or in DASS-21 mean scores at baseline.

Significant reductions in depression, anxiety, and stress scores were documented for all clients with completed post-treatment measurements. Clients with generalized anxiety disorder ($n = 13$) experienced the greatest mean changes for depression (−8.7, 95% CI: −15.5; −1.8) for anxiety (−8.8, 95% CI: −10.9; −6.6) and for stress (−7.1, 95% CI: −9.5; −4.6) compared to the other two diagnoses. For panic disorder ($n = 12$) the mean difference for depression score was −2.5 (95% CI: −5.6; 0.51), for anxiety score it was 4.1 (95% CI: −8.8; 0.54) and for stress score it was 4.9 (95% CI: −8.6; −1.1). For social phobia ($n = 15$) the mean difference for depression score was −7.2 (95% CI: −14.5; 0.02), for anxiety score it was −3.5 (95% CI: −8.0; 1.1) and for stress it was −1.0 (95% CI: −9.2; 7.17).

Stratification by study allocation revealed that the mean changes in the intervention group were sig-

Table 2
Participants' characteristics by complete and non-complete data

	Completers, $n = 41$	Non-completers, $n = 33$	Statistics (p-value)
Age (mean, S.D., years)	41.0 (12.5)	36.5 (10.8)	$t_{(71)} = -1.65$ (0.10)
Sex			
Female (%)	76	81	$\chi^2_{(1)} = 2.33$ (0.56)
Employment status			
Full or part time (%)	50	39	$\chi^2_{(1)} = 0.71$ (0.40)
Family status			
Single (%)	38	29	
Partnered/married (%)	44	39	$\chi^2_{(2)} = 1.91$ (0.38)
Other (%)	18	32	
Clinical diagnoses			
Generalized anxiety disorder (%)	32	39	
Panic disorder (%)	37	33	$\chi^2_{(2)} = 0.48$ (0.78)
Social phobia (%)	32	27	
DASS-21			
Depression (mean, S.D.)	17.7 (12.4)	20.1 (11.7)	$t_{(66)} = 0.79$ (0.43)
Anxiety (mean, S.D.)	17.6 (9.4)	20.7 (11.1)	$t_{(66)} = 1.21$ (0.23)
Stress (mean, S.D.)	20.7 (8.4)	23.5 (9.4)	$t_{(66)} = 1.28$ (0.21)
Past week physical activity			
Median sessions (IQR)[a]	2 (1–6)	1 (0–4)	$\chi^2_{(1)} = 4.91$ (0.03)
Median minutes (IQR)[a]	150 (20–300)	45 (0–180)	$\chi^2_{(1)} = 4.09$ (0.04)
Physical activity levels (three-item for exercise)			
Inactive (<30 min) (%)	26	48	
Moderately active (%)	21	17	$\chi^2_{(2)} = 3.55$ (0.17)
Sufficiently active (%)	53	35	

[a] IQR: inter-quartile range.

Table 3
Regression coefficients for follow-up mental health score (DASS-21) for main intervention effect and effect modification for completers and intervention effect by imputation for missing values at follow-up

	Regression coefficients[a] (S.E.)		
	Depression	Anxiety	Stress
By completers (Time 1 and Time 2)	$n = 40$, 11 groups	$n = 41$, 11 groups	$n = 41$, 11 groups
GAD (ref)	0.00	0.00	0.00
Social phobia	−7.57 (2.01)	4.92 (1.08)	7.10 (2.53)
Panic disorder	3.51 (1.54)	5.44 (0.99)	2.86 (1.45)
Intervention[b]	−6.21 (1.42)[§]	−3.41 (0.79)[§]	−5.14 (1.89)[§]
ANCOVA with interaction			
GAD (ref)	0.00	0.00	0.00
Social phobia	12.4 (2.45)	6.63 (0.74)	13.3 (0.63)
Panic disorder	5.0 (1.78)	7.11 (1.59)	2.91 (2.57)
Intervention[b]	−1.33 (2.88)	−0.81 (0.98)	−1.79 (1.27)
GAD × intervention	0.00	0.00	0.00
Social × intervention	−9.13 (2.99)[§]	−3.69 (1.12)[§]	−10.3 (1.11)[¶]
Panic × intervention	−5.07 (3.62)	−3.99 (2.38)	−0.74 (3.26)
By imputation for missing values at follow-up	$n = 68$, 11 groups	$n = 68$, 11 groups	$n = 68$, 11 groups
GAD (ref)	0.00	0.00	0.00
Panic disorder	2.13 (2.21)	2.22 (1.64)	3.69 (2.30)
Social phobia	2.01 (1.61)	2.74 (1.46)	1.40 (1.63)
Intervention[b]	−2.76 (1.41)	−1.05 (1.26)	−2.23 (1.71)

[a] Coefficients adjusted for group design and baseline measures.
[b] Reference category = comparison GCBT + ED.
[§] $p < 0.05$.
[¶] $p < 0.001$.

nificantly higher (−9.2) than the control (−2.6) on depression scores, with a medium effect size of −0.67 (95% CI: −1.29; −0.01) but not significantly different for anxiety scores (−6.1 vs. −4.6) with a small effect size = −0.16 (95% CI: −0.77; 0.45) and for stress scores (−5.8 vs. −2.8) with a small effect size of −0.32 (95% CI: −0.93; 0.30). However, the ANCOVA for ''completers'' (Table 3) indicated that after adjusting for DASS-21 scores at baseline, anxiety diagnoses and for the group design, a significant intervention effect on each of the mental health outcomes were shown; the GCBT + EX group experienced greater decline in depression score ($\beta = -6.2$, $p = 0.001$), in anxiety score ($\beta = -3.41$, $p = 0.002$), and in stress score ($\beta = -5.4$, $p = 0.022$) than the GCBT + ED control group. These reductions corresponded to large adjusted effect sizes for depression, anxiety, and stress scores (−1.39, −1.36, and −0.85, respectively). The intervention effects were attenuated and became non-significant, however, when missing values of non-completers were imputed with baseline values. point faible

A significant interaction between intervention and anxiety diagnoses was found in subsequent ANCOVA (see Table 3), indicating that social phobia clients allocated to the intervention experienced significantly greater improvement on depression, anxiety, and stress scores compared to clients with generalized anxiety allocated to the intervention. For panic disorder and generalized anxiety disorders being allocated to the intervention did not modify the treatment results.

To determine whether the effect seen among completers could be attributed to increased physical activity levels, a between group comparison on walking and total minutes of physical activity was examined. ANCOVA adjusting for group design, baseline walking, and anxiety diagnoses, revealed that the mean change in minutes of walking in the GCBT + EX group was significantly different than the comparison group (+21 min, $p = 0.02$). However, there was no significant between group differences for mean change in total physical activity minutes. At post-treatment, a similar proportion of clients (33%) in both groups increased their physical activity levels by at least one level (i.e., from inactive to moderately active) and this group exhibited the highest mean changes for depression, anxiety, and stress scores (−8.6, $p = 0.03$; −8.4, $p = 0.01$; 5.2,

$p = 0.09$, respectively), whereas those remaining sufficiently active at both measurements decreased or remained inactive had experienced smaller reductions in symptoms (about half of the mean change scores noted above) which were not statically significant.

4. Discussion

This study examined the additional benefits of incorporating a home-based walking program regulated by pedometers as an adjunct to GCBT in a public clinic specialized in treating anxiety disorders. Findings suggest that improvement in mental health outcomes were greater among those receiving the intervention, but the effect differed by anxiety diagnoses. The added benefits of the intervention were most marked for clients with social phobia, with results for clients with panic disorder or generalized anxiety disorder remaining questionable.

The intervention effect, however, could not be attributable to achieving the recommended amount of aerobic exercise, as recently demonstrated in the case of mild to moderate depression (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005). Further, the significant increase in minutes of walking in the intervention group did not translate into significant differences in total physical activity levels between the groups, suggesting that the intervention program was not more effective than educational sessions for behavior change. Regardless, the fact that those who made substantial improvement in their physical activity experienced the greatest improvement on DASS-21 highlights the possibility that the process of "adopting" an active lifestyle was associated with psychological benefits.

Several methodological limitations must be acknowledged before further discussion. This study had limited statistical power to demonstrate significant effects, particularly in light of the known efficacy of CBT (Mitte & Mitte, 2005; Otto, Smits, & Reese, 2004). Consequently, it is not possible to accurately interpret the absence of statistical findings for the analyses that involved the separate diagnostic groups. It is possible that some observed effects could be a result of unmeasured confounders, such as simultaneous use of CBT and pharmacotherapy that were not accounted for in the analysis. The large proportion (45%) of missing information on post-treatment mental health outcomes could also bias the outcome. Although there were no significant differences between completers and non-completers by baseline mental health status, patients who did not have completed measures at post-treatment were less active at baseline and might also respond differently to the GCBT therefore biasing the outcome in an unforseen direction. Another limitation includes use of a self-report physical activity measure, which was not tested for its validity in this population. Differential recall bias by diagnoses could have further led to misclassification of physical activity estimates in different directions.

points faibles

These limitations withstanding, few explanations lend support for a true intervention effect. First, process evaluation of this study indicated that attendance rate to the program meetings was stable and highest for clients with social phobia compared to other diagnoses (Phongsavan et al., in review), which is in line with the significant interaction effects seen for this particular diagnosis. Likewise, the lack of significant intervention effect for panic disorder or generalized anxiety disorder clients could be explained by the short duration of the exercise program. In this study, only clients with social phobia received 10 GCBT meetings, the minimal period of time suggested in the literature for effective aerobic training programs (Petruzzello et al., 1991). Broocks et al. (1998) also contend that the exercise program duration (10 weeks), might have been too short as patients found it difficult to start running on a regular basis during the first 4 weeks of the trial, which might explained the delayed effect of exercise compared with pharmacological treatment. Here, an increase in the relative attendance rates (i.e., percent remained for extra physical activity sessions of those attending the GCBT meeting) towards the end of the treatment was noted among clients with panic disorder in the intervention group, suggesting that some panic disorder clients either increased their interest or began to perceive the program as being valuable only towards the end of the treatment phase. Taken together, it could be that the 8-week treatment course was too short to exert the full physiological or psychological benefits for these clients. The fact that clients with generalized anxiety disorder experienced the greatest treatment effect but showed the lowest attendance to the program, which also declined from week to week, raises doubts about the utility of an adjunctive intervention for this diagnosis (Phongsavan et al., in review).

Among the common physiological mechanisms suggested to explain mental health benefits is that exercise enhances monoamine neurotransmitters that mediated stress and depression reactions, or that strenuous exercise may release endorphins that subsequently alter mood states (O'Connor, Raglin et al., 2000; O'Connor, Smith et al., 2000). It could be argued that the unsupervised walking program was of insufficient "dose" to trigger such physiological responses (Dunn

et al., 2005). Walking is an aerobic activity that can be undertaken at different intensities (depending on pace) thus, it could be that those walking at home might not have reached the required intensity level as would be expected from walking on a treadmill under supervised conditions. Yet, given that systematic reviews consistently report non-specific effect of exercise (i.e., effect not different between high and low intensities, between resistance exercise and aerobic training) (Calfas & Landers, 1998; Dunn et al., 2001) further indicates that other unmeasured psychological properties might have mediated the intervention effect, an argument highlighted by others; for example, panic patients who completed the 10-week jogging training experienced improvement in aerobic capacity, but the fitness gains were not associated with the clinical improvement indicating that the mechanisms by which endurance training induced its effect may not be biological. The authors highlighted cognitive and psychological elements as mediating the exercise clinical effect (Broocks et al., 1998; Meyer et al., 1998).

Psychological mechanisms hypothesized as mediating the effect of exercise included increases in self-esteem or self-efficacy (confidence to accomplish a tasks), distraction from unpleasant thoughts or social reinforcement associated with exercise (Paluska et al., 2000; Salmon, 2001). Here, it is unlikely that social reinforcement contributed to the effect because the walking program was executed at participants' home, and other influences associated with being in a group were accounted for in the analysis as a group design. Yet completers who adhered to the program could have experienced increased self-efficacy or a sense of mastery while monitoring, recording and seeing their progress, thus contributing to the effect of the GCBT + EX, but these factors were not measured in this study. Lastly, the contact with the exercise trainer in the GCBT + EX group was more frequent and also included personal feedback, which could have contributed to the intervention effect for some patients.

We are not aware of other studies that have investigated a combination of exercise with CBT using the DSM diagnosis of anxiety disorders and included also clients with social phobia. Two systematic reviews identified only one randomized controlled trial that had tested the combined effect of CBT and exercise on mild to moderate depression (Lawlor & Hopker, 2001; Stathopoulou et al., 2006), both referring to the same study. These reviews concluded that there was no advantage for an adjunct treatment, with a small effect size of 0.27 for jogging over CBT alone (Stathopoulou et al., 2006). While the current findings suggest significant combined effects for some patients, we were not able to attribute the effect to the walking program with confidence. Given the paucity of exercise interventions with clinical anxiety disorders, it is worthwhile replicating the study within the context of mental health clinic services with a bigger sample size for each diagnosis, using a revised exercise intervention protocol, testing longer intervention period, using objective physical activity measures and focusing on what might be the psychological mechanisms that could mediate exercise effect.

Acknowledgments

This research was supported by the South West Sydney Area Health Research Fund and the Australian Rotary Health Research Fund. We thank the participants and staff of the anxiety clinic for their collaboration; Ajsa Mahmic for overseeing the study activities and providing administrative support; and Belinda von Hofe for overseeing the study exercise program.

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