

Web-based mindfulness course for staff working in care homes in Wales for older people with dementia: Stepped-wedge trial

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Abstract:

Design and intervention: Before-and-after evaluation of web-based mindfulness training for staff caring for people living with dementia in care homes. Stepped-wedge cluster randomised design.

Setting and participants: Random sample of 31 care homes for people living with dementia. Homes started mindfulness training at a random time over 35 weeks. From these homes 172 staff volunteered, 151 (88%) started training, and 111 (67%) completed questionnaires after 20 weeks.

Methods: Questionnaires completed at baseline, 8 and 20 weeks included job stress (WSI) and health and well-being (SF-12).

Results: There were significant reductions in job stress of 0.07 (95% confidence interval [CI]: 0.02, 0.13) at 8 weeks and 0.06 (95% CI: 0.01, 0.11) at 20 weeks; and improvements of 2.49 points (95% CI: 0.81, 4.17) in the SF-12 Mental Component Score at 8 weeks and 3.41 (95% CI: 1.88, 4.94) at 20 weeks.

Conclusions: Web-based mindfulness training improved the psychological well-being of care home staff and reduced their stress with small to moderate effects in both short and medium term.

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Keywords: dementia; care homes; care staff; mindfulness; quality of life; stress; stepped-wedge cluster randomised design.

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Ian T Russell The late Professor Ian Russell (1944-2022) was an eminent health researcher. Ian originally studied mathematics at Birmingham University and then completed a PhD in Health Services Research at Essex. He was renowned for his innovative and pragmatic approach to the design and conduct of trials and the use of complex methods to inform health care delivery and policy decisions. Stepped-wedge trial design was an area of particular expertise. Over the lengthy period of his career, he published over 340 peer-reviewed publications. Ian founded departments at Aberdeen, York, Bangor, and Swansea Universities. Additionally, he was founding Director of Research & Development in Wales, and chair of the Commissioning Board for the Health & Technology Assessment, NHS Executive (1993-1996). ORCID 0000-0002-0069-479X

Peter Huxley is a sociologist and a trained psychiatric social worker. He completed his MSc and PhD under the supervision of Professor Sir David Goldberg. Together they wrote two influential texts on the pathway to psychiatric care and common mental disorders (1980 and 1992 respectively). He was the first Professor of Psychiatric Social Work in the UK, at Manchester University, where he later became the head of the School of Psychiatry. In 1999 he moved to the Institute of Psychiatry in London where he was the first Professor of Social Work. While in London he was the founding Director the DH funded Social Care Workforce Research Unit. He moved to the Centre for Mental Health and Society at Bangor University in 2014, where he is Co-Director. ORCID 0000 0001 5152 8030

Introduction

Dementia is a growing global health challenge (Editorial, *Lancet Neurology*, 2017). In the United Kingdom (UK), there are an estimated 850,000 people living with dementia (PLWD) (Prince et al., 2014). One third of PLWD reside in care homes – residential facilities providing care mainly for older people. Within care homes 80% of residents have dementia or severe memory impairment. Thus dementia is a major issue in care homes (Prince et al., 2013).

Care workers are crucial to the quality of care, and quality of life, of PLWD in care homes, and the relationship between them and residents is central to this quality (Bowers et al., 2000). Though literature on the mental health and well-being of family caregivers is comprehensive (Bisla et al., 2011), there are fewer studies of care home workers looking after residents with dementia (Pitfield et al., 2011). However, we have reported high levels of stress associated with working in nursing homes, especially among nursing staff (Islam et al., 2017). Other studies have reported: staff stress in residential facilities for PLWD (Brodaty et al., 2003; Zimmerman et al., 2005; Edvardsson et al., 2008); behavioural and psychological symptoms (BPSD) in residents (Edvardsson et al., 2008); and the benefits of a person-centred approach (Zimmerman et al., 2005).

Stress in healthcare staff leads to high sickness, high absenteeism, high turnover, lower productivity, low job satisfaction, and burnout (Parker et al., 2003; Erickson and Grove, 2007; Zangaro and Soeken, 2007; Gilboa et al., 2008); and reduces the quality and effectiveness of care (Burke, 2000). Despite this evidence of the need for effective interventions to reduce stress among care home staff, there has been little robust research. A rigorous review of interventions for reducing occupational stress amongst healthcare workers found that only two of 14 trials were sound, and advocated more rigorous research (Edwards and Burnard, 2003).

Mindfulness-based stress reduction (MBSR) benefits many mental health issues and mental wellbeing generally, as well as physical problems (Grossman et al., 2004; Marchand, 2012). Mindfulness practice is effective in reducing stress and decreasing burnout amongst healthcare professionals including nursing staff (Cohen-Katz et al., 2004); and enhances job satisfaction (Choi and Koh, 2015). Alternatives to traditional classroom courses teaching MBSR include web-based delivery; early research suggests that this is as effective as traditional courses (Wolever et al., 2012) and accessible and acceptable to trainees (Glück and Maercker, 2011; Krusche et al., 2013).

Thus we aimed to evaluate the effect of a web-based mindfulness course, primarily on the work-related stress of staff caring for PLWD in care homes.

Methods

Study design and participants

Before-and-after study of web-based mindfulness-based training with stepped-wedge cluster randomised design, described in detail in the trial protocol (Baker et al., 2015).

The Care and Social Services Inspectorate of Wales (CSSIW) provided a list of the 403 care homes in Wales registered to care for PLWD; we surveyed a random sample of 134 (33%) (Islam et al., 2017). Of the 72 (54%) who responded and agreed to take part in the potential trial, we selected a random sample of 35, and a random order of starting mindfulness training, both stratified by area (North, Mid, South East or South West Wales) and type of care home (Figure 1). There are three types of home: private homes seeking profit; homes run by Local Authorities for local residents; and non-profit-seeking homes in the voluntary sector, typically run by charities. Within all three sectors residential homes provide accommodation, meals and care, but nursing homes employ registered nurses to meet more complex health needs. Four homes were later unable to take part in the trial; so Figure 2 shows the final order in which 31 homes started training.

We concealed this order from home managers until six weeks before their proposed start. We then told them their proposed date; and we asked them to confirm that this was feasible and, if so, to brief their staff. We arranged meetings to recruit and consent between 4 and 10 staff in each home and provided laptop computers for them to access the mindfulness course. We estimated that, if four consented staff in each trial home reported their stress levels before they started mindfulness training, and 8 and 20 weeks thereafter, the trial would have more than 80% power to detect an improvement in stress equivalent to a 'small to moderate' effect size of 0.3 (Baker et al., 2015).

In most weeks, the consented staff of one of the 31 care homes began the web-based mindfulness training, until all homes had started the course. We asked managers to release each consenting staff member from duty to a quiet room at a convenient time to undertake this training.

Intervention

The course combines Mindfulness-Based Stress Reduction (MBSR) ([Kabat-Zinn, 2009](#)) with Mindfulness-Based Cognitive Therapy (MBCT) ([Segal et al., 2002](#)). It teaches formal meditation skills and informal techniques suitable for daily use ([Segal et al., 2002](#)). The Mental Health Foundation organised and delivered it through Wellmind Media ([Be Mindful, 2019](#)). Though it is possible to complete the course in four weeks, we encouraged participants to work at their own pace.

Measurement

From care homes we collected data on number of beds, both in total and registered for PLWD, number of permanent staff, and staff characteristics including gender, age, ethnicity (white or other), highest qualification (higher, supplementary or basic), job role (manager, nurse, senior carer, carer or care assistant), full- or part-time, average weekly working hours, whether trained in dementia care, and length of time working in care homes and with PLWD.

Our staff outcome measures covered seven domains: job stress (primary outcome); job content; job satisfaction; experience of working with dementia; attitudes to dementia; influence of health on job productivity; and health and wellbeing. We described these measures in detail in reporting the baseline survey ([Islam et al., 2017](#)) and summarise them here. We asked participants to complete these measures at baseline, and after 8 and 20 weeks, irrespective of their progress with the course.

Work Stress Inventory (WSI)

[Zimmerman et al. \(2005\)](#) modified the WSI ([Schaefer and Moos, 1993](#)) to measure stress in professional carers of PLWD in four domains: work events (7 items); caring for residents (4 items); workload and scheduling (8 items); and relationship with supervisor (11 items). Each item, and thus mean scores for the total and each domain, range from 1 to 5 with high scores showing more stress.

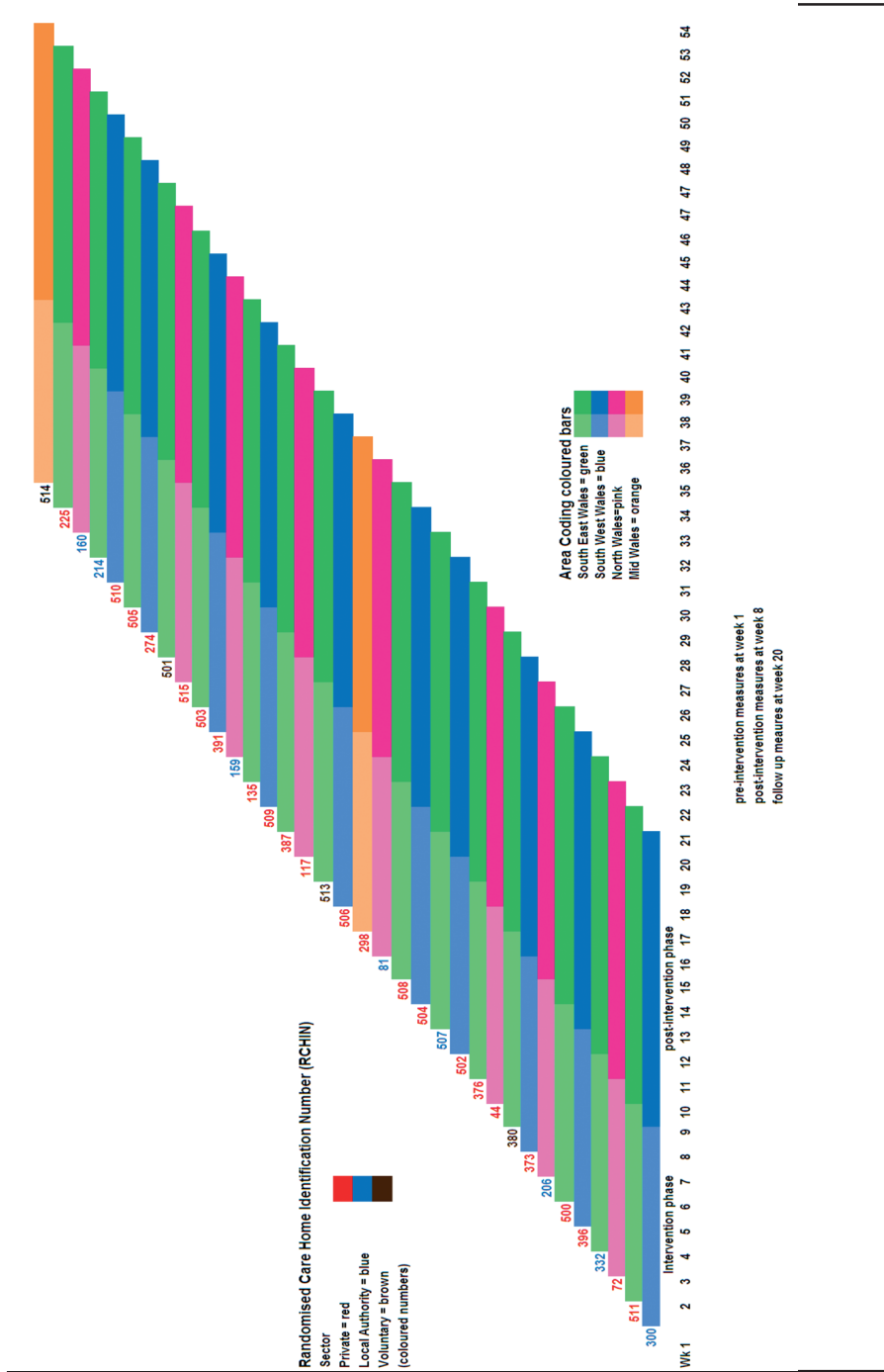


Figure 1: Stepped wedge cluster randomised design as planned.

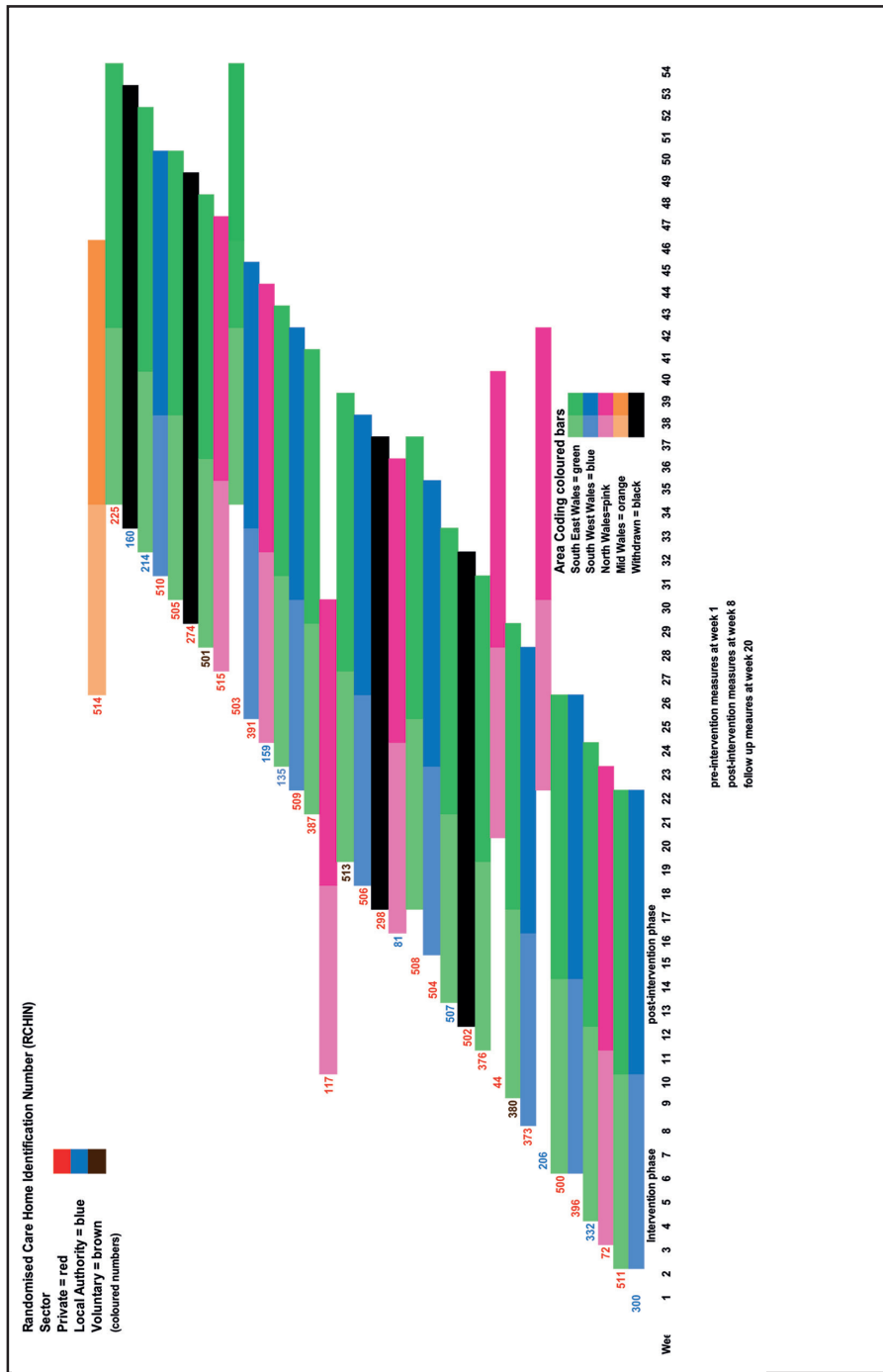


Figure 2: Stepped wedge cluster randomised design as implemented.

Karasek Job Content Questionnaire (KJC)

This summarises the nature of jobs and their immediate context (Karasek, 1979). It comprises three sub-scales: decision latitude (9 four-point items yielding scores between 9 and 36, showing the most latitude), psychological job demands (5 four-point items) and social support in the work place (8 four-point items).

Satisfaction with Job Facets (SJF)

To measure general job satisfaction, Andrew and Withey's questionnaire (1976) uses 5 seven-point scales from 'terrible' to 'delighted'. Thus total scores lie between 5 and 35, with higher scores showing greater job satisfaction.

Experience of working with dementia patients (EWD)

This assesses job satisfaction through 21 items, each scored from zero (not at all) to 4 (extremely) (Åström et al., 1991). It yields six sub-scores: experience of feedback at work; experience of care organisation; satisfaction compared with own expectations; satisfaction compared with expectations of others; satisfactory contact with patients; and satisfaction with work environment.

Approaches to Dementia Questionnaire (ADQ):

Comprising 19 five-point items, this yields total score, 2 sub-scores – hope (8 items) and person-centredness, and 4 sub-sub-scores – work events, caring for residents, workload and scheduling, and relations with supervisor (Lintern et al., 2000).

Stanford Presenteeism Scale (SPS-6)

This measures staff productivity adjusted for health status (Koopman et al., 2002). Each of the 6 five-point items explores staff's ability to work within their work environment despite any health problem. Thus the total score ranges from 6 to 30, with 30 showing the greatest productivity.

Health and well-being (SF-12)

To describe participants' health and wellbeing, we used the SF-12, an even shorter version of the Short Form 36 (Ware et al., 1996); this generates two summary measures – Mental Component Summary (MCS-12) and Physical Component Summary (PCS-12) – where good health scores more highly.

Statistical Analysis

We analysed data by SPSS version 22 (SPSS Inc, Chicago, IL, USA). For all basic demographic data and outcome variables we calculated summary statistics: with means and standard deviations for continuous variables; and percentages for categorical variables. We checked whether the distributions of the outcome measures before and after training were normal, both by visual analysis (histogram, and stem-and-leaf and Q-Q plots) and confirmatory statistical testing (Kolmogorov-Smirnov test). As most measures were skewed, we used the Wilcoxon test, the non-parametric rank-based equivalent of the parametric paired t test, to test for the general effect of mindfulness, and the Mann-Whitney test, the non-parametric rank-based equivalent of the parametric two-sample t test, to test for the specific effect of completing the mindfulness course. To impute the inevitable missing data, we used mean imputation based on participants' values before, and if possible after, the missing value. As Engels and Diehr (2003) showed, in longitudinal studies imputation that uses data specific to individual participants is superior to mean substitution.

Ethics approval and consent to participate

The Research Ethics Committee of the College of Human and Health Sciences of Swansea University approved the study. Each participant gave informed written consent and permission to publish.

Results

From the 31 care homes participating across Wales, 172 staff who care for people living with dementia (PLWD) volunteered to participate in the study. [Figure 3](#) is the CONSORT diagram showing their flow through the study.

[Table 1](#) shows that the mean age of these 172 volunteers was 45.2 years (SD 11.7), and 146 (85%) were female. Most volunteers worked in private care homes (116; 67%), and in homes registered to provide nursing care (115; 67%). The majority of staff were employed as (senior) carers (104; 60%) but only 20 (12%) were nurses. Only 21 (12%) volunteers failed to start the online training, and 72 (42%) completed the course. Older staff, white staff, managers, and staff with higher education were more likely to complete the course.

Our outcome measures had been psychometrically developed and validated to assess seven important psychological aspects of work and life in general: job stress (WSI); job content (KJCQ); job satisfaction (SJF); experience of working with dementia (EWD); attitudes to dementia (ADW); influence of health on job productivity (SPS-6); and health and wellbeing (SF-12). In the general population all seven are effectively normally distributed. Initial analysis of our baseline survey ([Islam et al., 2017](#)) suggested that, in care home staff potentially under greater stress than the general population, they were not all normally distributed. We therefore used the Kolmogorov-Smirnov test to test formally for Normality at baseline and after 8 and 20 weeks, though conscious that it is an over-sensitive test that detects even small departures from Normality.

[Table 2](#) shows that of the 30 resulting significance tests, in 10 separate domains on 3 occasions, 22 were significant at or below the 1% level, 5 at the 5% level, and the remaining 3 were not significant. Though WSI and the SF12 mental component were closest to normality across the 3 occasions, the remaining 8 domains were clearly skewed; fortunately change scores are less likely to be skewed. To test for differences in these ten domains, we therefore used both mean scores and paired and two-sample t tests; and the equivalent but more robust non-parametric tests – Wilcoxon and Mann-Whitney – to test whether apparent differences were indeed statistically significant.

[Table 3](#) shows significant decreases in mean staff stress scores on WSI, the primary outcome, at both 8 and 20 weeks from baseline. The resulting significant improvements in mental wellbeing as measured by the mean mental score of the SF-12 were greater at 20 weeks than at 8 weeks. Significant improvements in mean EWD scores and mean ADQ scores at 20 weeks but not at 8 weeks showed that staff had steadily gained in satisfaction from working with people living with dementia, and steadily developed a more positive approach to dementia. Mindfulness training also improved mean job satisfaction (SJF) at both 8 and 20 weeks and

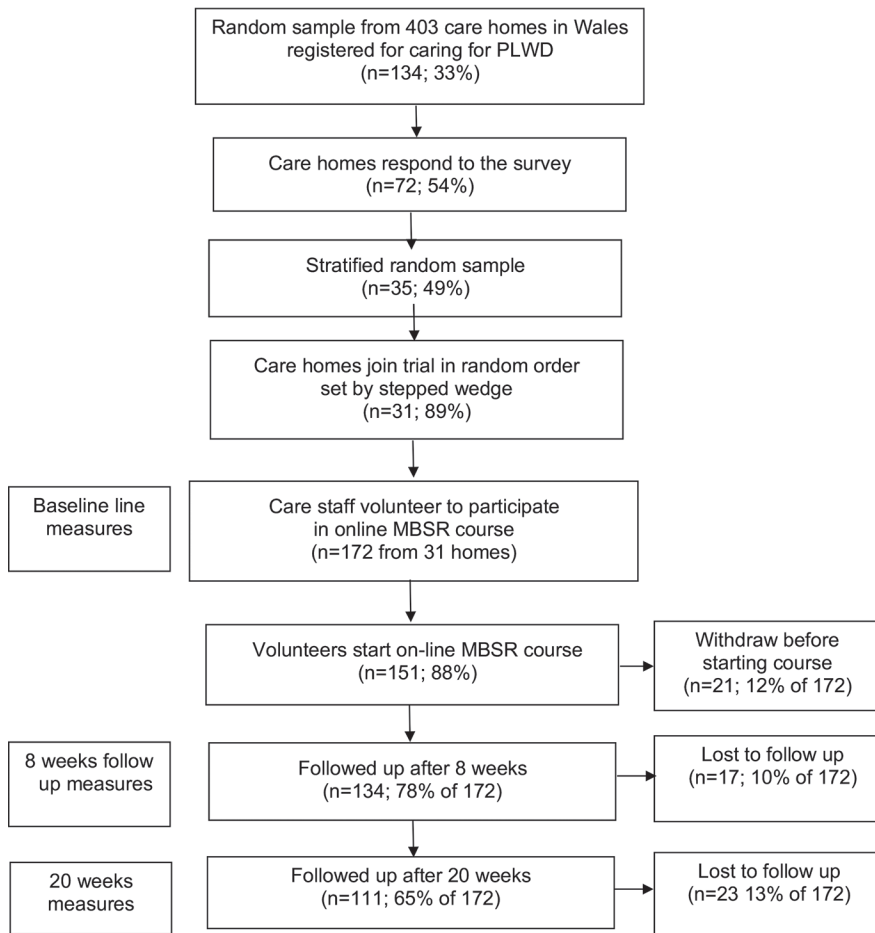


Figure 3: Flow of care homes and participating staff through trial.

Table 1
 Characteristics of participants by whether course completed

Variable	Course NOT completed (row %)	Course completed (row %)	Total (column %)	Significance (Chi-squared, df)
Mean age (SD) in years	43.0 (11.6)	48.2 (11.7)	45.2 (11.7)	Mean difference = 5.2* (95% CI from 1.6 to 8.8)
'Male'	16 (62%)	10 (38%)	26 (15% of 172)	0.70 (0.15, 1df)
'Female'	84 (58%)	62 (42%)	146 (85% of 172)	
Sector				
Local authority	19 (50%)	19 (50%)	38 (22% of 172)	0.46 (1.53, 2df)
Private	71 (61%)	45 (39%)	116 (67% of 172)	
Voluntary	10 (56%)	8 (44%)	18 (10% of 172)	
Ethnicity				
White	97 (61%)	63 (39%)	160 (93% of 172)	0.016* (5.82, 1df)
Non-White	3 (25%)	9 (75%)	12 (7% of 172)	
Education				
Low or none	38 (68%)	18 (32%)	56 (33% of 172)	0.047* (6.13, 2df)
Medium	24 (65%)	13 (35%)	37 (21% of 172)	
Higher	38 (48%)	41 (58%)	79 (46% of 172)	
Trained in dementia care?				
Yes	80 (61%)	52 (39%)	132 (77% of 172)	0.23 (1.42, 1df)
No	20 (20%)	20 (28%)	40 (23% of 172)	
Type of Care Home				
With nursing	70 (61%)	45 (39%)	115 (67% of 172)	0.30 (1.06, 1df)
Residential only	30 (53%)	27 (47%)	57 (33% of 172)	
Current role				
Manager	21 (44%)	27 (56%)	48 (28% of 172)	0.12 (5.83, 3df)
Senior carer	17 (63%)	10 (37%)	27 (16% of 172)	
Carer	50 (65%)	27 (35%)	77 (45% of 172)	
Nurse	12 (60%)	8 (40%)	20 (12% of 172)	0.017* (5.66, 1df)
Total (% of sample)	100 (58%)	72 (42%)		

Key: * = Significant at 5% level

mean social support (KJC subscale) after 20 weeks. In contrast the mindfulness course had no significant effect either on mean decision latitude (KJC subscale) or mean staff productivity (SPS-6). Finally, the mean physical score of the SF-12 had

deteriorated significantly at 8 weeks but not at 20 weeks, and staff had experienced greater psychological demands from work (KJC sub-scale) at both 8 and 20 weeks.

To explore whether course completion conferred greater benefit, [Table 4](#) compares staff who completed the course with those who did not. Comparing mean outcomes across the two groups showed few large differences, but staff who completed the full course benefitted more on the mental health component of the SF-12. The mean score for course completers at 20 weeks (50.2) was more than 6 above that at baseline (43.6) and nearly 3 above that at 8 weeks (47.3); though non-completers improved from a mean score of 45.6 at baseline to 47.2 at 8 weeks, they fell to 46.7 at 20 weeks. Completers also reported clear improvements at 20 weeks in their attitudes to dementia (ADQ).

Discussion

Main findings

Our trial showed that the brief mindfulness course delivered through the internet improved the mental wellbeing of care home staff, as measured by the MCS, the mental health the component of the SF-12. The improvement was statistically significant both 8 and 20 weeks after the baseline when participants could first access the course. The mean effects were small to moderate in the sense of being about 30% of the estimated standard deviation, but they were larger at 20 weeks than at 8 weeks. We found smaller, but still significant, benefits in carer stress as measured by the WSI. After 20 but not 8 weeks there were also small but significant improvements in the ‘experience of staff working with people living with dementia’ as measured by the EWD; and in attitudes to dementia as measured by the ADQ. Participants who completed the course gained more benefit in improved mental wellbeing, although this may be due to their higher ages and education levels.

However, we found a small but significant increase in psychological demand as measured by the appropriate subscale of the KJC both at 8 and 20 weeks. After 8 weeks, but not 20 weeks, there was also a significant decline in physical wellbeing as measured by the PCS, the physical health component of the SF-12.

Strengths and limitations

In designing this study, we were aware that ‘resentful demoralisation’ is a threat in simple randomised trials, because control participants may never receive the

Table 2
Kolmogorov-Smirnov tests for normality

Measure	Timing	Kolmogorov-Smirnov tests	
		KS statistic	Significance
Work Stress Inventory (WSI)	Baseline	0.046	0.200
	Week 8	0.076	0.016
	Week 20	0.073	0.026
Karasek Job Content (KJC) Decision Latitude	Baseline	0.099	<0.001
	Week 8	0.101	<0.001
	Week 20	0.090	0.002
KJC Psychological Demand	Baseline	0.145	<0.001
	Week 8	0.130	<0.001
	Week 20	0.149	<0.001
KJC Social Support	Baseline	0.125	<0.001
	Week 8	0.141	<0.001
	Week 20	0.125	<0.001
Satisfaction with Job Facets (SJF)	Baseline	0.070	0.040
	Week 8	0.090	0.002
	Week 20	0.095	0.001
Experience of working with dementia (EWD)	Baseline	0.090	0.002
	Week 8	0.064	0.085
	Week 20	0.087	0.003
Approaches to Dementia (ADQ)	Baseline	0.101	<0.001
	Week 8	0.094	0.001
	Week 20	0.119	<0.001
Productivity and health status (SPS-6)	Baseline	0.090	0.002
	Week 8	0.095	0.001
	Week 20	0.110	<0.001
SF-12 Physical component Score (PCS)	Baseline	0.122	<0.001
	Week 8	0.092	0.001
	Week 20	0.133	<0.001
SF-12 Mental Component Score (MCS)	Baseline	0.073	0.025
	Week 8	0.052	0.200
	Week 20	0.078	0.012

Table 3
Outcomes at baseline, 8 weeks and 20 weeks

Outcome measures	Mean, SD		Mean change from baseline (95% CI)			
	Baseline	SD	8 weeks	20 weeks	8 weeks (total n=134)	20 weeks (total n=111)
Work Stress Inventory (WSI)	2.82, 0.42		2.74, 0.41	2.75, 0.40	-0.07* (-0.13, -0.02)	-0.06* (-0.11, -0.01)
Karasek Job Content (KJC)						
Decision Latitude	27.0, 2.9		26.9, 2.9	27.0, 3.0	-0.02 (-0.38, +0.34)	-0.00 (-0.38, +0.38)
Psychological Demand	12.7, 1.5		13.1, 1.4	13.1, 1.5	0.37* (0.12, 0.62)	0.35* (0.10, 0.60)
Social Support	22.7, 3.0		23.1, 3.5	23.5, 3.4	0.39 (-0.11, 0.89)	0.79* (0.29, 1.29)
Satisfaction with Job Facets (SJF)	25.3, 4.1		25.9, 4.4	26.1, 4.4	0.62* (0.09, 1.14)	0.76* (0.19, 1.33)
Experience of Working with Dementia (EWD)	81.3, 10.0		82.1, 10.4	83.0, 10.0	0.79 (-0.61, 2.18)	1.63* (0.35, 2.92)
Approaches to Dementia (ADQ)	81.0, 8.0		81.5, 8.5	82.5, 8.2	0.59 (-0.51, 1.69)	1.56* (0.40, 2.71)
Productivity and health status (SPS-6)	20.6, 5.4		21.4, 5.2	21.2, 5.3	0.86 (-0.03, 1.74)	0.63 (-0.32, 1.57)
SF-12 Physical Component Score (PCS)	54.0, 7.3		51.6, 7.9	52.9, 7.2	-2.36* (-3.72, -0.99)	-1.07 (-2.16, 0.03)
SF-12 Mental Component Score (MCS)	44.6, 9.4		47.2, 8.9	48.1, 9.6	2.49* (0.81, 4.17)	3.41*** (1.88, 4.94)

Key: * = Significant at 5% level; *** = Significant at 0.1% level.

Note: We know these 10 outcome measures are all Normally distributed in the general population. However Table 2 shows that, when completed by the stressed staff of care homes, most fail the (over-sensitive) Kolmogorov-Smirnov Test for Normality. Fortunately tests based on Normal distribution are generally robust to such departures from Normality. We therefore checked the significance of the paired-sample t tests reported in the last 2 columns of this table against the corresponding Wilcoxon non-parametric tests (which are robust to departures from Normality), and found them all consistent.

Table 4
Outcomes by whether course completed

Outcome measures	Course not completed (Mean)		Course completed (Mean)		Mean difference in change from baseline (approx 95% CI)	
	8 weeks	20 weeks	8 weeks	20 weeks	8 weeks	20 weeks
	Baseline	20 weeks	Baseline	20 weeks	8 weeks	20 weeks
Work Stress Inventory (WSI)	2.79	2.73	2.74	2.75	0.03 (-0.07,0.13)	0.02 (-0.08,0.12)
Karasek Job Content (KJC)						
Decision Latitude	26.8	26.8	26.7	27.2	0.0 (-0.7,0.7)	0.04 (-0.7,0.8)
Psychological Demand	12.8	13.0	13.1	13.2	0.04 (-0.5,0.5)	0.02 (-0.5,0.5)
Social Support	23.1	23.3	23.5	23.3	0.05 (-1.0,1.0)	0.09 (-0.9,1.1)
Satisfaction with Job Facets (SJF)	25.9	26.3	26.3	25.8	0.06 (-1.0,1.1)	0.08 (-1.1,1.2)
Experience of Working with Dementia (EWD)	81.8	82.0	82.5	82.4	1.4 (-4.2,7.0)	2.2 (-4.3,8.7)
Approaches to Dementia (ADQ)	81.3	81.6	81.7	81.4	0.7 (-1.5,2.9)	2.8* (0.5,5.1)
Productivity and health status (SPS-6)	19.9	20.4	20.4	22.7	0.8 (-1.0,2.5)	0.3 (-1.6,2.2)
SF-12 Physical Score (PCS)	54.1	52.4	53.0	50.8	-1.6 (-4.3,1.1)	0.1 (-2.0,2.2)
SF-12 Mental Score (MCS)	45.6	47.2	46.7	47.3	2.1 (-1.2, 5.5)	5.5* (2.5,8.6)

Key: * = Significant at 5% level

Note: We know these 10 outcome measures are all Normally distributed in the general population. However Table 2 shows that, when completed by the stressed staff of care homes, most fail the (over-sensitive) Kolmogorov-Smirnov Test for Normality. Fortunately tests based on Normal distribution are generally robust to such departures from Normality. We therefore checked the significance of the 2-sample t tests reported in the last 2 columns of this table against the corresponding Mann-Whitney non-parametric tests (which are robust to departures from Normality), and found them all consistent.

intervention under evaluation. So we adopted a stepped-wedge cluster design, commonly used for true innovations in service delivery (Hemmings *et al.*, 2015 and 2017). Another strength of the study design was the randomised selection of care homes, stratified by type of home and geographical location within Wales. We then asked each participating home to seek volunteers to undertake the mindfulness course within the home. Though trials with voluntary recruitment are open to selection bias, we accepted this limitation to retain as many participants possible, as our resources were limited; we accept that our findings therefore reflect the potential of mindfulness to benefit motivated volunteers rather than less motivated conscripts. To retain as many participants as possible, we provided all participating homes with a laptop computer, and a dongle for the dedicated use of the study where no internet access was available.

Interpretation

It is never easy to assess what improvement in outcome measures is clinically relevant in adult populations: there is a wide range of valuations between individual specialties, between individual clinicians within specialties, and between individual participants. If we accept the simple advice of papers seeking a unique criterion (e.g. Busija *et al.*, 2011; Díaz-Arribas *et al.*, 2017), then the mean improvement of 3.5 in the MCS was close to their ‘minimal clinically important difference’. Furthermore, those members of staff who completed the course improved by 6.6 on average.

This adds to the growing literature reporting the benefits of mindfulness-based interventions for stress. We found an effect size on mental wellbeing at 20 weeks relative to baseline, similar to group-based MBSR programmes in adults with chronic physical health conditions (Bohlmeijer *et al.*, 2010). In health and social care workers, group-based MBSR has been effective in reducing stress and anxiety (Irving *et al.*, 2009), but research into other methods of delivering MBSR to them is limited. There is evidence that telephone-based MBSR was beneficial in a small study of nurses in US: improvement in SF-12 MCS scores persisted for 4 months (Bazarko *et al.*, 2013).

Though the evaluation of online mindfulness programmes is still rare, initial evidence is encouraging. Unfortunately, most studies are small (Glück and Maercker, 2011), lack control groups (Bazarko *et al.*, 2013; Krusche *et al.*, 2013), or compare heterogeneous stress management programmes and delivery (Wolever *et al.*, 2012; Mortledge *et al.*, 2013). Furthermore, we know of no evaluation of online mindfulness programmes for health and social care workers, especially within dementia care. Fortunately, we found more benefit at 20 weeks than at

8 weeks by using a longer follow-up period than most previous studies of on-line Mindfulness programmes (Glück and Maercker, 2011; Wolever et al, 2012; Krusche et al., 2013; Mortledge et al., 2013). Moreover, online delivery facilitates training when attendance at traditional courses is difficult, and reduces costs.

In contrast the Karasek Job Content Questionnaire showed that the mindfulness course increased the psychological demand perceived by respondents, perhaps because it increased awareness of the demands they face. The other negative finding – initial deterioration in the SF-12 PCS – may have arisen from participants' increased awareness of bodily limitations from exercises like the body scan. Similarly, Mortledge's feasibility study (2013) of an internet-delivered mindfulness-based stress management programme also found significant improvements in the SF-12 MCS after 12 weeks but not in the SF-12 PCS; and Bazarko et al. (2013) found no improvement in PCS despite a significant improvement in MCS in nurses completing a telephone delivered MBSR programme.

Although our study did not seek to measure the quality or nature of care received by residents of care homes, we hope that improvements in staff experiences of dementia and attitudes to dementia improved the care they provided for people living with dementia. By analogy a qualitative study of nurses who completed a MBSR course reported increased self-awareness, improved coping with stress and communication (Frisvold et al., 2012).

Conclusions and future directions

This study of an online mindfulness course for care home staff showed small to moderate but significant improvements in psychological well-being, and reductions in stress, in short and medium-term. Further evaluation is needed to assess factors affecting accessibility, uptake, acceptability, and completion; and to study economic consequences related to absenteeism and productivity. It is especially important to evaluate whether to extend mindfulness training to a wider range of informal and formal carers of people living with dementia.

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Authors' Contributions

Concept and design: Baker, Huxley, Russell

Successful application for funding: Baker, Huxley

Acquisition, analysis or interpretation of data: All authors

Administrative or technical support: Baker, Russell, Dennis

Drafting of manuscript: Dennis, Russell, Islam

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: Islam, Russell

Study supervision: Huxley, Russell, Dennis

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Competing interest

The Mental Health Foundation receives a fee from the intervention. The authors declare they have no competing interests.

Availability of data and materials

As all authors have now retired or left Swansea University, we regret that the datasets collected and analysed during the study are not available.

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