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The effect of mindfulness-based stress reduction on disease activity in people with rheumatoid arthritis: a randomised controlled trial

Mindfulness training involves the cultivation of non-judgemental attention to unwanted thoughts, feelings and bodily experiences via meditation and may help ameliorate both psychological and physical symptoms of chronic disease.[1] Clinical trials have shown that mindfulness training improves the psychological well-being of people with rheumatoid arthritis (RA).[2–4] However, there is limited evidence for its efficacy on disease activity outcomes in RA. Given evidence linking increased mindfulness to improved immune markers,[5] mindfulness training may reduce disease activity in patients with RA by enhancing their immune function. The aim of this randomised controlled trial was to examine the effects of a standardised mindfulness-based stress reduction (MBSR) intervention on RA disease activity.

Fifty-one patients with RA, according to the 1987 American College of Rheumatology classification criteria[6] and without any prior meditation experience, were recruited from two public hospitals in Auckland, New Zealand. After completing baseline assessments, 26 and 25 participants were randomised to the MBSR and control groups, respectively. The MBSR group received the standardised 8-week programme developed by the University of Massachusetts Medical School,[7] and the control group agreed that they could participate free of charge in MBSR after all data collection was completed. Follow-up assessments were completed after 2, 4 and 6 months. Assessments were conducted by a trained research assistant who was blinded to treatment allocation. At each study visit, RA disease activity was assessed using the four-variable Disease Activity Score in 28 joints-C-reactive protein (DAS28-CRP). Individual components of the DAS28-CRP include numbers of tender and swollen joints, CRP and patients' assessment of disease activity on a 100 mm visual analogue scale.[8] Duration of early morning stiffness (minutes) and pain (0–100 mm visual analogue scale) was also measured. The change over time, treatment differences and their interaction were analysed in the 42 participants who completed the interventions using multivariate analysis of covariance (PASW Statistics V.18.0) analyses. Baseline levels were included as covariates. The sphericity assumption was verified for all main (group or time) and significant interaction (group by time) effects, and significant effects were examined using Fisher's least significant difference to preserve a 5% significance level. Partial η^2 was calculated as a measure of effect size. All tests were two tailed.

The baseline characteristics of the groups were similar (table 1). In the MBSR group, greater reduction in DAS28-CRP scores was observed compared with the control group ($P_{intervention}=0.01$, $\eta^2=0.17$) immediately after the intervention and at both follow-up points (treatment effects on the separate DAS28-CRP components are presented in figure 1). The MBSR group also showed greater improvements in duration of morning stiffness ($P_{intervention}=0.03$, $\eta^2=0.13$) and pain scores ($P_{intervention}=0.04$, $\eta^2=0.10$). Again, these effects were evident post-intervention and at both follow-up time points.

This is the first study to show an effect of MBSR on reduced RA disease activity that was maintained at follow-up. Although the mechanisms for this observation require further investigation, the positive effects of MBSR on joint tenderness, improved global assessment and pain, together with lack of effects on swollen joint count and CRP, may imply that a change in MBSR participants' *experience* of RA rather than in underlying joint inflammation is responsible for the reduction in RA disease activity. This pattern of effects is also consistent with evidence linking mindfulness training to improved pain regulation[9] and well-established links between reduced pain and greater well-being among people with RA.[10] In conclusion, the present findings offer clinicians preliminary evidence for the utility of mindfulness-based interventions in people with RA to help reduce experienced disease activity (tender joints, patient global assessment, stiffness, pain) but not objective disease activity (swollen joints, CRP).

Table 1 Baseline characteristics of 42 patients* for the study groups

	Control group (n=21)	MBSR group (n=21)	p Value
Women, n (%)	18 (86)	19 (91)	0.63
New Zealand European, n (%)	11 (52)	15 (71)	0.45
Employed (part or full time), n (%)	11 (52)	16 (76)	0.23
History of depression, n (%)	3 (16)	3 (16)	0.94
Currently taking biologics, n (%)	4 (21)	2 (10)	0.31
Age, years, mean (SD)	55 (13)	52 (12)	0.46
Disease duration, mean (SD)	10.95 (11.45)	10.90 (10.41)	0.95
Methotrexate use, n (%)	10 (47.6)	14 (66.7)	0.21
Prednisone use, n (%)	7 (33.3)	5 (23.8)	0.50
Other oral DMARDs, n (%)	16 (76.21)	14 (66.7)	0.50
Swollen joint count, mean number (SD)	12.24 (9.90)	10.71 (7.75)	0.89
Tender joint count, mean number (SD)	5.38 (4.91)	3.71 (3.77)	0.49
Early morning stiffness (min), mean (SD)	61.90 (100.27)	56.24 (104.41)	0.64
CRP, mg/L, mean (SD)	9.26 (25.35)	6.53 (9.78)	0.70
VAS-pain (0–100, 0=no pain), mean (SD)	45.57 (30.53)	39.24 (25.95)	0.99
VAS-PGA (0–100, 0=no activity), mean (SD)	61.38 (23.11)	59.62 (22.89)	0.46
DAS28-CRP, mean (SD)	4.26 (1.03)	4.16 (1.55)	0.65

*Five participants failed to complete the MBSR intervention and four participants did not complete the control intervention. These participants were excluded at baseline. At 6 months, 1.2% of data was missing from control and MBSR interventions, respectively, and was imputed using a standard carry-forward analysis.
CRP, C-reactive protein; DAS28-CRP, Disease Activity Score in 28 joints; DMARD, disease-modifying antirheumatic drugs; MBSR, mindfulness-based stress reduction; PGA, patient global assessment; VAS, visual analogue scale.

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Contributors FAF (the guarantor) accepts full responsibility for the work and the conduct of the study, had access to the data and controlled the decision to publish. FAF conceived of the study, recruited participants and coordinated study visits, delivered the intervention, analysed the data, contributed to the data interpretation and drafted the manuscript. RJB conceived of the study and assisted with protocol development. GDG provided statistical advice. ND assisted with protocol development, supervised access to participants, guided data interpretation and helped draft the manuscript. NSC conceived of the study, supervised delivery of the protocol and data analysis and drafted the manuscript. All authors read and approved the final manuscript.

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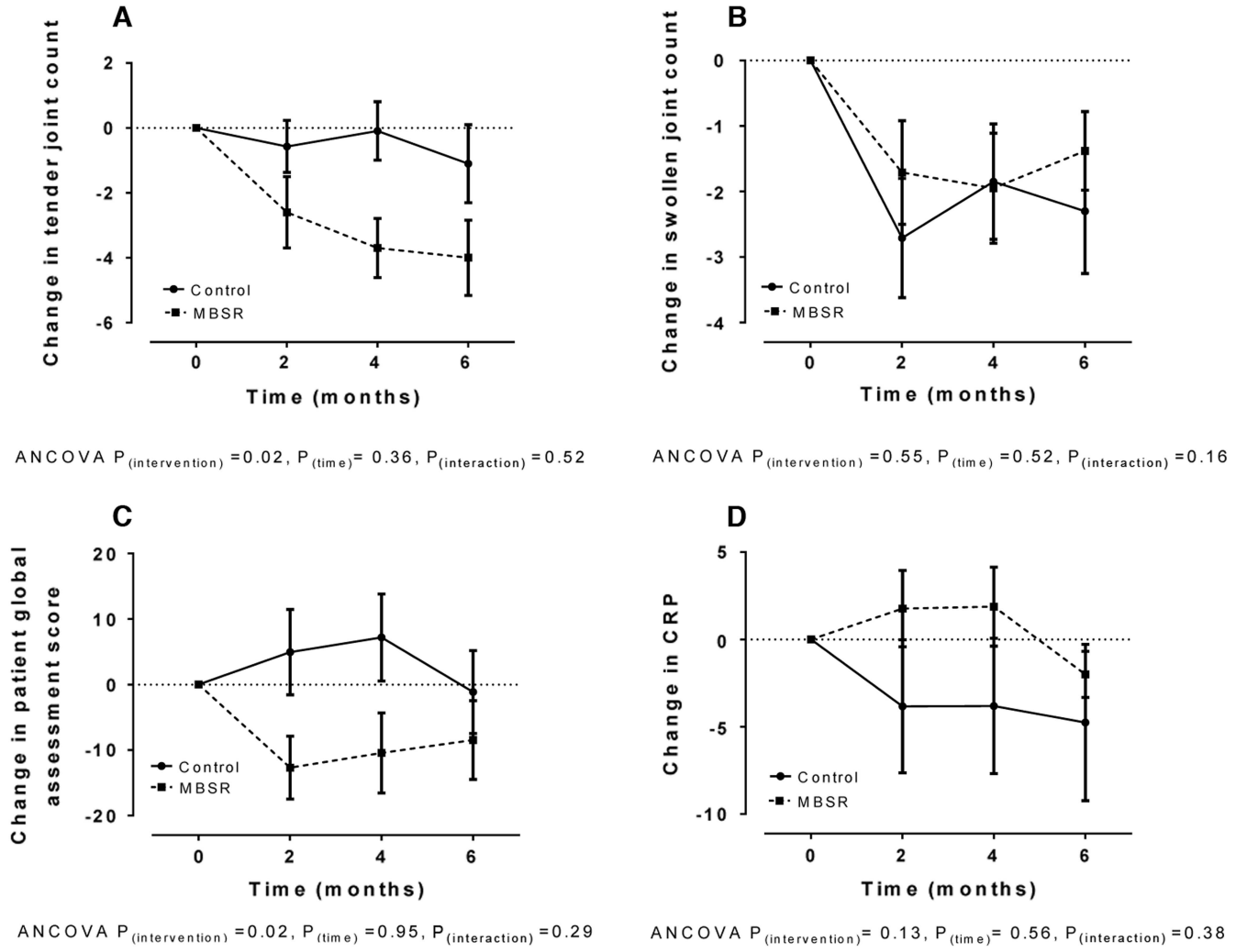

Figure 1 Change in outcome measures. (A) Change in tender joint count. (B) Change in swollen joint count. (C) Change in patient global assessment. (D) Change in C-reactive protein (CRP). Data are presented as mean (SEM). ANCOVA, analysis of covariance; MBSR, mindfulness-based stress reduction.

Competing interests None.

Ethics approval The NorthernXEthics Committee approved the study, and all patients provided written consent.

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